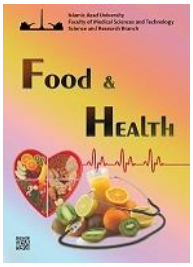

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The effectiveness of interventions based on the protection motivation theory on healthy eating behaviors: A systematic review study

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ABSTRACT

One sixth of the diseases in all countries of the world are found to be caused by malnutrition and improper food selection at different times and under various conditions. In this study, we aimed to investigate the effect of interventions based on the protection motivation theory on healthy eating behaviors in a systematic way. All articles were systematically retrieved from information sources, including Persian databases of Iran-Medex and SID as well as English databases as PubMed, Web of Science, Scopus, ScienceDirect, and Google Scholar. The keywords were as follows: healthy eating behavior, protection motivation theory, behavior, healthy nutrition and intervention. In the first search, 247 articles were obtained. After reviewing them in terms of the inclusion criteria, 8 articles were included in this study. The duration of the intervention was between 1 week and 24 months and the nutritional behaviors of the individuals were studied during this period. Lectures, questions and answers, the use of telephone calls and paper educational messages, and food were often used in the context of information transfer. The results indicate the effectiveness of protection motivation theory on improving the nutritional behaviors of individuals. The results of the previous intervention studies indicated that the greater the perceived barriers to protective behavior, the less motivated a person in performing protective behaviors. A positive and statistically significant correlation was also found between self-efficacy and protection motivation in the investigated studies.

1. Introduction

Food and nutrition are included as the most important basic human needs that ensure the well-being and health of society during life from birth time to old age. The body of all living organisms, like humans, needs energy to maintain its basic metabolism, and this can be provided by food (1). The roles of proper nutrition and the direct effects of nutrition in human health are well known and obvious to all, up to the extent that the Joint Committee of Experts of the World Health Organization and the Food and Drug Administration have emphasized that food and nutrition plans should be included in the overall development plan in each country, in order to allocate economics to that (2). Differences in eating habits are evident in different cultures, races, genders, and geographical areas. Wrong eating habits are currently known as one of the important causes of nutrient deficiencies, especially calcium and vitamins A, B, C as well as hidden or overt malnutrition, resulting in behavioral changes, especially in adolescents (3). Previous studies have shown that more than one-sixth of all diseases worldwide are caused by malnutrition and improper food selection at different times and under various conditions.

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Accordingly, this may reach up to one third in some deprived areas (2). Non-communicable diseases are responsible for 63% of the 57 million deaths worldwide. Studies performed in recent years showed an increase in the prevalence of chronic diseases at a young age (4). In developing countries, risk factors as well as the incidence of non-communicable diseases are increasing and the age of the disease is decreasing. Instead of traditional foods and simple snacks, young people in the community currently tend more to focus on high-calorie foods with lack of sufficient nutritional value. Nowadays, energy, protein, and micronutrient deficiencies are the most important nutritional problems‹. These diseases pose a heavy economic burden on countries due to their high health costs (5). The change in diet is the same nutritional transition that is currently underway as the globalization process. It has caused some problems such as various diseases (stroke, hypertension, cancer, etc.) (4). The results show that due to the nutritional transition, one third of the cost of buying food is spent on ready-made food and experiments outside the home. Nowadays, people do not pay many attentions to the main meals and instead of that, they mostly eat a lot of small meals. The results of a study conducted in the United States showed that 37% of adults and 42% of children ate ready meals (6). Nutritional behavior is one of the most important components of lifestyle and its improvement requires the use of the related interventions, in order to maintain and promote healthy eating behaviors. Researchers have defined behavior as an overt action that takes place consciously or unconsciously (7). Due to the complex nature of behavior, conscious change will not always lead to behavior change due to various reasons like the environment, so it may not allow behavior to occur (8). Several studies showed that theory-based interventions can lead people to change their attitudes and behaviors about nutrition (9). As well, some researchers in their studies suggested that interventions should have a motivational component (10, 11). Among the theories proposed regarding health education, the theory of protection motivation has attracted the attention of many researchers. Accordingly, this theory is used to understand and predict health intentions and behaviors protecting a person against harmful events. In introducing the theory of protection motivation, it should be noted that it was firstly introduced by Rogers in 1975 and has been widely accepted thereafter and used as a theory for predicting and intervening in health-related behaviors (9). Moreover, this theory consists of the outcome of two mediating Threat appraisal processes as follows: 1) Vulnerability: expresses a person's belief in being vulnerable to a health threat, 2) Severity: expresses a person's belief about a serious health threat, 3) Rewards: expresses the reward that a person receives for doing the wrong behavior or not doing the recommended behavior, and 4) Fear: In fact, it is an intermediate variable between the sensitivity and severity with the threat appraisal. Coping appraisal also includes: 1) Self-efficacy: expresses a person's belief that he or she can successfully perform the suggested behavior. 2) Response efficiency: expresses the person's estimation that the proposed behavior will be effective, and 3) Response costs: expresses the person's estimate of the costs associated with performing the protective behavior (12). In another study, Rogers has stated that fear through the constructs of self-efficacy, response efficiency, response cost, rewards, vulnerability, and severity can consequently affect the protection motivation index (12). Given the above-mentioned reasons, the importance and impact of nutritional behaviors on health and the incidence of various diseases, and the fact that no systematic study has examined the effectiveness of interventions based on the protection motivation theory on healthy eating behaviors so far, so it can be stated that this type of study can provide a correct understanding on the background of a subject by reviewing various studies in this regard and illuminating the path of researchers to conduct further studies in the future. Therefore, this study was conducted to answer the question of interventions based on the theory of how much protection motivation is effective on promoting healthy eating behaviors of different groups.

2. Materials and Methods

The present research was a systematic review study conducted based on the following steps. Search strategies: Electric search was systematically done in order to achieve the objectives of this study from the Persian databases as Iran-Medex and SID as well as English databases as PubMed, Web of Science, Scopus, ScienceDirect, and Google Scholar in 2018. The keywords used were the followings: healthy eating behavior, protection motivation, theory, behavior, healthy nutrition and intervention. The time period was between 2008 and September 2018. No restrictions were placed on the language of publication when searching the above-mentioned electronic databases and the search process was performed by manual search of journals, abstracts of articles in conferences, seminars, and dissertations. There was no limit on the duration of performing the intervention, the type of participants, and the place of the study. The steps for selecting articles were as follows: Firstly, the initial search was separately performed by two researchers. In the next step, duplicate articles were removed, and then more limited searches were performed to remove the irrelevant items. After reviewing the summary and title of each study and criteria eligibility, the potential articles were identified. The full text of these articles was reviewed by two authors until reaching a consensus. Selection of studies: the inclusion criteria were as follows: 1-original research, 2-available full text of the article, 3-the study should be interventional, 4- quantitative, and 5- healthy eating behaviors should be the main part of one of the components of the article. As well, case studies, cross-sectional studies, descriptive studies, analytical studies, short articles, letter to the editor, and systematic and review articles were deleted. For the evaluation of quality of articles, concert checklist was used to report the standard studies. This checklist contains 24 items for scoring. In this regard, each item is given a score of either 0 or 1. If a study obtained a score above 15, it was selected and those with a score of 15 and below were excluded from the study (13). In data mining process, the specifics of each study

were extracted by the author using a standard form. This form included the names of the authors, place of study, year of study, purpose of study, type of study, target group, study population size, intervention description, and structures of protection motivation theory, which were the most important results of the selected articles. The two researchers independently examined the data entry criteria. In case of any disagreement among the researchers, it was resolved by the third researcher.

3. Results and discussion

In the first search, 247 articles were obtained. At the next stage, duplicate articles (109 cases) were removed and 138 articles remained. Thereafter, 81 articles were deleted by reading the title and 35 articles were deleted by reading the abstract. The remaining 22 articles were reviewed by two researchers in terms of the Consortium Quality Evaluation Checklist, and the third researcher reviewed the articles to reach a consensus. Eventually, eight articles remained in the final evaluation. Study design: 8 interventional studies were reviewed. In the intervention studies, the duration of the intervention was selected as between 1 week and 24 months and also the nutritional behaviors of the individuals were studied. Target group: In 3 intervention studies, the target group was selected to be students, an intervention study was done on the elderly over 60 years old, an intervention on women aged between 50 and 30 years old, an intervention on middle-aged people as 60 years old, 1 study on type 2 diabetic patients, and a study was conducted on women with obesity and overweight. Description of interventions: In the 8 interventional studies included, lectures, questions and answers, the use of telephone calls and paper educational messages, and food were often used in the context of information transfer. The results of the studies performed on healthy eating behaviors using protection motivation theory are presented in Table 1. This systematic review study was conducted by reviewing 8 articles with the framework of conservation motivation theory in choosing healthy eating behavior. The results of this study indicate the effectiveness of the protection motivation theory on improving the nutritional behaviors of individuals. In all the included studies, people's perception of the risk of unhealthy behaviors and disease was considered as a strong predictor of healthy eating behaviors. Moreover, in all the studies, the effect of information transfer based on the protection motivation theory has improved nutritional choices (20). In most studies, attitudes toward health have been found to be influential in relation to intentional behavior (13-17). The results of the studies showed that age, education, occupation, income, family dimension, and gender are important predictors in assessing conservation motivation (20). In several studies, interventions and attitudes based on the protection motivation theory have increased and developed self-efficacy in choosing healthy eating behaviors (13-17). In Stadler's study, by investigating the role of self-regulatory education in increasing the effectiveness of theory-based training conservation motivation, it was pointed out that empowering individuals and teaching self-regulatory techniques can take a big step toward improving nutritional behaviors (20). In most of the reviewed studies, the structure of perceived behavioral control and the perceived risk indicated its positive effect on the adoption of healthy eating behaviors (13-17). In addition, the roles of education and increasing people's awareness in improving attitudes and beliefs of individuals in promoting healthy behaviors such as nutritional behaviors have been mentioned (13-17, 19-21). Notably, fear had the lowest average score. There was a correlation among protection motivation and the mean score of the constructs of response cost, self-efficacy, coping appraisal, and behavior (13-17). The results of intervention studies indicated that the greater the perceived barriers to protective behavior, the less motivated a person in performing a protective behavior. As well, a positive and statistically significant correlation was found between self-efficacy and protective motivation in the investigated studies (19-21). This positive correlation indicates that the individual believes that he/she can protect the behavior in the greater the health risk to do, so the greater the intention he/she has to do that behavior (13-16). Some studies have shown that the components of threat appraisal and then the components of coping appraisal are the strong predictors of intention to engage in protective behaviors (19, 20). These results suggested that the greater a person's ability and response to cope with a perceived threat, the more likely he/she is engaged in the behavior. The significant correlation between protective motivation and protective behaviors in the future suggests that the more a person intends to perform behavior, the more likely he/she will perform that behavior in the future. In the present study, due to the existence of different target groups, the method of intervention, duration of interventions, different intervention groups, different times, and implementation of the intervention in different places and countries, it was difficult to compare the studies in this field. Another limitation of this study was the language of the investigated studies, which was selected as either English or Persian language and the study of studies in other languages was beyond the ability of the researcher. Additionally, another important limitation was the lack of purely interventional studies in the field of healthy eating behaviors using the theory of motivation, protection and lack of access to other scientific databases. Despite these limitations, it can be stated that this study brings useful information on the effectiveness of the conservation motivation theory on improving healthy eating behaviors and the need for performing interventions.

4. Conclusion

Most importantly, how to make effective interventions on the structures of this theory is left to researchers. One of the points suggested to researchers according to the results of this study is to observe matching in intervention groups, to observe the appropriate time for the implementation of interventions, and to choose an effective educational method for each age group. It is suggested that researchers should firstly examine

Table 1. Results of studies conducted to promote healthy eating behaviors using protection motivation theory

Authors and year of publication	place	Target	type of study	target group	Sample size	Duration of intervention	Study variables	Content of the intervention	results	Consort score
Kourki and Gharaei (13)	Iran, Hamadan	Predicted evaluation of elderly nutrition improvement based on the conservation motivation theory (PMT)	Random intervention	Elderly over 60 years old	200 people	One session	Level of knowledge, behavior, awareness, performance (before and after the intervention)	The program includes lectures, brainstorming, discussions on health and nutrition	The results showed that the positive effect of the intervention on the promotion of healthy eating behaviors was significant among the samples and also increased the awareness and improved the social norms. In addition, participation in the design of health behaviors and the related programs are included as the benefits of this method.	27
Sayuen and Banchonhattakit (14)	Thailand	Investigating the effects of a training program based on supportive motivation theory to prevent the spread of amphetamine use behavior	quasi-experimental	Students	66 people	8 weeks	1. Demographic Questionnaire 2. PMT Extended Questionnaire (Before and after the intervention)	Investigating the side effects of self-administration of amphetamines and their long-term effects using lectures, group discussion	1. Demographic Questionnaire 2. PMT Extended Questionnaire (Before and after performing the intervention) Side effects of self-administration of amphetamines and their long-term effects using lectures, group discussion The results showed that after the implementation of the trainings according to the theory of protection motivation regarding the modification of nutritional behaviors and modification of drug selection, the experiment group with higher criteria of knowledge on amphetamine, severity of perception of side effects of amphetamine use, the sensitivity, effectiveness Amphetamine prophylaxis response, self-efficacy, intention to prevent amphetamine use compared to before the intervention with a statistical score of drug, meaning that it was higher than the other group.	23

Ritland and Rodriguez (15)	Canada	The Effect of Antiviral Media Content on Healthy Eating Behaviors and Exercise: A Test of Protected Motivation Theory	Interventional	Students	633	2 weeks	1. Demographic Information Questionnaire 2. PMT questionnaire Before and after performing the intervention	Introducing consumer foods, supplements, obesity and overweight through various online media and television programs, newspapers, printed magazines	In this study, the Protected Motivation Framework extended guidelines for determining whether exposure to antibiotic exposure and attention. Media content consequently increase people's awareness on the threat and their ability to deal with it. It also assessed whether these cognitive processes, in turn, affect individuals' intentions to take recommended measures to prevent obesity. The results of a national online survey using a non-probabilistic sample showed that attention to obesity and the related information increases significantly. Increasing people's willingness to exercise as well as their overall coping appraisals (the perceived efficacy) is recommended. Behaviors and their ability to perform them). Likewise, the increased threats and countermeasures were also found to significantly affect people's intentions for exercise and diet.	27
Mirkarimi et al. (16)	Iran, Gorgan	The effect of motivational interview on weight loss program based on the protection motivation theory	Interventional	Two Obese and overweight men who were referred to a nutrition clinic to correct eating behaviors and receive an appropriate diet plan	150 people	Check BMI Multifaceted Questionnaire of Dietary Patterns and Attitudes to Safe Food Selection Questionnaire of Protective Motivation Theory	The intervention group received two weeks (four sessions) of nutritional behavior and diet and exercise program. Motivational interview group + two weeks (four sessions) intervention received nutritional behavior and diet and exercise program and 5 motivational interview sessions.	The intervention group received a two-week (four sessions) explanation and validation of nutritional behavior and diet and exercise program. Trainings in the form of discussion and receiving a written diet and exercise program	The results showed that the two groups of intervention and motivational interview besides performing intervention compared to the control group had significant results in weight loss in comparison with the group of motivational interviews and performing an intervention compared to the intervention group showed some statistically significant differences in weight loss better and according to the pattern. Standards of eating behaviors show that motivation for successful interviewing is indicative of intervention.	21
Parham et al. (17)	Australia	Evaluation of Motivational Cognition in Self-Care in Diabetic Patients: Motivation of Frequency Scale Thought for Glucose Test, Physical Activity, Healthy Nutrition	Interventional	Patients with type 2 diabetes	237 people	Three months	1. Demographics 2. PMT questionnaire 3. Safe range of drug questionnaire Studying fat consumption and blood sugar level	Interventions by telephone calls about self-care and diabetes care and support programs for improving diabetes self-care, improving diet and eating behaviors, physical activity, health and mood procedures, educating and guiding patients about self-education and management, and Contact researchers for guidance	The results showed that the mean A1C of individuals, fat intake, and improvement of vegetable consumption and overall healthy eating behaviors after performing the intervention showed some significant results. Also, the amount of physical activity showed a significant improvement in the consumption of drugs after. The intervention was performed on a standard plate and its arbitrary and irregular consumption was also prevented. The results showed no significant relationship between the two sexes.	27

McGowan and Prapavessis (18)	Canada	Determining the effect of education based on the theory of protection motivation regarding colon cancer in exercise index and improving healthy eating behaviors in patients' relatives	Interventional	first and second degrees Relatives of cancer patients	166 people	1 week	PMT questionnaire Investigation of dietary patterns Examination of physical activity Survey of attitudes and beliefs about cancer	DVDs containing information about colon cancer, healthy eating behavior, exercise and physical activity,	According to the results, the use of protection motivation theory is effective in determining health behaviors. In fact, self-efficacy and planning are efficient, which can identify proximal predictors of unhealthy health behaviors. Perception does not seem to have a semantic effect. When predicting health behaviors, self-care variables should be used besides behavioral intention variables. The results of this study showed that media intervention exposed to a PMT framework alone can change individuals' behaviors and beliefs about colon cancer, as well as exercise goals and nutritional patterns. The implications of these findings and future studies are discussed.	25
Schwarzer et al. (19)	Germany	Adoption and maintenance of the four health behaviors: theoretical longitudinal studies in dental life, use of seat belts, nutritional behavior and physical activity on the sauce of protection motivation theory	Interventional	Students	252 people	6 weeks	1. Perception of risk 2. Motivational self-efficacy 3. Planned self-efficacy and measured improvement		According to the obtained results, the use of protection motivation theory is effective in determining health behaviors. In fact, self-efficacy and planning are efficient and identify proximal predictors of unhealthy health behaviors. Perception does not seem to have a significant effect. When predicting health behaviors, self-care variables should be used besides behavioral intention variables.	25
Stadler et al. (20)	New York	Evaluation of the effect of information intervention and self-regulation based on the motivation theory of protection in eating fruits and vegetables during 2 years	Interventional	Women 30 to 50 years	255 people	24 months	Demographic information questionnaire as well as daily food consumption reminder form	Educational information about the benefits of eating fruits and vegetables and learning self-regulation	Adding self-regulatory training to information interventions based on the theory of protective motivation has increased the effectiveness.	27

the structures before implementing any interventional theory, in order to determine their capacity in performing any intervention.

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