Original Article

Fruit and Vegetable Consumption in High School Students in Bandar Abbas, Iran: An Application of the Trans-theoretical Model

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Abstract

Background: A diet rich in fruits and vegetables is of a great importance, especially to adolescents due to their need for nutrients and their rapid growth. The aim of this study was to investigate the relationship between decisional balance and self-efficacy with stages of change for fruit and vegetable consumption in high school students in Bandar Abbas, Iran.

Methods: In this descriptive-analytical study, data were collected from 345 students studying in eight high schools of Bandar Abbas who were selected through multistage sampling. To collect data, separate questionnaires were designed for evaluating each of the variables, including the stages of change, perceived benefits, perceived barriers, and self-efficacy of fruit and vegetable consumption. Decisional balance was estimated by subtracting the perceived benefits and barriers. The data were analyzed with one-way ANOVA using SPSS 19.

Results: The results of this study indicated that the individuals' progress along the stages of change from pre-contemplation to maintenance level was associated with a significant increase in their decisional balance and self-efficacy for fruit and vegetable consumption ($P < 0.001$). The lowest level of decisional balance and self-efficacy regarding fruit showed up in the pre-contemplation stage, and the highest level of decisional balance and self-efficacy was in the maintenance stage. Similar trends were observed for vegetable consumption.

Conclusion: Decisional balance and self-efficacy should be considered in designing interventions to increase consumption of fruits and vegetables. There needs to be more emphasis on educational programs based on the Trans-theoretical Model (TTM) for the enhancement of perceived benefits and elimination of perceived barriers regarding consumption of fruits and vegetables.

Keywords: Fruit, Vegetables, Decision making, Self-Efficacy, Theoretical Model.

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Introduction

A diet rich in fruits and vegetables can be beneficial for health. Related body of research shows that nutrition patterns rich in fruits and vegetables are associated with a decrease in heart disease,[1–3] cancer,[4–6] and other chronic diseases.[7] Moreover, it is reported that replacing foods rich in energy with fruit and vegetable can be an effective strategy to control weight.[8] There has been further evidence that supports the role of fruit and vegetables in preventing strokes, heart attacks, cataracts, diverticulosis, and hypertension.[9]

A diet rich in fruit and vegetable is of utmost importance, especially for adolescents since this age is accompanied with rapid growth and great need for nutrients. Besides, the formation of healthy eating patterns in adolescence, which entails an intake of sufficient fruit and vegetable, can establish healthy eating patterns in adulthood.[9] Despite the importance of consuming sufficient fruit and vegetable during childhood and adolescence, large populations consume fruit and vegetable much below the recommended amount, especially children and teenagers in most Western countries,[10] Asian countries[11–13] including Iran[14] and African countries[15]. An investigation of health behavior carried out on 13 to 15 year-old students studying in the schools of 33 European and North American countries indicated that less than 50% of students consumed fruits and vegetables below the recommended amount.[16]

In many countries, fruits and vegetables are classified as one food category. In the United States, a daily intake of five units of fruits and vegetables is recommended.[17] Due to the benefits of consuming fruits and vegetables,[1,18] eating 2 or more units of fruits, and 3 or more units of vegetable,[16] or a daily intake of at least 400 grams of fruits and vegetables[19] is a general health advice. Nevertheless, the real consumption of these foods is considerably lower than the recommended amount.[20]

Increasing the consumption of fruits and vegetables is a public health goal with short- and long-term consequences. Identification of predictive factors related to the consumption of these foods by adolescents is an important step in developing effective

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interventions for these nutritional behaviors.[21]

In order to design effective interventions with the aim of improving fruit and vegetable consumption, an understanding of the etiologic processes and identification of the potential modifiable factors are required. Few studies have investigated the factors associated with adolescents' consumption of fruits and vegetables, and most of these studies lacked a strong theoretical framework.[9]

One of the most famous models for studying behavior determinants and designing interventions is the trans-theoretical model. This model involves the stages of change, decisional balance, and self-efficacy.[22,23] In this model, there are five separate stages for behavior change, including pre-contemplation, contemplation, preparation, action, and maintenance. People are classified in one stage based on their current behavior and intention to change their behavior.

In the pre-contemplation stage, people are not evoked to change their hazardous or unhealthy behavior within the next 6 months, while in the maintenance stage they have been adhering to a healthy behavior for more than 6 months. Based on the trans-theoretical model, people can progress from one stage to another, or return to the previous stage. Specific constructs of this model should be used in interventions including decisional balance and self-efficacy, with the aim of making progress through the stages of change. Decisional balance is the relative value attributed by an individual to the benefits and barriers of the behavior in question.[24,25] The pattern of changing stages is built on the assumption that in order to progress from the pre-contemplation stage, the barriers on the way of behavior change should be decreased. Self-efficacy is an individual's confidence in successfully performing the behavior. The trans-theoretical model assumes that self-efficacy steadily increases from the pre-contemplation stage to the maintenance.[26] The aim of this study was to investigate the relationship between decisional balance and self-efficacy with stages of change for fruit and vegetable consumption in high school students in Bandar Abbas, in the south of Iran.

Materials and Methods

The subjects of this descriptive-analytical study were high school students in Bandar Abbas. The sample size was estimated to be 384 individuals. Sampling was performed using a multistage method and initially, eight high schools were selected. Then, one grade was randomly selected from each school and some students were randomly selected from each grade. A questionnaire was used to collect the data.

To determine the stages of change for consuming two servings of fruits and 200 g or more of vegetables a day, two questionnaires were used both of which comprised of 4 Yes/No items. These items explored the state or intention of consuming two servings of fruits and 200 g or more of vegetables a day within the forthcoming month and then six months later. According to the responses, the result would belong to one of the pre-contemplation, contemplation, preparation, action or maintenance stages.

The perceived benefits questionnaire for fruits and the perceived benefits questionnaire for vegetables consumption each contained 7 items in a Likert scale, with 5 choices ranging from totally agree (score 5) to totally disagree (score 1). One sample item of perceived benefits questionnaire for fruits is "Fruit is useful to maintain good health" and for vegetables is "Consumption of vegetables makes one lose extra weight". The scores of all items in each questionnaire were summed and then divided by 7. Therefore, the perceived benefit scores of fruits and vegetables consumption ranged between 1 and 5.

The perceived barriers questionnaire for fruits consumption contained 8 items and the perceived barriers questionnaire for vegetable consumption contained 9 items in a Likert scale, having 5 choices ranging from totally agree (score 5) to totally disagree (score 1). A sample item of the perceived barrier questionnaire for fruits is "Fruits prices are high" and for vegetables is "It is difficult to find tasty vegetables". The scores of all items were added up and then divided by 8 for the fruit questionnaire and by 9 for the vegetable questionnaire. As a result, the perceived barrier scores of fruit and vegetable consumption ranged between 1 and 5. To estimate decisional balance, the perceived benefit score was subtracted from the perceived barrier score.

The perceived self-efficacy questionnaire for fruits and the perceived self-efficacy questionnaire for vegetable consumption each contained 7 items to be rated in a Likert scale, with 5 choices ranging from very easy (score 5) to very hard (score 1). The scores of all items were added up and then divided by 7 for each questionnaire. Thus, perceived self-efficacy scores of fruit and vegetable consumption ranged between 1 and 5.

Before distributing the questionnaires, necessary notifications were given to education officials and schools administrators, and the students' identities were kept confidential.

The data were analyzed using SPSS version 19.0. Cronbach's alpha was used to test the reliability of the questionnaires. One-way ANOVA was used to estimate the relation between decisional balance and self-efficacy with the stages of change for fruit and vegetable consumption. A post-hoc test for ANOVA in form of a linear contrast comparison was used for trend analysis. The significance level was set at below 0.05.

Results

From the 386 questionnaires distributed among students, 345 were completed, returned and analyzed (Response rate = 89.4%). The average age of the subjects was 15.8 years with a standard deviation (SD) of 1.2, and it ranged from 14 to 18 years. Most of the students were in the 15 year-old group. Moreover, 62.6% of the subjects were male and most of them (47.1%) were studying in the first grade of high school. Cronbach's alpha showed an acceptable internal consistency (Table 1).

Considering the distribution of subjects in different stages of change regarding fruit consumption, the highest percentage (44.9%) pertained to the maintenance stage, and the lowest percentage (7.2%) to contemplation stage (Table 2).

Subjects' progress along the stages of change from pre-contemplation to maintenance was accompanied by an increase in the decisional balance regarding fruit consumption. The lowest decisional balance regarding fruit consumption was observed in the pre-contemplation stage, and the highest decisional balance was observed in the maintenance stage (Table 3).

One-way ANOVA results showed a significant difference in terms of decisional balance between the different stages of change ($P < 0.001$). Decisional balance in the stages of change had an increasing linear trend. In addition, based on the results of linear trend analysis, decisional balance followed a significant linear trend ($P < 0.001$). In other words, subjects' progress from the pre-

Table 1. Cronbach's alpha of the questionnaires.

Scale	Fruits		Vegetable	
	Number of items	Cronbach's alpha (CI)	Number of items	Cronbach's alpha (CI)
Perceived benefits	7	0.79(0.76–0.82)	7	0.83(0.80–0.86)
Perceived barriers	8	0.68(0.62–0.73)	9	0.82(0.79–0.85)
Self-efficacy	7	0.85(0.82–0.87)	7	0.89(0.87–0.91)

Table 2. Distribution of students in different stages of change regarding the daily consumption of fruits (two servings or more meals) and vegetables (200 g or more).

Stage	Fruits		Vegetable	
	Number	Percentage (%)	Number	Percentage (%)
Pre-contemplation	62	18.1	135	39.1
Contemplation	25	7.2	28	8.1
Preparation	46	13.3	40	11.6
Action	57	16.5	42	12.2
Maintenance	155	44.9	100	29.0
Total	**345**	**100**	**345**	**100**

Table 3. Comparison of the mean scores of decisional balance and self-efficacy regarding the daily consumption of fruit and vegetables based on stages of change.

Stage	Fruits		Vegetable	
	Decisional Balance	self-efficacy	Decisional Balance	self-efficacy
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Pre contemplation	0.97 (.80)	2.50 (1.16)	1.17 (1.2)	2.24 (1.1)
Contemplation	1.13 (0.83)	2.51 (1.1)	1.34 (1.1)	2.54 (1.2)
Preparation	1.36 (0.91)	2.57 (0.88)	1.26 (0.86)	2.57 (0.96)
Action	1.47 (1.1)	2.89 (1.2)	1.23 (0.89)	2.64 (1.1)
Maintenance	1.71 (0.85)	2.99 (0.99)	1.63 (1.1)	2.76 (1.2)
Total	**1.45 (0.93)**	**2.78 (1.1)**	**1.34 (1.34)**	**2.50 (1.1)**
F statistics*	8.76	3.64	2.77	3.24
P-value*	<0.001	0.01	0.03	0.01
* F-statistics and P-value are reported for One-Way ANOVA				

contemplation stage to maintenance stage was associated with an increase in decisional balance in a linear manner (Figure 1).

Similarly, the subjects' progress through the stages of change from pre-contemplation to maintenance was accompanied by an increase in self-efficacy. The lowest level of self-efficacy regarding fruit consumption was in the pre-contemplation stage, and the highest level of self-efficacy was in the maintenance stage (Table 3).

Moreover, the results of one-way ANOVA showed a significant difference in terms of self-efficacy scores in different stages of change ($P < 0.001$). In addition, based on the results of linear trend analysis, self-efficacy was shown to follow a significant linear trend ($P < 0.001$). Self-efficacy in the stages of change had an increasing linear trend. In other words, the subjects' progress from pre-contemplation stage to maintenance stage was followed by an increase in self-efficacy in a linear fashion.

Considering the distribution of subjects in different stages of change regarding vegetable consumption, the highest percentage (39.1%) pertained to the pre-contemplation stage, and the lowest percentage (8.1%) to the contemplation stage (Table 2).

The subjects' progress along the stages of change from pre-contemplation to maintenance was followed by an increase in decisional balance regarding vegetable consumption. The lowest level of decisional balance pertained to the pre-contemplation stage, while the highest level of decisional balance pertained to the maintenance stage (Table 3).

Based on one-way ANOVA results, decisional balance followed a significant linear trend ($P<0.001$). Decisional balance in the stages of change had an increasing linear trend. In other words, the subjects' progress from pre-contemplation to maintenance was associated with an increase in decisional balance in a linear manner (Figure 2).

Furthermore, the subjects' progress along the stages of change from pre-contemplation to maintenance was accompanied by an increase in self-efficacy regarding vegetables consumption. The lowest level of self-efficacy regarding vegetable consumption was observed in the pre-contemplation stage while the highest level of self-efficacy was observed in the maintenance stage.

Based on one-way ANOVA results, self-efficacy was shown to follow a significant linear trend ($P < 0.001$). Self-efficacy

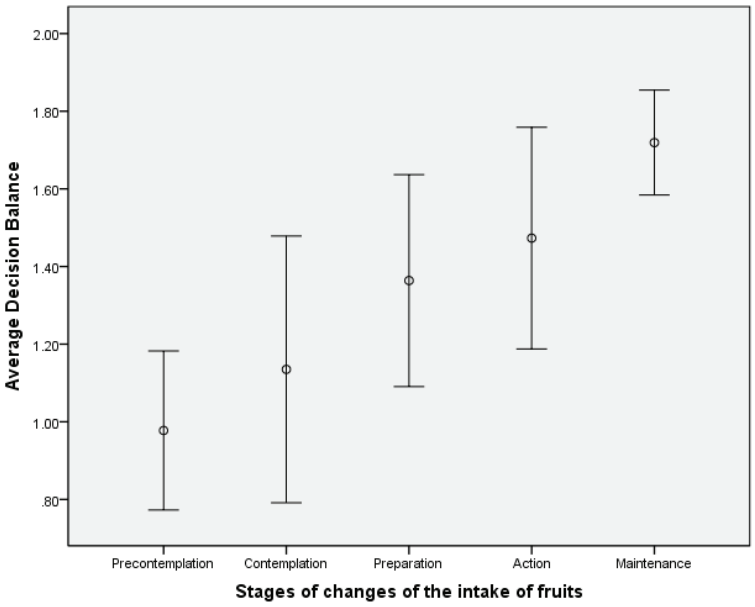

Figure 1. Trend of change in decisional balance regarding fruit consumption based on the stages of change.

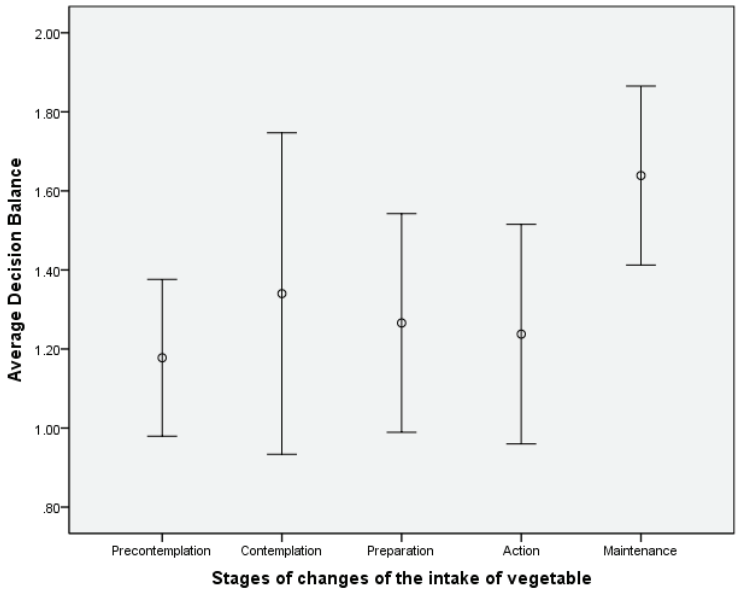

Figure 2. Trend of change in decisional balance regarding vegetable consumption based on the stages of change.

in the stages of change followed an increasing linear trend. In other words, the subjects' progress from pre-contemplation to maintenance was along with an increase in their self-efficacy in a linear manner (Table 3).

Discussion

The stages of change comprise the main body of the trans-theoretical model and have attracted many researchers in recent years. Identification and investigation of the stages of change in any area of health-related behaviors is considered as the basis of successful interventions.[27] For this purpose, this study was designed to determine the stages of change regarding fruit and vegetable consumption within the framework of trans-theoretical model. Its correlation with decisional balance and self-efficacy was also explored in a sample of students.

Considering the distribution of students in different stages of change regarding fruit consumption, 18.1% of subjects showed to consume less than 2 servings of fruits a day and did not intend to increase this rate. Also, 7.2% of the subjects were in the contemplation stage; in other words, despite the fact that they had less than 2 servings of fruit a day, they intended to eat more servings of fruit within the next 6 months. Moreover, 13.3% of the subjects were in the preparation stage, which means that they consumed less than 2 servings of fruit a day but intended to increase it within the next month. In addition, 16.5% of the subjects were in the

action stage, which means they consumed 2 or more servings of fruit but they had been doing so for less than 6 months. Finally, 44.9% of the subjects were in the maintenance stage, which means that they had been having two or more servings of fruit per day for more than 6 months. The results indicated that the majority of the present subjects were in the maintenance stage. However, this is still far from the standard, as the World Health Organization reported that to get the best use of the benefits of fruits, at least 5 fruits or 400 grams should be daily taken.[28] But in comparison with other societies, based on the results of different studies, this is quite acceptable. For example, in a similar study carried out in the United States, more than two thirds of the subjects were in the pre-contemplation stage.[29] It is worth mentioning that the difference may result from the fact that in the American study, fruit and vegetable consumption was considered as one variable, while they were studied separately in the present study.

The results of the present study indicated that most of the subjects were in the pre-contemplation stage as concerns vegetable consumption, as 39.1% of the subjects consumed less than 200 grams of vegetable daily and did not intend to increase this rate. Also, 8.1% of the students were in the contemplation stage, which means they consumed less than 200 grams of vegetables, but were thinking of increasing it within the next 6 months. Moreover, 11.6% of the subjects were in the preparation stage, which means they consumed less than 200 grams of vegetables but intended to add to this amount within the next month. In addition, 12.2% of the subjects were in the action stage and consumed 200 grams of vegetables daily, but they had been following this behavior for less than 6 months. Finally, 29% of the subjects were in the maintenance stage and it was more than 6 months they were taking at least 200 grams of vegetables daily.

It was observed that more than one third of the subjects were in the pre-contemplation stage which is in agreement with the results of other investigations in the same field.[30,31] Considering the fact that most of the subjects, who constitute the future human resources of the country, were in the pre-action stage, they will be faced with severe consequences of not taking sufficient vegetables unless they modify their behavior.

It was further observed that the decisional balance increases while subjects move from the pre-contemplation stage to the maintenance stage. Hence, the lowest level of decisional balance regarding fruit and vegetable consumption was observed in the pre-contemplation stage and the highest level of decisional balance in the maintenance stage. The decisional balance reflects the current state of fruit and vegetable consumption and subjects' perception of the benefits and barriers of behavior change.

Generally, a progress through the stages of behavior change seems to be followed by an increase in benefits and a decrease in barriers and the subjects resolve to change behavior when the benefits overcome the barriers.[32]

The results of the present study showed that the subjects' progress through the stages of change from pre-contemplation to maintenance is accompanied by an increase in their perceived benefits of consuming fruits and vegetables. These findings are in accordance with the principles of trans-theoretical model. In this regard, designing educational programs and sending appropriate health messages about the benefits of fruits and vegetables to school students are recommended with the purpose of encouraging them to consume more fruits and vegetables.

The subjects' progress along the stages of change regarding fruit and vegetable consumption from pre-contemplation to maintenance was followed by an increase in self-efficacy that is similar to the results of the related literature.[33] Finnell *et al*. similarly concluded that subjects' self-efficacy increased gradually in higher stages of change.[34] According to the findings reported by Bandura (1977), self-efficacy is the most important construct in predicting behavior change among individuals.[35] Findorff also believes that self-efficacy is among the most important predictive factors of adhering to health behaviors.[36] Accordingly, usually people with high levels of self-efficacy in a special area manifest the highest level of behavior change in that area. Based on the results of other related literature, individuals can progress from the pre-contemplation and contemplation stages to higher levels of action and maintenance of behavior using different methods and techniques.[37] The stages of change are based on the assumption that education is capable of changing behavior in people and transferring them from one stage of change to the next.[38] The important issue in applying trans-theoretical model to change behavior is that educational interventions can be designed, adapted, and changed based on the individuals' preparation level.[39]

According to the results of this study, it can be concluded that an increase in decisional balance and self-efficacy results in an increase in consuming fruits and vegetables among high school students. Since decisional balance is related to the recognition of benefits and overcoming the barriers of fruit and vegetable consumption, and self-efficacy is related to changes in knowledge, attitude and empowerment of individuals,[40] it is recommended to consider all these factors in designing interventions for changing fruit and vegetable consumption behaviors. One of the recommended interventions is educational plans based on the components of the trans-theoretical model.

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