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The Effect of Educational Intervention Based on the Theory of Planned Behavior on Nutritional Behavior with Regard to Cardiovascular Diseases Among Health Volunteers

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ABSTRACT

Background: We sought to evaluate the effect of educational intervention based on the theory of planned behavior (TPB) on nutritional behaviors in relation to the cardiovascular disease (CVD) among health volunteers. **Methods:** In this quasi-experimental study, the participants included 128 active health volunteers. To conduct the study, 65 and 63 participants were randomly assigned into the intervention and control groups, respectively. Data were collected before and six weeks after the intervention using a validated researcher-made questionnaire. The questionnaire consisted of demographic variables, knowledge questions, and TPB constructs. Data were analyzed by Chi-square, *t*-test, Mann-Whitney U, and Wilcoxon test. R**esults**: No significant difference was observed between the intervention and control groups with regard to the demographic characteristics, knowledge mean scores, and TPB constructs at the beginning of the study. However, the mean scores of knowledge, attitude, subjective norms, perceived behavioral control (PBC), and nutritional behavior increased significantly ($P < 0.001$, $P < 0.001$, $P = 0.018$, $P = 0.007$, and $P < 0.001$, respectively) in the intervention group six weeks after the beginning of study. Significant differences were observed in nutritional performance of the intervention group, in other words the nutritional behavior of the intervention group members changed during the intervention. **Conclusion**: The PBC was the strongest construct in attitude. To optimize nutritional interventions in preventing the CVD, TPB should be implemented in educational interventions.

Keywords: *Cardiovascular disease; Educational intervention; Nutritional behavior; Health volunteers.*

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Introduction

A bulk of epidemiological evidence indicates that the dietary pattern of people has undergone a rapid change in low- and middle-income nations. This nutritional transition has led to excessive intake of energy-dense diets high in unhealthy saturated fats, tropical oils (e.g., palm oil), sodium, and sugars, which have increased the risk of cardiovascular diseases (CVDs) (Buttar *et al.*, 2005). The main determinants for the rise of CVDs among nations at all stages of development include diabetes, dyslipidemia, hypertension, tobacco use and exposure, unhealthy dietary changes (fats, oils, salt, and increased calories), and reduced physical activity. On the other hand, the main determinants for the drop of CVDs in some countries include declines in cardiovascular risk factors and healthful dietary shifts (Della *et al.*, 2008) . The incidence of CVDs can be reduced by approximately 80 percent after modification of people's lifestyle, such as increase of physical activity, modification of dietary pattern, and smoking cessation. The preventive approaches against CVDs must be tailored at a primary health promotion level(Fila and Smith, 2006) .

Theory of planned behavior (TPB) is one of the most widely used health behavior change techniques from the 22 techniques used in CVD prevention and treatment (Kelly and Fuster, 2010) (Kelly and Fuster, 2010). White et al. revealed the effect of intervention on behavior change with regard to the mediating role of planning. Furthermore, TPB-based interventions, including approaches of planning may encourage physical activity and other positive health behaviors among older people with diabetes and cardiovascular diseases(Hu, 2008) . This model is capable of explaining the differences among individuals' consumption of fruit and vegetables. It also can increase fruit and vegetable consumption in societies, where consumption of this dietary group is low (Kiamco-Millman and Pinto-Zipp, 2013) .

Major changes with regard to the use of health services have recently occurred as one of the government's strategies. Majority of countries have principally developed in providing health services due to the participation of community (Kothe *et al.*, 2011). Hence, community involvement in health affairs has started since 1990 as an experimental plan in the capital of Iran (Tehran), comprising 160 health volunteer females. The first requirement to implement and continue the plan was activating health services in large cities(Zakus, 1998) . Health volunteers were trained with appropriate and adjusted educational methods by 4000 efficient instructors all over the country. Therefore, these health volenteers could attain the ability to train the families under their own supervision to solve life and health problems of the society (Zakus, 1998) .

Consequently, the effectiveness of educational interventions was confirmed by education and empowerment of health volunteers and led to the community and households' health. Therefore, the aim of this research was to investigate the influence of educational intervention based on the TPB on nutritional behaviors in order to prevent CVDs among health volunteers in the Kerman Health Center.

Materials and Methods

Participants of Study: This quasi-experimental study was conducted on 128 active health volunteer females, who were selected by the census. Informal consent was obtained from all participants. Later, 65 and 63 participants were randomly assigned into the intervention and control groups. Data were collected before and six weeks after the intervention using a validated researcher-made questionnaire. The inclusion criteria were: 1) willingness to participate in the study, 2) reference to the health center for at least six months, and 3) ability to understand the educational content and participate in group discussions. The exclusion criterion was unwillingness to continue the cooperation due to any reason. After receiving the required permissions and coordinating with the health centers, the health volunteers were educated and

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trained in routine classes. Prior to the intervention, participants were provided with the study purpose and were ensured about the information confidentiality.

Protocol and Educational Package of Study: At first, a pre-test was conducted to assess the knowledge and TPB constructs in the intervention and control groups. Then, a statistical analysis was carried out on the initial data. The educational content was determined based on the results and the training program was developed for the intervention group. The training sessions were held in six 90-minute sessions. The teaching method in the training sessions included lectures and group discussions with questions and answers. The training sessions were conducted by coaches who were staff members of the health center.

At the first session, the subject of CVDs and its related risk factors were lectured. Later, some questions and answers were conducted in this regard. At the second session, general information on nutrition as well as the role of nutrition in the prevention of CVDs were educated and discussed. At the third session, in order to create a positive attitude and to revise the participants' misconceptions in the field of nutrition and cooking, the educator discussed with the health volunteers. Furthermore, exchange of thoughts and personal experiences were directed by the educator. At the fourth and fifth sessions, the external and internal factors facilitating nutritional behavior were discussed, respectively. At the sixth session, individual ability and ease or difficulty of behavior was discussed.

In order to promote learning, the educational pamphlets were distributed among the participants. To examine the influence of program on the subjective norm, health volunteers took part in classes with their husbands and other family members. Participants were also provided with the educational materials as a training guide. The data were recollected after a six-week follow-up in order to evaluate the influence of the program and to compare the intervention and control groups.

The structured questionnaire consisted of demographic variables, knowledge questions, and TPB constructs. The TPB constructs, included attitudes, subjective norm, perceived behavioral control, behavioral intention, and nutritional behavior. The three TPB constructs of the structured questionnaire were designed based on a modified 5-point Likert scale and consisted of attitude (10 questions), subjective norm (6 questions), and perceived behavioral control (8 questions). On the Likert scale, 1 = strongly disagree and 5 = strongly agree. The other two constructs consisted of behavioral intention (7 questions) and nutritional behavior (10 questions) and were based on a modified 5-point Likert scale. On the Likert scale of behavioral intention 1 = very low probability and 5 = very high probability. On the Likert scale of nutritional behavioral 1 = never and 5 = always. To measure the participants' knowledge, the participants should answer to a 14-item questionnaire. Each item had three options "right", "wrong", and "I do not know". Each correct answer received one score and wrong answers or I do not know option got zero.

The study was supported by Vice chancellor for Research of Kerman University of Medical Sciences (Grant No: 93.441) and the protocol was approved by the review panels and ethics committees of Kerman University of Medical Sciences.

Content Validity: The validity of the questionnaire was determined by face and content validities. A panel of experts consisting of five content experts reviewed the questionnaire. The experts included the professionals who worked in the relted field. To calculate the content validity index (CVI), experts were asked to rate the relevance of each item, usually on a 4-point scale. The CVI was calculated for each item and for the overall scale. The content validity index was computed as 0.88 for the overall scale. This value

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can be considered as an evidence for good content validity.

Reliability: To determine the internal consistency of the questionnaire, 25 health volunteers completed a test-retest questionnaire. Two-week test-retest consistency of the questionnaire was measured by Cronbach's alpha. The inter-class correlation coefficient was used to estimate the internal credit analysis among the options of the questionnaire items before and after the test. The correlation coefficients of knowledge, attitude, subjective norm, perceived behavioral control, behavioral intention, and nutritional behaviors were 0.89, 0.86, 0.72, 0.86, 0.87, and 0.75, respectively.

Data analysis: Data were analyzed with SPSS version 21. Data were analyzed by Chi-square tests, *t*-test, Mann-Whitney U, and Wilcoxon tests. In this study, P-value < 0.05 was considered statistically significant.

Results

The mean ± standard deviation (SD) age of the participants in the intervention and the control groups were 40.96 ± 10.4 and 37.33 ± 9.53 yearr, respectively ($P = 0.04$). The mean ± SD body mass index of participants in the intervention and the control groups were 27.01±5.31 and 25.73±3.88 Kg/m^2, respectively ($P = 0.11$).

Table 1 shows correlation of the TPB constructs of participants before the intervention. As **Table 2** represents, six weeks after accomplishing the educational intervention program, percentiles of the participants in the intervention group were compared with those of the control group with regard to knowledge and other TPB constructs. The results showed a good increase in the prevention of cardiovascular diseases among the intervention group. However, no increase was found in the percentiles of the control group participants with regard to the TPB constructs. Percentiles of the participants in the intervention and the control groups were 50.8 and 41.3 percent, respectively.

No significant difference was observed between the intervention and control groups with regard to the scores of knowledge, attitude, subjective norms, perceived behavior control, behavioral intention, and nutritional behavior before the intervention. However, the intervention and control groups were significantly different in their scores of knowledge, attitude, behavioral intention, and nutritional behavior ($P < 0.0001$, $P = 0.016$, $P = 0.006$, $P = 0.027$, respectively) six weeks after the intervention (**Table 3**).

Table 3 also indicates the mean differences of the two groups before and six weeks after the intervention. A significant difference was alo observed in the intervention group with regard to the scores of knowledge, attitude, subjective norms, perceived behavioral control, and nutritional behavior ($P < 0.0001$, $P = 0.0001$, $P = 0.018$, $P = 0.007$, and $P = 0.0001$ respectively) six weeks after the educational program. No significant difference was seen in scores of the TPB constructs in control group after the educational program.

Table 4 shows the mean differences in the scores of nutritional behaviors of participants, which influenced nutritional performances of the intervention and control groups at baseline and six weeks after the intervention. Significant differences were also observed in the intervention group participants' nutritional performance considering their nutritional behavior changes during the intervention.

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Table 1. Correlation of the theory of planned behavior constructs of participants before the intervention

Constructs	Behavior	Perceived behavioral control	Subjective norms	Attitude
Intentions	0.53[a] < 0.001[b]	0.37 < 0.001	0.31 < 0.001	0.34 < 0.001
Behavior	1	0.43 0.001	0.28 < 0.001	0.40 < 0.001
Perceived behavioral control		1	0.39 < 0.001	0.54 < 0.001
Subjective norms			1	0.40 < 0.001
Attitude				1

[a] : correlation(r); [b] : P-value

Table 2. Frequency distribution of the theory of planned behavior constructs of participants based on range of constructs in studied groups before and six weeks after intervention

Groups	Theory of planned behavior constructs	Before the Intervention, N (%)			After the Intervention, N (%)		
		Undesirable	Relatively Desirable	Desirable	Undesirable	Relatively Desirable	Desirable
Intervention	Knowledge	2 (3.0)	7 (10.8)	56 (86.2)	0 (0.0)	1 (1.5)	64 (98.5)
	Attitude	0 (0.0)	12 (18.5)	53 (81.5)	0 (0.0)	4 (6.2)	61 (93.8)
	Subjective norms	0 (0.0)	29 (44.6)	36 (55.4)	0 (0.0)	19 (29.2)	46 (70.8)
	Perceived behavioral control	1 (1.5)	39 (60.0)	25 (38.5)	0 (0.0)	33 (50.8)	32 (49.2)
	Behavioral intention	1 (1.5)	26 (40.0)	38 (58.5)	0 (0.0)	22 (33.8)	43 (66.2)
	Nutritional behaviors	1 (1.5)	43 (66.2)	21 (32.3)	0 (0.0)	26 (40.0)	39 (60.0)
Control	Knowledge	0 (0.0)	13 (20.6)	50 (79.4)	0 (0.0)	11 (17.5)	52 (82.5)
	Attitude	0 (0.0)	7 (11.1)	56 (88.9)	0 (0.0)	7 (11.1)	56 (88.9)
	Subjective norms	0 (0.0)	25 (39.7)	38 (60.3)	0 (0.0)	26 (41.3)	37 (58.7)
	Perceived behavioral control	0 (0.0)	37 (58.7)	26 (41.3)	1 (1.6)	42 (66.7)	20 (31.7)
	Behavioral intention	1 (1.6)	21 (33.3)	41 (65.1)	1 (1.6)	25 (39.7)	37 (58.7)
	Nutritional behaviors	0 (0.0)	40 (63.5)	23 (36.5)	0 (0.0)	39 (61.9)	24 (38.1)

Table 3. Mean ± SD score of theory of planned behavior constructs of participants in studied groups at baseline and at six weeks after intervention

Variables	Group	Before		After		P-value
		Mean ± SD	*P*.value	Mean ± SD	*P*.value	
Knowledge	Intervention Control	12.47 ± 2.04 12.07 ± 1.92	0.125	13.58 ± 0.76 12.22 ± 1.77	<0.0001	<0.0001 0.442
Attitude	Intervention Control	41.66 ± 5.03 42.30 ± 4.34	0.443	44.04 ± 4.32 42.11 ± 4.67	0.016	<0.0001 0.765
Subjective norms	Intervention Control	23.10 ± 3.11 23.66 ± 2.89	0.295	24.15 ± 2.99 23.49 ± 3.08	0.221	0.018 0.627
Perceived behavioral control	Intervention Control	27.46 ± 4.86 28.38 ± 4.37	0.263	29.24 ± 4.75 28.19 ± 4.60	0.205	0.007 0.714
Behavioral intention	Intervention Control	27.64 ± 5.45 27.17 ± 5.25	0.619	28.60 ± 4.05 26.42 ± 4.64	0.006	0.083 0.357
Nutritional behaviors	Intervention Control	35.07 ± 5.75 36.22 ± 5.02	0.233	38.72 ± 5.41 36.61 ± 5.22	0.027	<0.0001 0.553

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Table 4. Mean ± SD score of nutritional behaviors of participants in every group at baseline and at six weeks after intervention

Nutritional Performance	Intervention Group			Control Group		
	Before	After	*P*-value	Before	After	*P*-value
Consume of low-fat dairy products	3.84 ±0.90	4.16 ± 0.78	0.013	3.66 ± 0.89	3.84 ± 0.82	0.219
Separate excess fats from meat	4.00 ± 1.10	4.47 ± 0.75	0.002	3.95 ± 1.06	4.03 ± 0.87	0.551
Use of salt table at eating time	2.90 ± 1.36	2.13 ± 1.05	<0.0001	2.79 ± 1.35	2.41 ± 1.11	0.014
Consume of solid vegetable oil	2.40 ±1.35	2.24 ± 1.23	0.670	2.15 ± 1.06	2.36 ± 1.26	0.880
Pay attention to food product labels	3.73 ± 1.06	4.41 ± 0.74	<0.0001	4.12 ± 1.05	4.17 ± 0.85	0.704
Boiling or steaming of food	3.16 ± 0.96	3.67 ± 1.01	0.001	3.36 ± 0.93	3.44 ± 1.02	0.497
Consumption of fast food	2.13 ± 0.68	1.87 ± 0.76	0.028	1.93 ± 0.64	1.85 ± 0.69	0.388
Consumption of white meat	3.50± 0.86	3.70 ± 0.87	0.124	3.61 ± 0.70	3.57 ± 0.81	0.678
Consumption of nuts as snacks	2.83 ± 1.00	3.26 ± 0.98	0.003	3.03 ± 0.94	2.98 ± 0.83	0.729
Daily intake of fruits/vegetables at least three times	3.27 ± 0.85	3.43 ± 1.06	0.221	3.34 ± 0.93	3.20 ± 0.88	0.296

Discussion

We found that the educational intervention based on TPB was effective on promoting and improving the nutritional behavior to prevent CVDs among health volunteers. The TPB model is often applied to evaluate healthy/unhealthy eating beliefs and behaviors. Therefore, the TPB model might be a beneficial and efficient framework to determine the nutrition-related behaviors and improve poor dietary practices in individuals (Miri *et al.*, 2012) .

We did not find any significant differences between the control and intervention groups with regard to the scores of knowledge and other TPB constructs prior to the intervention. However, the scores of knowledge and other TPB constructs, except for the behavioral intention, increased significantly in the intervention group six weeks after the intervention. Considering the continuous attendance of health volunteers in the health centers and acquisition of teaching materials throughout this time, the scores of knowledge and other TPB constructs were acceptable prior to the nutritional intervention. The promotion of knowledge in health volunteers, as eligible individuals who transfer the healthy nutrition behaviors to members pf the community, is critical to have a healthy population. A study revealed that nurses' attitudes, subjective norms, and perceived behavioral control were significantly correlated with nurses' intentions for the objective behavior. Knowledge of nurses' attitudes and perceptions can guide the healthcare organizations to help nurses' initiatives in raising female patients' awareness about heart disease as a major health risk (Riebl *et al.*, 2015) .

Miri et al. revealed that health knowledge and attitude of rural women, who were under the supervision of health centers increased after an educational intervention. They concluded that performing a health volunteer plan on the health knowledge and attitude of rural women empowered the health volunteers in improving the knowledge and attitude levels of the rural women (Miri *et al.*, 2012). Moreover, supporting healthy nutrition behaviors is an essential aspect of nutritional interventions designed to prevent from cardiovascular disease risk factors. A study used the TPB model to examine the beliefs of 192 participants with type 2 diabetes and cardiovascular disease about their compliance with low-fat diet and regular physical activity behaviors. The reserachers concluded that in order to encourage a healthy lifestyle amongst participants, interventions should address the perceived costs associated with behavioral performance and encourage people to maintain healthy behaviors (White *et al.*, 2012) .

After six weeks of intervention, the number of health volunteers with desirable attitude, subjective norms, perceived behavioral control, behavior intention, and nutritional behavior increased by

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12.3, 15.4, 10.7, 7.7, and 28 percent, respectively. Therefore, desirable subjective norms with the highest relative growth (15.4%) compared to the desirable behavior intention with the least relative growth (7.7%) had the highest influence on the nutritional behavior. Kothe et al. revealed that the TPB model could promote consumption of breakfast profoundly. After a 4-week follow-up, the intervention did not result in predictable increments in breakfast consumption or changes in attitude, subjective norms, or perceived behavioral control. Change in breakfast consumption habits was predicted by changes in attitude, subjective norm, and perceived behavioral control after the follow-up(Winter *et al.*, 2016) . The change in nutritional behavior of participants in this study was similar to the change in breakfast consumption in Kothe's study (Kothe *et al.*, 2011). The increase in the scores of TPB constructs could contribute to the accomplishment of the behavior after an intervention. On the contrary, the increase in scores of each construct could be the same as or different from the others with regard to a specific behavior such as breakfast consumption or modification of a dietary pattern to prevent chronic diseases. Hence, it is important to determine the effective factor and its influence on the nutritional behavior in comparison with other TPB constructs. Zakus revealed that factors other than the intentions to induce healthy eating behaviors are possibly involved in this area, because they did not find any relationship between intention and healthy eating behavior in urban Native American youth. Although boys' eating behavior was predicted by subjective norm, girls' eating behavior was mostly predicted by barriers (Zakus, 1998). Unlike the previous study, health volunteers in our study were females. Health volunteers are eligible individuals who transfer health resources and messages to the other community members, support them to have a critical insight into their traditions and keep their valuable habits, beliefs, customs, and revise their own incorrect traditions. One of the limitations of this researchwas its short duration. However, the length of the study was designed similar to previous studies to prevent the participants' withdrawal. Therefore, more research is required to identify the efficacy of the TPB model intervention on the population who receive health resources in order to promote the healthy dietary patterns.

Conclusion

In order to optimize the nutritional interventions and to promote the nutritional behavior in preventing CVDs, TPB should be applied as the best plan in educational interventions. Nutritional education intervention based on TPB inhanced the mean scores of knowledge, attitude, subjective norms, perceived behavioral control, and nutritional behavior among the health volunteers.

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Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Authors' Contributions

Rezabeigi Davarani E. contributed in collecting data, preparing a draft of manuscript, preparing the training environment, as well as conducting educational intervention for participants. He also approved the final version of the manuscript and agreed all aspects of the work (This work was a thesis of MSc student). Mahmoodi M.R. contributed in conception of the original idea, designing the study, analysing and interpreting the data, questionnaire designing, as well as rewriting and revising the draft. He also aapproved the final version of the manuscript and agreed all aspects of the work. Khanjani N. contributed to the conception of the original idea, analysis and interpretation of the data, approval of the final version of the manuscript, and agreed all aspects of the work. Fadakar M.M. contributed in designing the study, approved the final version of the manuscript, and agreed all aspects of the work.

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