The effectiveness of training program based on protective motivation theory on improving nutritional behaviors and physical activity in military patients with type 2 diabetes mellitus

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Abstract

Introduction: Diabetes is considered as one of the most common metabolic disorders and one of the biggest worldwide health problems; first-line treatment is suggested as a changing diet and physical activity by experts. The aim of the present study was the determination of the effectiveness of a training program based on a protective motivation theory on improving nutritional behaviors and physical activity in type 2 military diabetic patients. Methods: In this controlled intervention study, 76 military diabetic individuals (2 groups with 38 individuals in each) were participated. Data gathering instrument was a researcher-made questionnaire based on structures of conservation motivation theory. The data were entered into SPSS19 software and analyzed by using paired t-test and Pearson's correlation coefficient. Results: Findings showed that except in perceived sensitivity in the test and control groups, there was a significant difference between the mean scores of all the components of the Protective Motivation Theory. In the test group, there was a significant difference between the mean scores of all constructs of the Protective Motivation Theory before and after the educational intervention, while in the control group, there was a significant difference between the mean scores of fear, effectiveness of response, severity, and perceived sensitivity structures before and after educational intervention. Glycated hemoglobin (Hb-A1c) and weight of the intervention group were significantly decreased after the intervention. In addition, adherence to diet and physical activity were increased. Conclusion: The results of this study showed that conservation motivation theory can be used as a framework in designing educational programs to improve the diet and physical activity among diabetics.

Keywords: Diabetes mellitus, military patients, protection motivation theory

Introduction

According to the World Health Organization, by 2025, the population of diabetics will grow 122% and the growth in developing countries will be 170%.[2] In the last decade, the fastest growth rate of diabetes has been reported in the Middle East countries in the age group of 45–64 years old that are productive in terms of socially and economically.[3] Diabetes is highly prevalent in Iran that 7.7% of Iranian adult populations, aged 25–64 years old, have diabetes, although half of the cases of diabetes have not been diagnosed yet.[6] Abdí’s study at a military center showed that the prevalence of diabetes was 10.5% among military men and 10.8% among women.[5] The results of Akbari’s study on 21,000 personnel of a military population showed that 10.3% of them suffer from Diabetes Mellitus.[8] In
addition to the high prevalence of the disease, it costs a lot of money to health systems, which statistics through worldwide show that 12% of total health care costs are attributed to diabetes and its complications.[1] Experts consider that the first line of treatment for type 2 diabetes is the change in lifestyle.[9]

Nowadays, the positive effects of regular physical activity and proper nutrition planning have been acknowledged on diabetes control and prevention[8] which three factors (implementation of Physical activity, dietary consideration and insulin infusion) are the three main bases in the treatment and control of this chronic and common disease. Meanwhile, physical activity is extremely important because it has positive psychological effects in addition to its therapeutic effects.[9] Appropriate physical activity for diabetics can include walking, cycling, exercise, and swimming.[10] Physical activity causes to reduce blood glucose levels, increase insulin sensitivity of cells, decrease adipose tissue, and to lower weight and blood pressure.[11] Despite positive effects of physical activity on different aspects of the life of a diabetic, more diabetic people have less physical activity compared to normal individuals.[12] Nutrition diet plays a critical role in controlling blood glucose level and is aimed at reducing the intake of simple glucose, saturated fats, cholesterol and increasing intake of fruits and vegetables and dietary fiber. These interventions can improve serum lipid levels and cause to regulate glucose levels, lower blood pressure, maintain or reduce body weight, and reduce the complications of diabetes.[13] Today, self-care and education are more emphasized than treatment[14] and they help patients to make the right decisions about their health.[15] Using health education models is helpful as a framework to educate and change behavior and their survival in these patients. One of the important theories in the field of behavior change is conservation motivation theory. According to this theory, threat assessment and adaptation determine individuals' intentions are two types for protective behaviors. Early-conservation motivation theory has been used for behaviors such as reducing alcohol consumption and adopting a healthy lifestyle. It has also been used more to understand the acceptance of treatment recommendations than other theories.[10]

Since theoretical-based interventional studies are limited on improving nutritional behaviors and increasing physical activity among military personnel, the present study was designed and implemented with aim to investigate the effect of protective motivation based on educational intervention theory on improving nutritional behaviors and physical activity of type 2 military diabetic patients.

Methods

The study was an Intervention study. This was done on military diabetic people who were willing to participate in the study. Inclusion criteria included: Having type 2 diabetes mellitus and being satisfied to participate in the study. Exclusion criteria included: Regular absence in training classes and having stroke. Sample size was 38 individuals in each group with respect to 5% error and 80% test power and according to the results of the Kashfi et al. study[17] and according to 10% drops in individuals. 38 diabetic patients of one center were considered as intervention group and 38 diabetic patients of another center were considered as a control group. 24 Hour Diet Recall questionnaire was used to determine dietary intake of diabetic.

The dietary approaches’ assessment was based on the scoring of diet based on 8 food components including fruits, vegetables, grains, legumes and meals, low fat dairy products, red and processed meat, sweet beverages, and salt intake. The subjects were ranked in different quintuple according to their intake for each component of the diet pattern. In the diet plan, receiving more amounts fruits, vegetables, grains, legumes and meals, low fat dairy products and receiving low amounts of meat, sweet beverages and salt is desirable, so the lowest quintuple get the less amount of meat, sweet beverages and salt, which it would get the lowest score 5 and the highest quintuple would get 1. Then, scores ranged from 8 to 40 in the diet plan. People whose score were more, they complied the diet and vice versa.[10]

A researcher-made questionnaire was used to examine the structure of conservation motivation theory. The questionnaire was designed based on the opinions of health education professionals (2 persons), interviews with some diabetics and nutritionists and internal medicine specialists. Content validity ratio (CVR) and content validity index (CVI) were used to determine content validity. The questionnaire for validity examination was completed by 10 health education, nutrition, and internal medicine specialists and the questions were confirmed. In the present study, the reliability of the questionnaire was assessed by using Cronbach’s alpha. Finally, the questionnaire was designed with 70 questions in seven parts: Perceived severity with 5 questions, Perceived sensitivity with 7 questions, Self-efficacy with 7 questions, Response efficiency with 8 questions, Cost with 5 questions, Reward with 4 questions, Fear with 3 questions, and Behavioral intention with 5 questions and with Cronbach’s alpha 0.76–0.96 in Likert scale in range of 5 choices, I totally agree (5) to totally disagree (1). Data were analyzed by SPSS 18 software and by using paired t-test and Pearson’s correlation coefficient.

Height, weight, Glycated hemoglobin (Hb–A1c), Protective Motivation Theory constructs, and dietary intake were measured before and three months after intervention. Interventions were designed for the intervention group in three sessions. The first session was about diabetes, its classification, complications, and prevention. The second session focused on the importance of nutrition in controlling diabetes. The third session discussed the importance of physical activity and its impact on type 2 diabetes.

Results

The findings showed that the age of most participants was in the range of 40–55, 95.6% were married, 53.6% of them with normal weight, and 77.2% had a moderate economic condition. The relationship between the structures of Protective Motivation Theory to compliance with the diet and Physical Activity was
consistent with the overall structure of the theory, in which the self-efficacy, response efficiency, perceived severity, and sensitivity were positively associated with intention [Table 1]. Results showed that the structures of protection motivation theory with control group were not significant before intervention. After intervention, all constructs except perceived sensitivity structure were between the two groups [Table 2]. Body mass index and Glycated hemoglobin (Hb-A1c) rate were decreased after intervention in the protective motivation group and adherence to diet and physical activity were increased [Table 3].

**Discussion**

The results of this study showed that the status of the structures of Protective Motivation Theory was favorable in compliance of the diet and physical activity, but also the perceived costs and rewards were high and the fear score was lower than the rest of the structures. Based on this theory, fear provides the motivation for self-protection. The results of the present study on the score of the structures are consistent with the results of Ebadi Fard et al., although the method was different in the two studies. The results of this study showed that there was a significant relationship between the intentions of compliance with the diet and the scores of the constructs of the protective motivation theory. But the rate of correlation between the structures and the intention was different, so that the most was the relationship between intent and self-efficacy. In the case of self-efficacy, the results of this study are consistent with the study of Morowati sharifabad and colleagues. Perceived costs and rewards were significant with behavioral intention and its negative significance was consistent with the results of the Kaviani et al's study. In the study of Morowati sharifabad and colleagues, perceived cost was meaningful with behavioral intention and perceived rewards were not meaningful with behavioral intention, which seems to be the difference in the type of behavior and participants. This study evaluated the protective behaviors of lung cancer in workers.

In the present study, there was a correlation between adaptation assessment and threat assessment with the intention to follow a diet plan. The correlation between the adaptation assessments with the intention was higher than the threat assessment. This point suggests that among individuals with high patients with type 2 diabetes mellitus, interventions need to be designed to strengthen self-efficacy, response-efficacy, and cost reduction. Abdolkarimi's study is consistent with the results of the study. The results of this study showed that although there was no significant difference between intervention and control groups before intervention based on protective motivation, the difference in constructs was significant after educational intervention. This means that the score of perceived susceptibility, perceived severity, and fear was increased, and the score of perceived cost structures and perceived rewards was reduced. In addition, the self-efficacy and response-efficacy score was increased against the before of the intervention in the protection motivation group. In other words, the threat assessment scores of non-compliance of the diet program and physical activity were higher among the individuals with higher patients with type 2 Diabetes Mellitus, as well as the individual's assessment of the adaption ability was recommended to follow the diet, and this process leads to increase protection motivation (intent) in the intervention-based motivation group.

These results indicated that training based on the theory of incentive protection is effective in modifying the score of the structures.

In the control group also, there were changes of perceived susceptibility, perceived severity, response efficiency, and fear, and the t-test was also significant. The level of changes before and after the intervention was significant, but the level of changes was much lower than the protection motivation group.

These findings are consistent with the results of the study of Sayyid Abadi. In addition, in the study of Ebadi Fard et al., after the intervention, the score of all constructs was significantly changed, which is consistent with the results of the present study. The changes in the control group are due to sensitivity to diet and physical activity in the completion of the questionnaire in the first stage, which has led to these behaviors and their changes.

The results of our study showed that although the level of hemoglobin A1c was not significantly different in the pre-intervention and control groups, the level of hemoglobin A1c decreased after the intervention compared to the pre-intervention group. One possible cause of the decrease in hemoglobin A1c

| PMT Constructs | Mean±SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|----------------|---------|---|---|---|---|---|---|---|---|---|
| 1.Vulnerability| 4.31±0.63| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 2.Severity     | 4.34±0.64| 0.64**| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 3.Percieved Cost| 4.45±0.60| -0.07| -0.09| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4.Reward       | 4.34±0.65| -0.01| -0.02| 0.27**| 1 | 2 | 3 | 4 | 5 | 6 |
| 6.Response Efficiency| 3.90±0.67| 0.51**| 0.49**| -0.12| -0.07| 0.46**| 1 | 2 | 3 | 4 |
| 7.Threat       | 3.22±1.35| 0.64**| 0.64**| -0.25**| -0.71**| 0.32**| 0.43**| 1 | 2 | 3 |
| 8.Coping       | 4.2±1.04| 0.42**| 0.39**| -0.73**| -0.22**| 0.66**| 0.68**| 0.47**| 1 | 2 |
| 9.Fear         | 4.2±0.94| 0.30**| 0.30**| 0.15| -0.05| 0.31**| 0.38**| 0.28**| 0.19*| 1 |
| 10.Intention   | 4.36±0.63| 0.40**| 0.25**| -0.12*| -0.12*| 0.50**| 0.43**| 0.34**| 0.49**| 0.31**| 1 |
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Table 2: Comparison of the theory of protection motivation structures with the control group before and after the intervention

| PMT Constructs   | PMT Mean ± SD | Control Mean ± SD | P    |
|------------------|---------------|-------------------|------|
| Vulnerability    | 4.32 ± 0.53   | 4.40 ± 0.52       | 0.431|
| After            | 4.59 ± 0.45   | 4.45 ± 0.50       | 0.145|
| P                | 0.000         | 0.008             |      |
| Severity         | 4.44 ± 0.50   | 4.34 ± 0.53       | 0.335|
| After            | 4.70 ± 0.37   | 4.41 ± 0.48       | 0.001|
| P                | 0.000         | 0.001             |      |
| Perceived Cost   | 3.25 ± 0.65   | 3.11 ± 0.63       | 0.279|
| After            | 2.71 ± 0.63   | 3.18 ± 0.66       | 0.001|
| P                | 0.000         | 0.089             |      |
| Reward           | 3.44 ± 0.83   | 3.48 ± 0.80       | 0.775|
| After            | 2.94 ± 0.80   | 3.54 ± 0.78       | 0.001|
| P                | 0.000         | 0.086             |      |
| Self-Efficacy    | 4.50 ± 0.45   | 4.47 ± 0.48       | 0.750|
| After            | 4.76 ± 0.35   | 4.46 ± 0.48       | 0.001|
| P                | 0.000         | 0.290             |      |
| Response Efficacy| 4.43 ± 0.42   | 4.40 ± 0.51       | 0.279|
| After            | 4.73 ± 0.32   | 4.49 ± 0.46       | 0.007|
| P                | 0.000         | 0.000             |      |
| Fear             | 4.03 ± 1      | 3.97 ± 0.87       | 0.771|
| After            | 4.46 ± 0.59   | 4.04 ± 0.84       | 0.005|
| P                | 0.000         | 0.002             |      |
| Intention        | 4.40 ± 0.50   | 4.42 ± 0.42       | 0.885|
| After            | 4.58 ± 0.43   | 4.41 ± 0.58       | 0.006|
| P                | 0.000         | 0.712             |      |

Table 3: Physical activity, HbA1C, body mass index, and diet compliance with the protection motivation group and the control group

| PMT Constructs | PMT Mean ± SD | Control Mean ± SD | P    |
|----------------|---------------|-------------------|------|
| Physical Activity | Before 396 ± 0.45 | 346 ± 0.39       | 0.048|
| After           | 495 ± 0.29    | 359 ± 0.18       | 0.000|
| P               | 0.000         | 0.048             |      |
| HbA1C           | Before 7.07 ± 0.87 | 7.37 ± 0.62       | 0.570|
| After           | 6.36 ± 0.80   | 7.40 ± 0.52       | 0.000|
| P               | 0.000         | 0.670             |      |
| Body Mass Index | Before 27.20 ± 3.42 | 27.67 ± 3.82     | 0.514|
| After           | 24.98 ± 3.21  | 27.58 ± 3.66      | 0.000|
| P               | 0.000         | 0.099             |      |
| diet compliance | Before 26.38 ± 4.21 | 25.14 ± 5.07     | 0.187|
| After           | 30.94 ± 3.76  | 25.82 ± 4.75      | 0.000|
| P               | 0.000         | 0.090             |      |
| diet compliance | Before 4.56 ± 0.45 | 0.68 ± 0.32       | 0.000|
| After           | 4.56 ± 0.45   | 0.68 ± 0.32       | 0.000|

may be the increasing physical activity and adherence to a diet. The results of our study are consistent with a study [28] that showed that eight weeks of physical activity reduces HbA1c levels compared to the control group. However, the rate of change in hemoglobin A1c levels in our study (-0.71) was lower than in the Najafipour et al.’s study (-0.06). This can be attributed to the fact that in the study of Najafipour et al., the control group performed regular, supervised activity for eight weeks, while individuals in the present study were encouraged to do physical activity; however, it seems that careful implementation of a post-motivational physical activity program can be used to help control patients’ Diabetes status.

The results of this study showed that the decrease in BMI in protective motivation group was more than the control group and it was significant but changes in the two groups were not significant after the intervention. In study of Azadbakht et al. [26] entitled, “Determination of the effects of DASH diet on risk factors for cardiovascular disease among type 2 diabetic patients,” showed that follow-up of DASH diet caused to reduce weight. In addition, the results of the study of Mostafavi et al. [27] showed that after the educational intervention, the weight of the subjects decreased, which is consistent with the results of our study. The results also showed that according to the combination of nutrition intervention and physical activity, the rate of weight loss in the intervention group was higher than the control group.

The results of this study showed that the level of compliance of the Diet Plans in the protective motivation group was more and significant compared to the control group after intervention. A study of Racine et al. [28] showed that Nutrition Therapy Medical Interventions improved only the nutritional knowledge of individuals after intervention and did not change the compliance of the diet program. One of the reasons mentioned in this study is that three sessions may not be sufficient to change behavior. The results of Van Oss [29] also showed that the score of diet compliance was increased after the intervention.

Conclusion

The results of the study showed that intervention design which was based on protection motivation theory modifies perceived susceptibility, perceived severity, response efficacy, self-efficacy, fear, protection motivation and reduces perceived rewards and costs and thus improves the BMI. Physical activity has increased as well as improved nutrition. Therefore, it seems that the structures of this theory can be used to train and motivate people to improve their physical activity and adhere to the diet plan of diabetic patients.

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Conflicts of interest

There are no conflicts of interest.

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