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Family and school-based educational intervention on fruits and vegetable consumption of female students: Application of social cognitive theory

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Abstract:

BACKGROUND: Fruits and vegetable (F.V) consumption is the most pivotal strategy of preventing cardiovascular diseases, obesity, diabetes, and cancers. The present study aims to evaluate the effect of educational intervention based on social cognitive theory (SCT) on consumption of F.Vs among female high schools' students in Rafsanjan (South of Iran).

SUBJECTS AND METHODS: This quasi-experimental study was carried out among 272 students (intervention = 134 and control group = 138) using a multistage sampling method. The instrument used in this study included demographic characteristics, the students' F.V consumption during the past 7 days and its determinants based on the theory. Educational interventions were made in three sessions for students and two sessions for parents, teachers, and school officials. The data were analyzed by SPSS version 18 using the statistical tests of Chi-square, independent samples *t*-test, paired-samples *t*-test, and univariate model at a significant level of 0.05.

RESULTS: Three months after the educational program, mean scores and standard deviation of F.V consumption and constructs in the intervention group increased significantly ($P < 0.001$). Respectively, 22.2% and 36.1% of the changes in the average unit of F.V consumption were the result of the present educational intervention.

CONCLUSION: The intervention based on SCT with an emphasis on the interaction between student, family, and school has had an effect on F.V consumption behavior. Therefore, in forming behavior, attention is paid to the interaction of individual and interpersonal factors.

Keywords:

Education, fruit, social theory, student, vegetables

Introduction

Consuming fruits and vegetables (F.Vs) improves people's quality of life and prevents depression, cardiovascular diseases, hypertension, type 2 diabetes, some cancers, and obesity.^[1,2] Kids and juveniles should consume 5 units (400 g) of F.Vs per day like adults.^[3] The appropriate consumption of F.Vs saves more than 1.7 million people a year from death; in addition, about 14% of deaths from

gastrointestinal cancers, 11% of deaths from ischemic heart diseases, and about 9% of total global mortalities are the result of the inappropriate consumption of F.Vs.^[4] Research shows that the consumption of F.Vs in adolescents is undesirable and far lower than the amount recommended by the World Health Organization (WHO).^[5-8] In the same vein, <1% of Australian children eat enough F.Vs.^[6] In the research of Gold *et al.* on US schoolchildren, the average consumption of F.Vs was 3.3 and 4 units per day, respectively.^[5] The average

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consumption of F.Vs was 1.7 and 1.4 units per day in the adolescents of Chaharmahal and Bakhtiari (Western Iran).^[9]

The daily F.V use in Rafsanjan adolescent girls was 3.43 and 2.30 units per day, respectively, that is lower than the WHO recommended.^[10]

Consumption of F.Vs is influenced by many individual and interpersonal determinants, most studies have used multifaceted intervention strategies to increase access or consumption of FV.^[11] The supportive role of family and school in school and family-based interventions on F.V consumption has been confirmed.^[12,13]

Adolescence is a critical life period and it is also a golden time to provide intervention strategies.^[6-9,14] Because nutritional behaviors are acquired and influenced by factors such as attitudes, knowledge, beliefs, and interpersonal behaviors, health education can play an important role in this regard.^[15] Education is a planned process which involves mainly the combination of diverse educational experiences that facilitate the adoption of voluntary health behaviors.^[16] Theories also guide the performance of educators and can be used to plan, execute, and evaluate a program during different stages.^[17]

The social cognitive theory (SCT) is one of the behavioral theories used in health interventions, which was presented by Bandura in 1963 and describes human behavior based on the interaction among dynamic triad of personal cognitive, physical, and social environment and behavioral factors.^[18,19] The constructs of SCT include knowledge, self-efficacy, outcome expectations, outcome value, environment, observational learning, social support, behavioral skills, and behavioral ability.^[19,20]

According to the World Health Organization, individual, behavioral, and environmental factors play a role in creating and improving nutritional behaviors, obesity, and overweight.^[21] In some studies, SCT has been used as a framework for changing the behavior of F.V consumption, which has contradictory results; for example, in the studies of Gold *et al.* and Hashemi *et al.*, educational interventions based on the SCT led to the promotion of fruit consumption.^[5,22] However, in Abbasian's study, a contradictory report was presented.^[23]

Therefore, considering the importance of the use of F.Vs in preserving and promoting health and inadequate consumption of F.Vs in Rafsanjan girls,^[10] the present study was designed and conducted to evaluate the effects of the SCT-based intervention on promoting of

F.V consumption in female high schools' students in the Rafsanjan city (Southern Iran).

Materials and Methods

Study design and setting

The quasi-experimental study was conducted in Rafsanjan public female schools in 2018–2019.

Study participants and sampling

Participants were 272 female high schools' students (7th, 8th, and 9th grade). Out of 18, 4 schools were selected randomly, and 2 schools were assigned to the intervention group randomly and 2 schools to the control group. In each grade, a class was selected randomly. The inclusion criteria of the study entailed students with no particular illness (contrary to the use of a routine diet based on the food pyramid, such as diabetes and psychiatric illnesses) and being interested in participating in the study. The exclusion criteria also included being absent more than one session at the time of intervention, failure to keep attending training sessions, failure to answer 20% of the questions, and receiving a report on the consumption of F.Vs by over 3 standard deviations than the average. Out of 315 students participating in the study, 43 of them were excluded for the reasons mentioned above, and only 272 students (intervention = 134 and control group = 138) participated in the study [Figure 1].

Data collection tool and technique

The instrument used in this study included three parts, the first part including demographic characteristics (job and education of parents, income status description, and body mass index [BMI]) with 6 questions. The second part was a questionnaire on the frequency of F.V consumption. In this section, the students' F.V consumption during the past 7 days was evaluated. Accordingly, the students were asked about 32 types of F.Vs present in the season (autumn) and the market based on the unit specific to each fruit, with the responses being within the range of six times a day. The questions in this section were based on Rakhshandehroo's research.^[24] The content validity of this tool was studied in Rakhshandehroo's study using expert opinions in health education and nutrition sciences, which was reported to be 0.98. In addition, to assess stability, the intraclass correlation coefficient (ICC) was utilized. The reliability of the instrument was evaluated by Cronbach's alpha coefficient and reported as 0.93. The third part was the questionnaire for determining F.V consumption based on the SCT constructs taken from Rakhshandehroo's research,^[24] with the validity and reliability of the constructs having been confirmed in Rakhshandehroo's research and their Cronbach's alpha coefficient reported to have been within the range of 0.65–0.87.

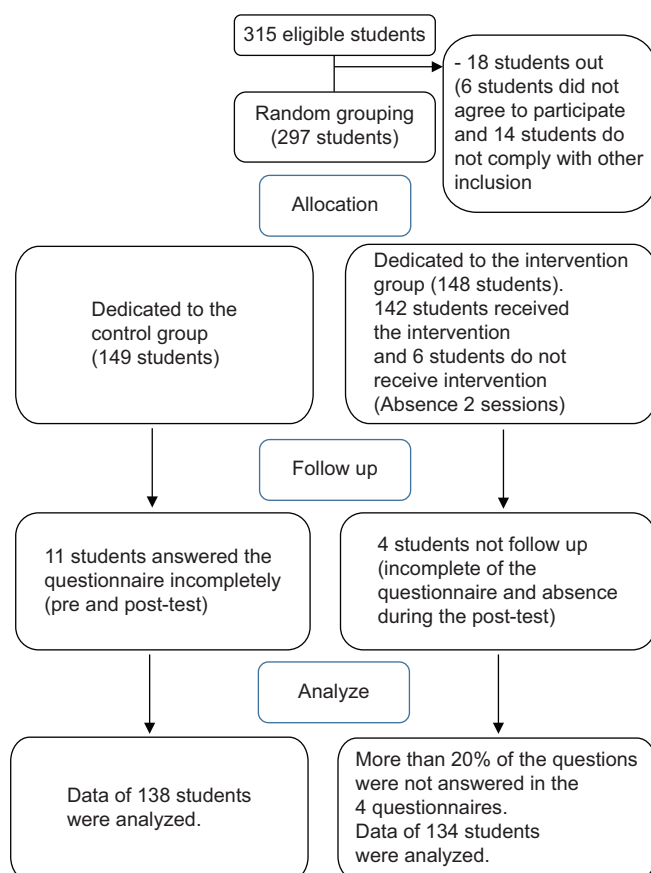


Figure 1: Consort follow diagram of social cognitive theory-based intervention on fruits and vegetable consumption

The students' knowledge was evaluated using 15 questions and the multifactor answer scale of "yes," "no," and "I do not know." Correct answers were given score 2, wrong answers were given score 0, and "I do not know" answers were given score 1. The scores ranged from 0 to 30. The constructs of environmental factors with 10 questions (the score range of 10–50), behavioral skills with 3 questions (the score range of 3–15), outcome expectation and outcome values with 11 questions (the score range of 11–55), observational learning with 7 questions (the score range of 7–35), social support with 4 questions (the score range of 4–20), and self-efficacy with 5 questions (the score range of 5–25) were evaluated, with the answers to which considered on a 5-point Likert scale of never to always and completely agree to completely disagree range. The answers of always and completely agree were given score 5, and the answers of never and completely disagree were given score 1. The questionnaires were given to the students without mentioning the names and the related code. Behavioral ability was obtained from the sum of knowledge and behavioral skills and its range of scores was 3–45.

At first, both intervention and control group students answered the questionnaires. The pretest was analyzed

by SPSS Version 18 (For Windows; SPSS Inc., IBM Corp., Chicago, Ill., USA), and educational priorities were determined. Next, the educational intervention was designed and formulated in the form of lesson plan. The lesson plan included the training content, training methods, as well as the duration and number of training sessions. After pretest analysis, the educational program was executed based on the SCT and relevant educational methods according to scientific resources,^[18,19] and similar to the Jeihooni *et al.* study,^[2] in three 40–50 min sessions for students as a direct target group and two 40–50 min training sessions for parents, teachers, and school officials as an indirect target group and cues to action with the aim of cooperation, guidance, supervision, and encouragement of students to consume F.Vs in the home and school environment, such as buying and making available F.Vs at home, home-packed lunches, creating a suitable atmosphere at home and school for consumption like serving fruits and healthy foods in school buffets [Table 1]. After the training sessions, a text message was sent to families of intervention group every week about F.V consumption. All training sessions were conducted in the school environment.

During this period, no educational intervention was applied to the control group. To observe ethical requirements in this study, an educational session was held, with educational pamphlets presented to the control group. To evaluate the effects, 3 months after the end of the intervention, the questionnaires were completed and collected in the presence of the researcher. The data were analyzed by SPSS version 18 (for Windows; SPSS Inc., Chicago, IL), using the statistical tests of Chi-square, independent samples *t*-test, paired samples *t*-test, and univariate model at a significant level of 0.05.

Ethical consideration

Ethical issues (including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors. The ethics code of IR.RUMS.REC.1397.111 with the permission of Rafsanjan University of Medical Sciences.

Results

The average age of students was 14.11 ± 1.13 years. The frequency distribution was the same in the three grades. The results showed that there was no statistical difference between demographic characteristic two groups ($P > 0.05$). The education level of the majority of fathers (~32%) ($P = 0.643$) and mothers (~47%) ($P = 0.682$) in both groups was a diploma. In both group, the highest frequency distribution of father's job was self-employed (~47%) ($P = 0.746$) and in terms of mother's job was housewife (~70%) ($P = 0.174$). Furthermore, the

Table 1: Objectives, content, and educational methods of intervention sessions

| Session | Objectives of the session | Summary of the activities | Methods |
|--|---|--|--|
| First | Promoting the knowledge and attitudes of students toward F.V consumption | Defining F.V consumption, food pyramid, the proportion of consumed juvenile needs, the types of F.Vs, nutrients in them, as well as the beneficial effects and preventive power of F.Vs from diseases | Lectures, providing questions and answers, introducing nutrition sites, and making discussions |
| Second | Outcome expectation, outcome value, and self-efficacy of students in F.V consumption | The positive effects of eating F.Vs, the negative consequences of not eating them, ways of increasing F.V consumption, and F.V consumption | Making discussions, brainstorming, expressing experiences, and displaying short videos |
| Third | Improving self-efficacy and behavioral skills of students regarding F.V consumption | Discussing ways of increasing self-efficacy in F.V consumption using photos and educational videos of washing and preparing salads as well as F.V desserts | Discussions, expressing opinions and experiences, and roles playing |
| The session for officials and teachers | Cooperation among officials and teachers aimed at establishing an appropriate school setting for increasing F.V consumption by students | Providing statistics, explaining the impacts of environmental factors and observational learning on F.V consumption, considering nutrition breaks based on F.V consumption in schools, and holding nutrition competitions in schools | Lecture, discussions, brainstorming, expressing experiences |
| The session for parents | Parental cooperation aimed at creating a proper home-based setting to increase F.V consumption by students | Providing statistics and figures, explaining the impacts of environmental factors and observational learning on F.V consumption, allocating time for F.V consumption with one's own children, and making F.Vs available | Lecture, questions, and answers, expression of experiences |

F.Vs=Fruits and vegetables

majority of students (41.8% of the intervention versus 42.8% of the control group) described their family income status well ($P = 0.119$). The BMI of students in the intervention group was 21.10 ± 4.27 and control was 21.65 ± 4.72 ($P = 0.343$).

Tables 2 and 3 show the mean and standard deviation of F.V consumption and constructs of SCT in the two groups. After the educational program, the mean scores and standard deviation of environmental factors, knowledge, behavioral skills and ability, outcome expectation and value, observational learning, social support, and self-efficacy in the intervention group increased significantly ($P < 0.001$). Furthermore, in the intervention group, F.V intake increased by 0.52 and 0.76 unit, respectively, and this difference was significant compared to the control group. However, the mean score of knowledge and outcome expectation ($P = 0.01$) and vegetable use ($P = 0.04$) in the control group increased significantly after the intervention.

Respectively, according to the univariate model, 22.2% and 36.1% of the changes in the average unit of F.V consumption were the results of the present educational intervention.

Discussion

Environmental factors are physical, economic, and social conditions surrounding students in terms of the use of F.Vs. Although educational program was delivered to parents and school officials to provide available F.Vs, according to the univariate test (covariance), the educational program had the least impact (16%) on this structure, similar to the Hashemi *et al.*^[22] and Abbasian

et al. studies.^[23] However, it was not consistent with the research of Woo and Lee^[25] who intervened to provide F.Vs in schools. From the families' point of view, the most important barrier to receiving the fruit was its high cost, therefore, it is suggested that authorities and policymakers take necessary programs, such as subsidizing schools by supplying and offering F.Vs to students.

Behavioral abilities are referred to as students' knowledge and behavioral skills in preparing and consuming F.Vs. To improve students' knowledge and behavioral skills, useful and new information with lectures, questions and answers, discussions, personal student experiences, introduction of blogs and nutrition sites, as well as photographs of various types of salads and fruit desserts and vegetables were presented. Recommendations were made to teens to prepare them at home. Accordingly, the mean score of knowledge, behavioral abilities, and skills was increased, being consistent with the results of the study of Abbasian *et al.*^[23] and Jeihooni *et al.*^[2] In the study of Woo and Lee, knowledge was one of the factors influencing F.V consumption.^[25] 35.2% of the changes in the above constructs were based on the program. After the intervention, mean score of knowledge in the control group increased significantly, which can be influenced by the content of the pretest and the search for their answers in this group.

In the educational interventions, the positive effects of F.V consumption and the negative consequences of not consuming F.Vs were expressed using lectures, group discussions, brainstorming, role playing, and the expression of students' experiences. In the meantime, the parents were asked to express their satisfaction

Table 2: The comparison of the mean and standard deviation of social cognitive theory constructs in the two groups, before and 3 months after the intervention

| Dependent variable | Groups | Mean±SD | | P** |
|-------------------------------|--------------|------------|------------|-------|
| | | Pre | Post | |
| Environmental factors (10-50) | Intervention | 28.88±3.01 | 31.14±3.52 | 0.001 |
| | Control | 29.47±3.03 | 29.42±2.95 | 0.24 |
| | P* | 0.11 | 0.001 | |
| Knowledge (0-30) | Intervention | 25.29±2.71 | 27.16±3.70 | 0.001 |
| | Control | 24.94±3.35 | 25.86±2.52 | 0.01 |
| | P* | 0.34 | 0.003 | |
| Behavioral skill (3-15) | Intervention | 9.96±2.28 | 11.27±1.61 | 0.001 |
| | Control | 10.04±2.29 | 9.84±2.40 | 0.06 |
| | P* | 0.77 | 0.001 | |
| Behavioral ability (3-45) | Intervention | 35.14±3.05 | 38.88±3.42 | 0.001 |
| | Control | 34.87±3.96 | 35.50±3.92 | 0.06 |
| | P* | 0.53 | 0.001 | |
| Outcome expectation (11-55) | Intervention | 47.23±5.80 | 50.11±4.03 | 0.001 |
| | Control | 47.34±5.91 | 48.31±6.51 | 0.01 |
| | P* | 0.87 | 0.001 | |
| Outcome value (11-55) | Intervention | 48.01±4.67 | 50.64±3.51 | 0.001 |
| | Control | 48.45±4.51 | 48.75±4.96 | 0.09 |
| | P* | 0.42 | 0.001 | |
| Observational learning (7-35) | Intervention | 28.14±3.57 | 30.52±3.14 | 0.001 |
| | Control | 27.81±4.15 | 28.22±4.54 | 0.21 |
| | P* | 0.48 | 0.001 | |
| Social support (4-20) | Intervention | 12.29±3.56 | 15.36±3.43 | 0.001 |
| | Control | 12.40±4.18 | 12.71±4.11 | 0.29 |
| | P* | 0.82 | 0.001 | |
| Self-efficacy (5-25) | Intervention | 15.48±3.48 | 16.76±2.96 | 0.001 |
| | Control | 15.25±3.47 | 15.21±2.53 | 0.45 |
| | P* | 0.58 | 0.001 | |

*Independent-samples t-test, **Paired-samples t-test. SD=Standard deviation

Table 3: The comparison of the mean unit consumption of fruits and vegetables in the two groups, before and 3 months after the intervention

| Dependent variable | Groups | Mean±SD | | P** |
|-----------------------|--------------|-----------|-----------|-------|
| | | Pre | Post | |
| Consumption fruit | Intervention | 3.24±1.69 | 3.76±1.89 | 0.001 |
| | Control | 3.27±1.56 | 3.29±1.58 | 0.11 |
| | P* | 0.88 | 0.04 | |
| Consumption vegetable | Intervention | 2.99±1.91 | 3.75±2.23 | 0.001 |
| | Control | 2.89±1.94 | 3.09±1.98 | 0.04 |
| | P* | 0.67 | 0.01 | |

*Independent-samples t-test, **Paired-samples t-test. SD=Standard deviation

with the consumption of F.Vs by their children. Both constructs had a significant increase compared to the preintervention period, being similar to the studies of Abdi *et al.* in the Hamedan city,^[26] Bashirian *et al.*,^[27] and Stacey *et al.*^[28] However, it was inconsistent with the findings of Hashemi *et al.*^[22] It seems that unfamiliarity with the various flavors of F.Vs from childhood causes major problems in teenager F.V consumption. Therefore, familiarizing teens with different flavors in situations such as holding F.V festivals in schools could be useful

for the use of different types of F.Vs by teens because some students refused to eat some fruit without being familiar with their flavors.

Observational learning means to model F.V consumption by observing the behavior of parents and peers. To promote it, students were requested to invite each other to consume F.Vs instead of consuming a lot of junk foods. In the parents' sessions, they were also recommended to eat F.Vs in the main meal with the family. The mean score of observational learning scores increased significantly. In the study of Haß and Hartmann, peer influences had a significant positive correlation with the consumption of F.Vs by students.^[29] Malnutrition among students in schools and the low consumption of F.Vs as snacks have diminished the role of peers in learning. Therefore, meeting necessary conditions for supplying F.Vs in schools and establishing nutrition sites in schools could play a significant role in increasing adolescents' consumption of F.Vs.

Social support refers to the encouragements a student receives from parents, school officials, and peers for the consumption of F.Vs. In this research, a special emphasis was put on parents and teachers for encouraging adolescents to promote social support while highlighting the importance of F.V consumption. In the meantime, it was proposed to hold a F.V consumption festival and establish nutrition breaks (F.V consumption) in schools. 37.5% of the changes in the social support score resulted from the educational program, being consistent with the study of Haß and Hartmann.^[29] In Fernandez's study, social support increased self-efficacy, thereby increasing F.V consumption.^[30] Therefore, it is suggested that F.Vs should be offered in school buffets and teachers encourage students to use F.Vs as guidelines for actions and as a role model.

The concept of self-efficacy in the present study refers to the students' confidence in the consumption of F.Vs in any situation and places. To promote self-efficacy in students while expressing the benefits of F.V consumption and its impact on different aspects of the quality of life, some underlying barriers, such as embarrassment and shyness, were challenged and discussed. At these sessions, it was also tried to reduce some of the perceived barriers and increase self-efficacy by providing appropriate treatments with different fruits. However, the mean score of self-efficacy score increases significantly, being consistent with the studies of Hashemi *et al.*^[22] and Lubans *et al.*^[31] Perhaps, if families provide fruit and make them available to children at home and outdoors (like the school environment), the average consumption will be much higher. In the study of Xu *et al.*, self-efficacy was positively and significantly correlated with the consumption of F.Vs.^[32]

Undoubtedly, economic issues play an important role in fruit consumption. Therefore, some measures should be adopted to make F.Vs available to students. For example, F.V snacks could be given to students, or subsidies might be assigned to schools in order of supplying F.Vs at school booths. In many countries, F.V snacks are distributed in schools, thereby increasing the consumption of F.Vs among students.^[33]

After the intervention, the daily F.V consumption reached a significant increase, with this being inconsistent with the research results of Heeren *et al.*^[34] In the study of Gold *et al.*, fruit consumption increased significantly.^[5] In the same vein, in the study of Hashemi *et al.*, F.V consumption increased in adolescents.^[22] This could be due to the family's crucial role in providing F.Vs to adolescents, which would be influenced by social, economic, and living conditions as well as other factors of life. Furthermore, the consumption of vegetables in the control group had increased at the time of follow-up, which in addition to the impact of knowledge and perceptions about the importance of consumption, we can point to lower preparation costs and higher access to vegetables.

Therefore, it is suggested that future studies should be focused on environmental factors and family education. In addition, it is necessary that healthy policies should be adopted for providing cheap and affordable fruit.

Conclusion

After the intervention, the amount of F.V consumption in the intervention group was increased. Furthermore, the family and school-based educational program based on social cognition theory was effective on all constructs of the theory and an increase in scores was observed in the structures.

Therefore, it is suggested that research should be conducted based on the SCT with an emphasis on environmental factors, especially families. It is also necessary to pay attention to the role of families and policymakers in supplying fruit and increasing access to it, especially in families in deprived areas. One of the limitations of the present study was to report F.V consumption and measure it over the past week, which could lead to a recall bias. Therefore, a weekly checklist can be used by families in future studies to measure the consumption of F.Vs accurately over a week.

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Conflicts of interest

There are no conflicts of interest.

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