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# Investigating Factors Effect on Fruit and Vegetable Consumption: Applying Social Cognitive Theory

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**ABSTRACT**

**Introduction:** Regular fruit and vegetable consumption is one of the preventative indicators for the development of obesity, disorders, and diseases. This study aimed to identify the determinants of fruit and vegetable consumption based on social cognitive theory (SCT) among first-grade high school female students.

**Methods:** This Analytical cross-sectional study was performed on 264 high school female students who were selected through multi-stage random sampling from school students in Rafsanjan (Southern Iran). The data were collected through a demographic questionnaire, the seven-day fruit, and vegetable consumption frequency, and its determinants questionnaire that was developed based on the constructs of SCT. Data were analyzed using SPSS-16 software through independent samples *t*-test, Pearson correlation, one-way Analysis of variance, and multiple linear regression analysis. The alpha is equal to 0.05.

**Results:** The mean (SD) score daily fruit and vegetable intakes were 3.43 (1.67) and 2.30 (1.20) units per day, respectively. The results of multiple linear regression analysis showed that environmental factors (β= 0.165, p= 0.009) and behavioral skills (β= 0.152, p= 0.025) have a significant effect on fruit consumption score. Behavioral skills (β= 0.151, p= 0.022) and social support (β= 0.143, p= 0.049) have significant effect on vegetables consumption score, the constructs of SCT explained 71% of the variances in fruit consumption and 9.8% of the variances in vegetable consumption. Mother's job (p= 0.032) and family income (p= 0.024) have a significant effect on fruit and vegetables consumption.

**Conclusion:** Fruit and vegetable intakes were less than the WHO recommended level. Therefore, attention to environmental factors, behavioral skills, and social support is suggested.

**Keywords:** Fruit, Vegetable, Social Cognitive Theory, Students, Adolescences

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## Introduction

Fruit and vegetable consumption are among the key components of healthy nutrition and important factors in the prevention of chronic diseases, especially cardiovascular diseases and some cancers (1). According to nutritional recommendations, children and adolescents like adults should consume 5 units (400g) of fruit and vegetables per day (2), and one of the main goals of WHO in school health programs is to have children eat at least 400 g of fruits and vegetables per day. Research shows that 74.1% of American children and adolescents aged 6-11 years do not eat enough fruits and 83.8% do not eat enough vegetables (3). Besides, less than 1% of Australian children consume these food groups in sufficient quantities (4). A study conducted by Abbasian et al. showed that the average units of fruit and vegetable consumption in the female adolescents in Tehran were 2.6 and 2.6, respectively. The corresponding value for female children in Hamadan in a study by Moini et al. was reported 3.4 units a day, which was lower than the standards and at an unfavorable situation (5-6).

Fruit and vegetable consumption have a significant impact on the quality of life of people. Research has shown that regular fruit and vegetable consumption reduces and prevents mental disorders such as depression (7-9), chronic diseases such as cardiovascular disease, hypertension, some cancers, type-II diabetes, and obesity (10). According to the WHO reports, the consumption of sufficient amounts of fruits and vegetables saves annually more than 1.7 million people from death in the world. The inappropriate consumption of fruit and vegetable is responsible for about 14% of the deaths due to gastrointestinal cancers, 11% of deaths from ischemic heart diseases, and nearly 9% of all deaths worldwide (1).

Among the main behavioral and non-behavioral determinants of fruit and vegetable consumption are the social status, preferences, fruit and vegetable consumption by parents, teachers, and peers, availability of fruits and vegetables, social support, parental encouragement, the environment for serving foods, exposure to new foods, frequent opportunities for testing foods, and behavioral abilities including knowledge and skills (2-3).

According to the WHO, regular fruit and vegetable consumption along with adequate physical activity are two important indicators determining and preventing the development of obesity, disorders, and diseases, but are themselves influenced by individual, behavioral and environmental determinants (11).

Bandura's (1963) social cognitive theory (SCT) describes human behavior as a triangular causality, whose three vertexes are behavior, environmental factors, and cognitive factors (12). The constructs of this theory are knowledge, outcome expectations, outcome values, observational learning, environment, and self-efficacy, self-efficacy in overcoming barriers, self-control, and emotional adjustment (13).

This theory applies to predict and express health behaviors, especially in children and adolescents, and suggests ways to change behavior and can be a guide to behavioral determinants (14-15). In Rakhshanderu's study, observational learning [family modeling] was found to be the strongest predictor of behavior (16). In another study, Mirkarimi et al. found that the constructs of environmental factors and outcome expectations have an important role in predicting fruit and vegetable consumption (17). In the study conducted by Heshmati et al., The most important perceived barriers were the high price of fruits and the lack of training by teachers and instructors (18).

Undoubtedly, adolescents constitute one of the most important and most sensitive age groups of any society whose health is considered an important basis for the health of the community (19). On the other hand, many behavioral patterns in adults, especially their food habits, are formed during childhood and adolescence, and they are less modifiable in the next life periods (20). The present study aims to identify the determinants of fruit and vegetable consumption based on social cognitive theory among first-grade high school female students in Rafsanjan. The findings and insights of this study can be used by relevant

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authorities to adopt and implement appropriate interventions and measures to improve the health of students.

## Methods

The target population in this analytical -cross sectional study included female adolescent students in Rafsanjan (southern Iran) in 2018-19. The research sample consisted of high school female students ($7^{th}$ to $9^{th}$ educational grade) who were selected by 2 stages sampling from high schools in Rafsanjan. At the first stage, the list of public girls' high schools was taken from the Department of Education. Since the city of Rafsanjan has no zoning in terms of the municipality, 4 schools were selected at random out of 18. In the second stage, after visiting the schools, the list of classes was received. The choice of classes in each grade level was also random, so that in each school, one class from each grade level was randomly selected.

The sample size was determined through statistical formula equal to 280 students based on the Najimi et al. study (20) [($n=\frac{z^2_{1-\frac{\alpha}{2}}\times\sigma^2}{d^2}, \alpha=0.05\rightarrow Z_{1-\frac{\alpha}{2}}=1.96$, $S^2$ =0.85, d= 0.1)]. In the study by Najimi et al., the average and standard deviation of fruit consumption in students was 2.62± 0.85.

After approving the research project at the Research Council of Rafsanjan University of Medical Sciences and obtaining a reference letter and code of ethics and making arrangements with the Education Department of Rafsanjan, the researcher collected the information based on a written permit. To this end, the researcher attended the selected classes, stated the research objectives, insured the students about the anonymity of the questionnaires and confidentiality of the data, and distributed the questionnaires among the respondents. During the time of completion of the questionnaires, the researcher was present in the classroom, monitored the manner of completing the questionnaires, and responded to the questions asked by the respondents to eliminate any possible ambiguity and make clarifications.

The data were collected through a demographic questionnaire, the seven-day fruit, and vegetable consumption frequency, and the fruit and vegetable consumption determinants questionnaire that was developed based on the constructs of cognitive social theory. The respondents were asked to answer the items in the questionnaire in the form of a self-report. The respondents who met the criteria for entering the study were students aged 13 to 16 years old, with no history of diseases that did not allow the use of a routine diet based on the food pyramid, such as diabetes, having no mental illness, and being interested in participating in the study. The exclusion criteria included not answering 20% or more questions in the questionnaires or a reporting fruit and vegetable consumption of more than 3 standard deviations. Accordingly, 32 types of winter fruits and vegetables (available in the market) with specified units for each fruit were determined and the respondents were asked to rate the frequency of using them based on a six-point scale ranging from six times a day to never. The fruit and vegetables consumption frequency questionnaire and its determinants based on the SCT were developed based on Rakhshanderu's study (16), where the content validity of the questionnaire was reported as equal 0.98 and its reliability was 0.93. Finally, upon completing the questioners, the consumed units of fruits and vegetables were separately calculated per day. The third part of the questionnaire measured the consumption of fruits and vegetables based on the constructs of social cognitive theory, which was also derived from Rakhshanderu's study (16). This part included 8 dimensions, with the number of items, the scoring method, the range of scores, and the responding scale are presented in the table1.

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**Table 1.** Characteristics of the present research tool

| Structure | Number of questions | Score questions | Scales range | Response scale | Cronbach's alpha |
|---|---|---|---|---|---|
| Environmental factors | 10 | 1-5 | 10-50 | Five Options Likert | 0.68 |
| Behavioral ability (Knowledge) | 3<br>10 | 1-5<br>1-3 | 13-45 | Multiple options or Answers Yes, No, I do not know | 0.65 |
| Behavioral ability (behavioral skill) | 3 | 1-5 | 3-15 | Five Options Likert | 0.82 |
| Outcome Expectation | 11 | 1-5 | 11-55 | Five Options Likert | 0.87 |
| Outcome Evaluation | 11 | 1-5 | 11-55 | Five Options Likert | 0.80 |
| Observational Learning | 7 | 1-5 | 7-35 | Five Options Likert | 0.75 |
| Social Support | 4 | 1-5 | 4-20 | Five Options Likert | 0.73 |
| Self-efficacy | 5 | 1-5 | 5-25 | Five Options Likert | 0.76 |

The collected data were submitted to the SPSS software (version16). One-way ANOVA and independent two-sample *t*-test were used to analyze the fruit and vegetable consumption in terms of demographic variables. Besides, multiple linear regression analysis was run to determine the effects of the components of social cognitive theory and demographic variables on fruit and vegetable consumption by the respondents. All assumptions about multiple linear regressions were met in the collected dataset. The alpha is equal to 0.05.

## Results

Of the 264 respondents, 82 students (31.1%) were studying in seventh grade, 96 students (36.3%) at the eighth grade, and 86 students (32.6%) were in the ninth grade. Mean (SD) of family size and the body mass index were 4.64 (0.96) and 21.32 (4.24) $kg/m^2$, respectively. Other demographic characteristics of the respondents are shown in Table 2. In general, Mean (SD) daily intakes of fruits and vegetables by the respondents were 3.43(1.67) and 2.30(1.20) units per day, respectively. There were significant relationships between fruit consumption score and father's job ($p= 0.031$) and family income ($p= 0.002$). In addition, the vegetable consumption score had a significant relationship with maternal job variables ($p= 0.032$) and family income ($p= 0.024$) (Table 2).

According to the Table 3, Pearson Correlation test showed a positive and significant correlation between fruit consumption with environmental factors ($p= 0.004$, $r= 0.180$) and behavioral skills ($p= 0.008$, $r= 0.165$). The vegetable consumption level was found to have a positive and significant correlation with behavioral skills ($p< 0.001$, $r= 0.234$), outcome expectation ($p< 0.001$, $r= 0.259$), outcome value ($p= 0.002$, $r= 0.190$), observational learning ($p= 0.002$, $r= 0.191$), and social reinforcement ($p< 0.001$, $r= 0.227$).

Table 4 shows the results of the multiple linear regression analysis for the effect of components of social cognitive theory on fruit consumption in the presence of demographic variables. As can be seen, environmental factors ($\beta= 0.165$, $p= 0.009$) and behavioral skills ($\beta= 0.152$, $p= 0.025$) have a significant effect on with fruit consumption. In addition, family income has a significant effect on fruit consumption ($\beta= 0.219$, $p=0.001$). The results showed that the variables entered in the multiple linear regression model can explain 71% of the variations in the fruit consumption level ($R^2=0.71$) (Table 4).

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**Table 2.** The comparison of the average fruit and vegetable consumption of students based on demographic variables

| Variables | Condition | Number (Percent) | M (SD) of fruit consumption (Unit / day) | P | M (SD) of Vegetables consumption (Unit / day) | P |
|---|---|---|---|---|---|---|
| Educational Grade | Seventh Grade | 82(31.1) | 3.57 (1.90) | 0.248[a] | 2.34 (1.30) | 0.938 |
| | Eighth Grade | 96(36.3) | 3.53 (1.62) | | 2.29 (1.13) | |
| | Ninth Grade | 86(32.6) | 3.18 (1.47) | | 2.27 (1.18) | |
| | Not responded | 0(0) | - | | - | |
| Father's education level | Illiterate | 5(1.89) | 3.34 (1.95) | 0.603[a] | 1.96 (1.36) | 0.143 |
| | Elementary | 25(9.46) | 3.50 (1.83) | | 1.95 (1.04) | |
| | Guidance school | 66(25.0) | 3.23 (1.78) | | 2.18 (1.21) | |
| | High school | 86(32.58) | 3.32 (1.64) | | 2.26 (1.18) | |
| | Academic | 72(27.28) | 3.66 (1.54) | | 2.57 (1.24) | |
| | Not responded | 10(3.79) | - | | - | |
| Mother's education level | Illiterate | 3(1.13) | 1.86 (0.98) | 0.535[a] | 2.13 (2.05) | 0.632 |
| | Elementary | 17(6.43) | 3.44 (1.82) | | 2.24 (1.32) | |
| | Guidance school | 49(18.56) | 3.37 (1.86) | | 2.18 (1.09) | |
| | High school | 118(44.7) | 3.40 (1.64) | | 2.24 (1.20) | |
| | Academic | 68(25.76) | 3.56 (1.57) | | 2.49 (1.23) | |
| | Not responded | 9(3.42) | - | | - | |
| Father's job | Self-employed | 136(51.51) | 3.28 (1.64) | 0. 031[a] | 2.33 (1.14) | 0.704 |
| | Employed | 65(24.62) | 3.67 (1.62) | | 2.36 (1.32) | |
| | Worker | 20(7.58) | 3.30 (1.79) | | 1.94 (1.14) | |
| | Unemployed | 4(1.51) | 2.05 (1.63) | | 1.77 (1.01) | |
| | Retired | 24(9.09) | 3.49 (1.68) | | 2.31 (1.28) | |
| | Other cases | 6(2.27) | 5.21 (0.93) | | 2.50 (1.35) | |
| | Not responded | 9(3.42) | - | | - | |
| Mother's job | Housewife | 193(73.11) | 3.40 (1.71) | 0.638[b] | 2.20 (1.18) | 0.032 |
| | Employed | 64(24.24) | 3.51 (1.58) | | 2.57 (1.22) | |
| | Not responded | 7(2.65) | - | | - | |
| Family income | Excellent | 40(15.15) | 4.04 (1.71) | 0.002[a] | 2.69 (1.27) | 0.024 |
| | Good | 104(39.9) | 3.67 (1.68) | | 2.38 (1.24) | |
| | Medium | 102(38.63) | 3.00 (1.50) | | 2.09 (1.06) | |
| | Weak | 10(3.79) | 3.11 (2.11) | | 1.85 (1.18) | |
| | Not responded | 8(2.53) | - | | - | |

M±SD= Mean ± Standard Division
Tests: a= One-way ANOVA, b= two- sample Independent t-test

Table 5 presents the results of the multiple linear regression analysis for the effect of components of social cognitive theory on vegetable consumption in the presence of demographic variables. As it is shown, behavioral skills (β= 0.151, p= 0.022) and social support (β= 0.143, p= 0.049) have significant effect on vegetables consumption. In addition, the mother's job shows a significant effect on vegetable consumption (β= 0.157, p= 0.027). The results generally showed that the variables entered in the multiple linear regression model can explain 9.8% of the variations in the vegetable consumption level (Table 5).

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**Table 3.** Correlation coefficients between fruit and vegetable consumption with social cognitive theory constructs

| variables | Mean score Standard Deviation | Fruit CONSUMPTION SCORE r (p) | Vegetables CONSUMPTION SCORE r (p) |
|---|---|---|---|
| Environmental factors | 29.19 ± 3.37 | r = 0.180 (p = 0.004) | r = - 0.087 (p = 0.163) |
| Behavioral ability (Knowledge) | 7.98 ± 1.92 | r = 0.40 (p = 0.525) | r = 0.116 (p = 0.062) |
| Behavioral ability (behavioral skill) | 9.86 ± 2.29 | r = 0.165 (p = 0.008) | r = 0.234 (p = 0.001) |
| Outcome Expectation | 47.01 ± 5.65 | r = 0.067 (p = 0.284) | r = 0.259 (p = 0.001) |
| Outcome Evaluation | 48.19 ± 4.44 | r = 0.043 (p = 0.494) | r = 0.190 (p = 0.002) |
| Observational learning | 27.79 ± 3.59 | r = 0.039 (p = 0.534) | r = 0.191 (p = 0.002) |
| Social support (friend support) | 12.35 ± 3.71 | r = 0.082 (p = 0.186) | r = 0.227 (p = 0.001) |
| Self-efficacy | 15.36 ± 3.32 | r = 0.048 (p = 0.443) | r = 0.001 (p = 0.997) |

Tests: Pearson Correlation

**Table 4.** The results of the multiple linear regression analysis for the effect of components of social cognitive theory on fruit consumption

| Constructs | Not standardized β | 95% confidence interval for β not standardized | β standardized | p |
|---|---|---|---|---|
| Environmental factors | 0.082 | (0.021,0.142) | 0.165 | 0.009 |
| Behavioral ability (Knowledge) | 0.0001 | (- 0.139,0.138) | 0.001 | 0.994 |
| Behavioral ability (behavioral skill) | 0.112 | (0.014,0.210) | 0.152 | 0.025 |
| Outcome Expectation | 0.002 | (- 0.051,0.054) | 0.005 | 0.954 |
| Outcome Evaluation | 0.015 | (- 0.046,0.075) | 0.038 | 0.634 |
| Observational learning | - 0.023 | (- 0.099,0.053) | - 0.049 | 0.548 |
| Social support (friend support) | 0.008 | (- 0.059,0.075) | 0.017 | 0.820 |
| Self-efficacy | 0.016 | (- 0.051,0.083) | 0.031 | 0.646 |
| Grade | - 0.232 | (- 0.50,0.035) | - 0.109 | 0.089 |
| Father's level of education | 0.004 | (- 0.265,0.273) | 0.003 | 0.976 |
| Mother's education level | -0.003 | (- 0.328,0.322) | - 0.002 | 0.985 |
| Father's job | 0.088 | (- 0.071,0.248) | 0.073 | 0.275 |
| Mother's job | 0.023 | (- 0.534,0.581) | 0.006 | 0.934 |
| Family income | 0.473 | (0.192,0.754) | 0.219 | 0.001 |

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**Table 5.** The results of the multiple linear regression analysis for the effect of components of social cognitive theory on vegetable consumption

| Constructs | Not standardized β | 95% confidence interval for β not standardized | β standardized | p-value |
|---|---|---|---|---|
| Environmental factors | -0.035 | (- 0.077,0.007) | - 0.100 | 0.101 |
| Behavioral ability (Knowledge) | -0.033 | (- 0.128,0.062) | - 0.044 | 0.493 |
| Behavioral ability (behavioral skill) | 0.079 | (0.012,0.147) | 0.151 | 0.022 |
| Outcome Expectation | 0.031 | (- 0. 05,0.067) | 0.143 | 0.096 |
| Outcome Evaluation | 0.017 | (- 0.024,0.059) | 0.064 | 0.415 |
| Observational learning | - 0.004 | (- 0.056,0.049) | - 0.011 | 0.893 |
| Social support (friend support) | 0.046 | (0.001,0.092) | 0.143 | 0.049 |
| Self-efficacy | - 0.034 | (- 0.083, 0.012) | - 0.095 | 0.150 |
| Grade | - 0.074 | (0.258,0.111) | - 0.049 | 0.432 |
| Father's level of education | 0.126 | (- 0.059,0.311) | 0.109 | 0.181 |
| Mother's education level | - 0.179 | (- 0.403,0.045) | - 0.134 | 0.116 |
| Father's job | - 0.058 | (- 0.168,0.052) | - 0.067 | 0.299 |
| Mother's job | 0.434 | (0.050,0.818) | 0.157 | 0.027 |
| Family income | 0.234 | (0.041,0.428) | 0.153 | 0.018 |

Given that in the present study, an average of 10% of the data is missing data, the number of samples mentioned for some variables is smaller than the whole sample under analysis.

## Discussion

The average daily fruit and vegetable intakes in adolescent girls in Rafsanjan were 3.43 and 2.30 units per day, respectively, that was lower than the WHO recommended limits (5 units per day). Environmental factors and behavioral skills have a significant relationship with fruit consumption. Besides, vegetable consumption was found to have a significant relationship with behavioral skills and social reinforcement.

A study conducted by Abbasian et al. showed that the average units of fruit and vegetable consumption in the female adolescents in Tehran were 2.6 and 2.6, respectively (5). The corresponding value for female children in Hamadan in a study by Moini et al. was reported 3.4 units a day (6), showing that the fruit consumption was consistent with our samples, but the vegetable consumption in our samples was less than that of their samples. In the study conducted by Hashemi et al., the average fruit and vegetable consumption in adolescent girls in Tehran was 3.23 and 2.8 units a day (21).

The results of the present study indicated that adolescents consume more fruit than vegetables. They also consumed fruits such as apples, pomegranates, dates, tangerines, and oranges more frequently and fruits such as kiwi, grapefruit, and natural juice less frequently. The participants also stated that they consume vegetables such as cucumber, tomatoes, and leafy greens more frequently than other vegetables, while beans, pumpkins, and celery are used less commonly. In most cases, unfamiliarity with the taste of the fruit or vegetable prevents adolescents from eating them. Accordingly, it is suggested that familiarizing children with different types of fruits and vegetables and their different flavors from childhood and kindergarten and primary school will undoubtedly have a significant effect on the desire to eat fruits and vegetables with familiar flavors and tastes.

A majority of the respondents in this study reported a high and modest level of family income, and only 3.9% of the respondents stated that they have lower family income. There was a significant relationship between the higher consumption of fruit with the father's job (employee and retiree) and the high and good family income. Similarly, there was a significant relationship between higher vegetable consumption with the mother's job and the high and good family income. Previous studies

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have also shown a positive and significant relationship between family income level and fruit and vegetable consumption, which can be attributed due to the effects of economic condition on the family ability to buy fruits and vegetables. The results of a study conducted by Moini et al. in high schools in Hamadan showed that household size, mother's education, father's occupation, and household income have a significant correlation with fruit and vegetable consumption (6). However, Rakhshanderu et al. found no significant relationship between parents' occupation with adolescent behavioral skills in terms of fruit and vegetable consumption. In contrast, the mother's education and the place of residence had a significant relationship with behavioral skills, but this relationship was not significant for the respondents' age (22). Given the above considerations, it is suggested that arrangements be made to distribute fruits and vegetables at reasonable prices in the school buffets.

One of the constructs of social cognitive theory is environmental factors which refer to the physical and social conditions surrounding the student, including the supply of fruits and vegetables at home, the family's adequate income to provide them, and the student's access and permission to the use of fruits and vegetables. The mean score for environmental factors was 29.19%, showing a relatively good condition and correlated with fruit consumption but did not correlate with vegetable consumption. Among the environmental factors, access to and availability of fruits and vegetables had the highest impact and insufficient income and lack of time to buy fruits and vegetables had the minimum effect. The results of a study by Najimi et al. showed a significant correlation between students' access to fruits and vegetables with the consumption of these food groups among fourth-grade male primary school students in Isfahan (20). Hashemi et al. reported that the availability of fruits and vegetables was equal to 1.2 (21). Given the significant impact of the availability of fruits and vegetables at home and in the school environment on adolescents' consumption, it is suggested that educational sessions be held for parents of schoolchildren, school officials, and teachers to make them aware of the positive effects of the availability of fruits and vegetables at home and school.

Behavioral ability refers to behavioral awareness and behavioral skills of adolescents to prepare and consume fruits and vegetables. The mean score of behavioral ability in this study was 7.98 which implies an unfavorable situation and did not correlate with the fruit and vegetable consumption. Among the behavioral factors, the adolescent's awareness of the fruits and vegetables gained the lowest score, and the washing and preparation of fruits and vegetables showed the highest score. Najimi et al. showed a significant correlation between behavioral ability and fruit and vegetable consumption (20). The mean score of adolescents' skills in using fruits and vegetables was 69.2 in Rakhshanderu's study (22). Besides, the mean score of adolescents' awareness of fruit and vegetable consumption in the study conducted by Hashemi et al. was 0.3 and their mean score for behavioral skill was 4.67 (21). Perhaps the reason for the lack of a correlation is the students' low awareness. Accordingly, students' awareness and behavioral skills can be increased by holding training sessions and including the necessary materials on the fruit and vegetable consumption in courses related to lifestyle and introducing websites dealing with nutrition.

Outcome expectation refers to the adolescent's expectation of the results of consuming fruits and vegetables. The mean score of outcome expectation in this study was 47.01, which shows a favorable condition, and it did not correlate with fruit consumption but was correlated with vegetable consumption. The maximum outcome expectation scores were related to health and vitamins, and the minimum score was related to the taste of fruits and vegetables. Najimi et al. showed that outcome expectations did not have a significant correlation with the fruit and vegetable consumption (20). The importance of health and beauty for girls certainly can affect fruit and vegetable consumption by them. Considering the significant impact of this construct on the fruit and

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vegetable consumption, adolescents can be encouraged to use fruits and vegetables more frequently by organizing training courses in the form of lectures, discussions, and role play, and emphasizing the health aspects and familiarity with different flavors of fruits and vegetables.

Outcome value is the value the teenager assigns to the consumption of fruits and vegetables. The mean score of the outcome value in this study was 48.19, which was the highest score compared to the other constructs pointing to a favorable condition. However, it did not correlate with the fruit consumption but was correlated with vegetable consumption. The maximum scores for this construct were related to having good skin and hair and having a good weight, and the minimum score was related to the dislike of the fruit and vegetable flavor. The mean score of the outcome value was 15.7 in the study conducted by Hashemi et al. (21). It seems that the unfamiliarity with the various flavors of fruits and vegetables from childhood causes major problems in fruit and vegetable consumption during adolescence. Considering the significant effects of outcome value, students can be familiar with various flavors of fruits and vegetables by training courses and role-play sessions for them to highlight the positive effects of fruit and vegetable consumption on their academic performance. Besides, students can be encouraged to use fruits and vegetables more frequently by familiarizing them with different flavors through holding fruit and vegetable festivals at schools.

Observational learning was operationalized in this study as to learn how to use fruits and vegetables by observing the behavior of parents and peers. The mean score of observational learning was 27.79, which shows a relatively favorable situation, and it was not correlated with the consumption of fruits but was correlated with vegetable consumption. The maximum score of this construct was related to the learning from professionals and the family, and the minimum score was related to not observing fruit and vegetable consumption by friends. Najimi et al. showed that observational learning had only a significant correlation with fruit consumption by students (20). The mean score of observational learning was equal to 3.1 in the study conducted by Hashemi et al. (21). Hass and Hartmann's study on a sample of elementary school students in Germany showed that parental modeling and peer influence have a significant and positive relationship with the consumption of fruits and vegetables (23). It seems that the lack of dining spaces at schools and low consumption of fruit and vegetable as snacks have diminished the role of peers in learning. Therefore, considering the effective role of peers in learning to consume fruits and vegetables, creating the necessary grounds for supplying fruits and vegetables at schools, and including a break for eating fruits and vegetables, and the existence of dining places can play a significant role in increasing adolescent consumption.

Social reinforcement refers to rewards and punishments that adolescents receive from parents and peers (friends) for eating or not eating fruits and vegetables. The mean score of social reinforcement in this study 12.35, which shows an unfavorable condition and did not correlate with fruit consumption, but correlated with vegetable consumption. The maximum score for social reinforcement was related to parents' and teachers' encouragement, and the minimum score was related to the lack of encouragement by friends. Najimi et al. did not find a significant correlation between social reinforcement and fruit and vegetable consumption, and they considered the age group of students as well as the lack of peer influence as important factors in this regard (20). The reason for the low impact of peer encouragement can be due to the lack of supply and not using fruits and vegetables at schools. Given that family-based interventions can be effective in increasing the fruit and vegetable intake in adolescents (21), organizing training courses for parents, giving advice on giving snacks, including fruits and vegetables, to adolescents for school use, and assigning a break time for using fruits and vegetables in schools on a weekly or monthly basis can be effective.

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Self-efficacy refers to adolescent confidence in his/her ability to consume fruits and vegetables. The mean score of self-efficacy in this study was 15.36 that showed an unfavorable situation and did not correlate with the fruit and vegetable consumption. The maximum score of self-efficacy as a research variable was related to the ability to eat fruits and vegetables during illness, and the minimum score was related to not eating fruits and vegetables at parties due to embarrassment. Najmi et al. explored students' self-efficacy in the form of self-efficacy in difficult situations and self-efficacy in the selection and showed that the two types of self-efficacy have a significant correlation with fruit and vegetable consumption (20). The mean score of self-efficacy was equal to 6.2 in the study conducted by Hashemi et al. (21). Ramezankhani et al. showed a direct (positive) correlation between fruit and vegetable consumption and self-efficacy (24). A study conducted by Woo and Lee on South Korean adolescences showed that self-efficacy was one of the strongest determinants of vegetable preference and consumption (25). The low levels of self-efficacy can perhaps be attributed to environmental problems such as inaccessibility of fruits and vegetables at home due to economic problems, lack of time, lack of parents' awareness, and students' low awareness. Accordingly, the awareness of parents and students can be increase by holding training sessions and screening movies.

The findings of the present study suggested that fruit consumption had a positive and significant correlation with the environmental factors and students' behavioral skills, and there was a positive and significant correlation between vegetable consumption and students' behavioral skills, outcome expectations, outcome value, observational learning, and social reinforcement. The results of multiple regression analysis revealed environmental factors and behavioral skills are correlated with fruit consumption, and behavioral skills and social reinforcement are associated with vegetable consumption. In sum, the constructs of social cognitive theory could explain 71% of the fruit consumption variations and 9.8% of the vegetable consumption variations. A study by Zamanian et al. on 18-70-year-old people in Arak showed that the degree of physical activity, economic position, and the father's education were the determinants of the fruit and vegetable consumption (26). Najimi et al. showed that observational learning is one of the factors influencing fruit consumption. Besides, self-efficacy, behavioral ability, and access were the most important determinants of fruit and vegetable consumption among primary school students (20). In a study conducted by Hass and Hartmann, the recognition of various types of fruits and vegetables, the children's preferences for fruit and vegetable consumption, parental modeling, and the influence of peers were four important determinants of fruit and vegetable consumption (23). In the study by Hashemian et al. self-efficacy and social support were the strongest predictors of adolescent behavior (27). In Rakhshanderu's study, observational learning, environment, self-efficacy, and behavioral ability were the strongest predictors of fruit and vegetable consumption behavior, respectively (16). Also, Mirkarimi et al. found that environmental factors and outcome expectations had an important role in predicting fruit and vegetable consumption (17). Investigations carried out in different countries with different environmental, cultural, and social conditions indicate the ability of the constructs of cognitive social theory for predicting the fruit and vegetable consumption. As such, it is suggested that interventional studies are conducted based on the constructs of social cognitive theory with emphasis on environmental factors and behavioral skills. Besides, a dining space can be provided at schools, and fruits and vegetables can be supplied in school buffets. One of the limitations of the present study was that the data were collected through self-reported questionnaires to be completed by students themselves, and the fruit and vegetable consumption was measured on a weekly basis.

## Conclusion

The average daily fruit and vegetable intakes in adolescent girls in Rafsanjan were 3.43 and 2.30

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units per day, respectively, that was lower than the WHO recommended limits (5 units per day). There was a significant relationship between the higher fruit and vegetable consumption with the father's job (employee and retiree), the high and good family income, and the mother's job.

The findings also showed that there was a positive and significant correlation between fruit consumption and environmental factors and students' behavioral skills, and a positive and significant correlation between vegetable consumption and behavioral skills, outcome expectation, outcome value, observational learning, and social reinforcement. Accordingly, students' awareness and behavioral skills can be increased by holding training sessions and including the necessary materials on the fruit and vegetable consumption in courses related to lifestyle.

According to the recall bias, it is recommended to assess adolescence fruit and vegetable consumption behavior, with the help of parents, be subtle and in the future. Also, the implementation of training interventions based on social cognitive theory with emphasis on environmental factors and behavioral skills in female students can increase fruit and vegetable consumption.

The strengths of research are the application of social cognitive theory and its constructs to identify the determinants of fruit and vegetable consumption that the WHO has also emphasized in this category of determinants. One of the limitations of the present study was that the data were collected through self-reported questionnaires to be completed by students themselves, and the fruit and vegetable consumption was measured on a weekly basis. Another limitation is the lack of adjustment for some confounding variables including BMI, economic status.

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## Conflict of interest

None declared.

## Author contribution

M.N. and M.A. designed the study. M.H. performed the experiment. Z.A. processed the experimental data, performed the analysis. M.N contributed to the interpretation of the results. M.H. wrote the manuscript in consultation with M.N. and M.A. All authors discussed the results and commented on the manuscript.

## Ethical statements

The Ethics Committee of Vice Chancellor for Research and Technology at Rafsanjan University of Medical Sciences approved the study (IR.RUMS.REC.1397.111).

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