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The Effect of the Extended Parallel Process Model on Self-efficacy of Type 2 Diabetic Patients

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Abstract

Background: WHO reported that, diabetes is a silent killer among chronic diseases, and the prevalence of this disease increases with age. Self-efficacy (SEEF), as one of the constructs of health models, plays an essential role in improving the health and self-management of diabetic patients.

Objectives: This study evaluated the effect of the extended parallel process model (EPPM) on the SEEF of type 2 diabetic patients.

Methods: This experimental study was conducted on 60 patients randomly divided into two tests (30 people) and control (30 people) groups. The data collection tool was the SEEF questionnaire. In the test group, training was conducted based on EPPM structures in six sessions (45 - 60 minutes) once a week. Routine training was also performed in the control group. The data were analyzed by descriptive statistics (frequency, mean and standard deviation) and inferential statistics (covariance, two independent-samples *t*-test, paired sample *t*-test, Fisher and chi-square).

Results: Two independent-sample *t*-test showed no significant difference between the test and control groups before the intervention regarding SEEF ($P = 0.45$). Meanwhile, a significant difference was observed between the test and control groups regarding SEEF ($P < 0.01$) after the intervention. The covariance test showed a significant relationship between the effect of EEMP and the SEEF of diabetic patients by removing the pre-test effect ($Eta = 0.63$, $P < 0.01$).

Conclusions: Based on the results, the developed parallel process model (EEMP) increases SEEF in diabetic patients. This health model is considered an effective and low-cost care method.

Keywords: Developed Parallel Process Model, Self-efficacy, Type 2 Diabetes

1. Background

Type 2 diabetes is the most common disease caused by endocrine disorders, and WHO reported that, diabetes is a silent epidemic and a health killer worldwide (1, 2). Based on this report, the rate of diabetes in the world will reach 380 million people by 2025 (1). In Iran, 7.7% of the country's population has diabetes (3). In the meantime, diabetes is one of the essential chronic diseases, the prevalence of which increases with age (3, 4). In this century, almost a quarter of people over 65 years of age have diabetes, and this number is expected to be multiplied in the next 30 years (5, 6).

In Iran, diabetes allocates more than 40 billion rials from the budget of the Ministry of Health to itself (7). In the world, 174 million dollars annually are spent on treating diabetes (8, 9). For this reason, diabetes is currently one of the most critical health challenges (10).

Studies have shown that lifestyle changes and adherence to behaviors recommended by the treatment team can delay the incidence of diabetes by up to 11 years and even reduce it by 20% in some cases (7, 8). On this basis, self-efficacy (SEEF) for diabetic patients is one of the self-care strategies a patient with high self-confidence can perform in the self-care process (2). Self-efficacy is

a person's belief in his ability to control behavior and disease conditions. In other words, SEEF is an individual's expectations of himself, which makes the patient capable of caring for himself (9, 10).

Based on previous studies, people with high SEEF have more behavioral stability and self-confidence than people with low SEEF (11, 12). Self-efficacy is considered one of the essential structures of behavioral theories, which plays a vital role in health promotion (13, 14). Therefore, SEEF is critical for managing diabetes (15). Studies have indicated that educational programs based on theory-oriented approaches are essential in changing behaviors (4).

The extended parallel process model (EPPM) has recently been used to prepare health messages and prevent diseases and risky behaviors (13, 14). Extended parallel process model is based on protection motivation theory, and these approaches play an influential role in recognizing and choosing healthy and appropriate behaviors (4). Extended parallel process model is proposed as a theoretical framework for behavior change. According to this model, a person evaluates the perceived effectiveness of dealing with a specific disease or its complications when they believe they are exposed to its risks and complications (achieving a perceived threat assessment) (7, 15, 16). Finally, changing people's attitudes and behavior is more likely (17, 18).

2. Objectives

This study was conducted to determine the effect of EPPM on the self-efficacy of type 2 diabetic patients.

3. Methods

The previous study was conducted with the aim of determining the effect of training based on extended parallel process model on adherence to medication regimen among diabetic elderly (19). This semi-experimental study was conducted as a pre-test and post-test for two control and test groups. The research environment was the diabetes clinic of Gorgan, Iran, which was conducted in 2022. The inclusion criteria included all type 2 diabetic patients with type 2 diabetes medical records. The sample size of the research is based on Zamani et al.'s study (15) with an effect size of 0.66, a test power of 80%, a significance level of 0.05, and a 95% confidence interval equal to 60 people (including 30 people in the test group and 30 people in the control group) was estimated.

The data collection tool included a demographic questionnaire and Diabetes Management Self-efficacy Scale (DMSES). Diabetes Management Self-efficacy Scale consists of 19 questions graded on a 10-point Likert scale, with a score of 0, meaning "I can't at all," to 10, meaning "I can understand completely." The overall score of the DMSES questionnaire is from 0 to 190, where a high score indicates a high SEEF. The reliability of the DMSES questionnaire in Iran was confirmed by Haghayegh et al., with a reliability coefficient of 0.81 (20).

The researcher prepared a list of the participants in the current study as part of his explanation to the clinic officials of the research plan for this study. Then, the samples that met the conditions for entering the study were selected. A simple random allocation method was used to determine 60 people, and the chosen people were divided into two groups by simple random allocation method and lottery (30 person) and control (30 person). First, the researcher was assured about the safety of this research while explaining the objectives of the investigation. All participants in the study were given a chance to withdraw from the study even during the implementation the study. In this study, three people from the test group and one from the control group were removed, and finally, new people were added from among those who met the conditions to enter the study.

The researcher collected the necessary information about the participants before conducting the study through self-reports and the DMSES questionnaire. For the control group, six care sessions were performed according to the clinic's routine. However, for the EPPM-based test group, six 30-45-minute training sessions were conducted once a week. Table 1 shows the content of the mentioned training sessions.

4. Results

The average age of the test and control groups was 67.83 ± 4.37 and 68.11 ± 3.84 years, respectively. In addition, the duration of diabetes 2 for the test and control group was 15.8 ± 6.3 and 16.8 ± 6.24 years, respectively (Table 1). Table 1 shows other demographic characteristics of the participants in the current study.

Comparison of demographic characteristics by independent samples *t*-test showed that the two test and control groups have no significant difference in terms of age of participants (P = 0.75) and duration of illness (P = 0.84). The chi-square test results showed no significant difference between the test and control groups regarding occupation (P = 0.66). In addition, Fisher's test showed no significant difference between the two test and control groups in terms of education (P = 0.22) and occupation (P = 0.66) (Table 2).

Table 1. Content of Training Sessions Based on Extended Parallel Process Model in the Test Group

Session Number	Structure	Objectives of the Session	Content of the Session
1	Perceived sensitivity	Getting to know the patient and identifying the risk factors of diabetes	Introduction of researcher and patient
			Statement of the training purpose
			Discussion about the time of onset of the disease
			Discussion about the disease history
			Discussion about the hospitalization history
			Discussion about the hereditary background
2	Perceived sensitivity	Identification of sensitivities and patient's understanding of the condition	Definition of diabetes and its types
			Causes of diabetes
			Discussion about normal blood sugar levels
			The ways to control blood sugar
			The complications and symptoms of diabetes to discover educational needs
	Intensity of understanding	Education based on understanding the patient, becoming aware of the complications of the disease, and sensitizing the patient	Training based on diabetes risk factors.
			Training on how to control weight.
			Training on how to control steroids and blood sugar.
			Training the patient about the symptoms of high blood sugar.
3	SEEF assessment	Assessing the patient's awareness level to provide training	The researcher evaluated the level of interest and ability of the patient.
			Assessing the patient's knowledge, attitude and education.
4	Sensitivity and intensity of perception	To be aware of permitted and prohibited diets	The patient is to be informed of the effect of diet on treating the disease.
			The patient must be informed of the complications of not complying with the diet.
			The patient is to be informed about unauthorized foods.
			The patient must be informed of the increased and decreased blood sugar.
5	SEEF assessment	Evaluation of the knowledge and training presented in these meetings	The patient must be informed of the importance of diet adherence.
			The patient is to be informed of the impact and various authorized and unauthorized foods and essential and influential snacks.
	SEEF assessment	Awareness of the patient with diabetic complications	In addition to getting informed about neurological, vascular, and muscular complications, the patient is informed about the complications of the diabetic foot and strategies to deal with diabetic foot progress.
			The patient is to be informed about nursing care for diabetes.
6	Patient's SEEF	The purpose of determining the effectiveness of training	Question and answer from the patient and the patient's family.
			The patient himself to be able to wash the leg properly and follow the food pyramid

Abbreviation: SEEF, self-efficacy.

Table 2. Demographic Characteristics of Study Participants in Test and Control Groups [a]

Demographic Characteristics	Study Groups		P
	Test	Control	
Age (y)	67.83 ± 4.37	68.11 ± 3.84	0.75
Duration of the disease (y)	15.8 ± 6.3	16.8 ± 6.24	0.84
Sex			0.29
Woman	18 (60)	16 (53.3)	
Man	12 (40)	14 (46.7)	
Level of education			0.22
Illiterate	4 (13.3)	3 (10)	
High school	13 (43.3)	7 (23.3)	
Diploma	11 (36.7)	2 (63.3)	
University education	2 (6.7)	1 (3.3)	
Job			0.66
Housewife	10 (33.3)	13 (43.3)	
Employee	12 (40)	9 (30)	
Freelance job	8 (26.7)	8 (26.7)	

[a] Values are expressed as No. (%) unless otherwise indicated.

The result of the two independent samples *t*-test between the test and control groups before the intervention did not show a significant difference regarding SEEF (P = 0.45). However, a significant difference was observed after the intervention (P < 0.01). Paired samples *t*-test did not show a significant difference in comparing SEEF in the control group before and after the intervention (P = 0.67). In the test group, a significant difference was observed in terms of SEEF before and after the intervention (P < 0.01) (Table 3). In addition, the covariance test showed a significant relationship between the effect of EPPM and SEEF of diabetic patients by removing the pre-test effect (P < 0.01, Eta = 0.63) (Table 4).

Table 3. Comparison of Self-efficacy Between Test and Control Groups Before and After Interventions

Study Time	Study Groups		P
	Control	Test	
Before intervention	154.32 ± 5.51	152.6 ± 6.1	0.32
After the intervention	161.77 ± 6.12	153.8 ± 6.18	< 0.01
P	< 0.01	0.73	-

5. Discussion

The results showed that EPPM increases the SEEF of type 2 diabetic patients, consistent with similar studies. Tabarsa et al. reported that EPPM reduces risky behaviors by increasing risk sensitivity (14). Zamani et al. showed that EPPM increases SEEF and the ability of diabetic patients (15). Parsaee et al. stated that the health model of the parallel process increases compliance with the diet of the elderly (4), and the same researchers reported in 2020 that this educational model plays a vital role in improving compliance with treatment and self-care in diabetic patients (7). Based on Tabarsa et al., EPPM motivates reducing high-risk sexual behaviors in adolescents by increasing understanding and creating behavior sensitivities (13). Zamani et al. showed through another study that EPPM increases compliance with the diet of diabetic patients (21). Farahmand et al. showed that the intervention based on the health belief model was effective for diabetic patients, and education improved the diet, regular use of medicine, blood sugar control, and weight loss of diabetic patients (22).

Razavi et al. indicated that cognitive models increase understanding and adherence to dietary and therapeutic regimens by raising patient awareness and information (23). The perception of disease is people's belief about the condition and its treatment when dealing with a disease or a life-threatening factor (24).

According to EPPM, when people believe they are highly exposed to disease or health risks, they will be more sensitive to dealing with it and have a higher SEEF in self-care against disease complications (21, 25).

Table 4. The Effect of the Developed Parallel Process Model on the Efficiency of Type 2 Diabetic Patients

Source of Variance	Sum of Squares	df	Mean of Squares	F Value	P	Eta
Modified model	50.31	2	25.15	68.1	< 0.01	0.76
Post-test separator	26.81	1	26.8	65.4	0.34	0.07
Group	38.16	1	11.07	50.5	< 0.01	0.63
Erorr	40.27	57	13.93			
Sum	2311	60				
Total	90.58	59				

The EPPM model, in addition to increasing motivation, increases people's understanding of high-risk factors and the prevention of disease symptoms (20). Extended parallel process model, as a cognitive theory, plays a vital role in increasing patients' knowledge and experience to increase SEEF (4, 15). In general, education is essential for improving the motivation to learn in patients and their caregivers (26-28). Self-care theory and patterns are low-cost but effective disease treatment methods (18, 29).

5.1. Limitations

One of the most important limitations of this research was the non-random sampling method and the elderly population. Therefore, it is suggested to conduct a similar study on the 40-60-year-old population in future studies.

5.2. Conclusions

The results showed that the EPPM increased the SEEF of type 2 diabetic patients. Therefore, the developed similar process model played an essential role in improving behaviors. This theory effectively changed and maintained behavior. Further, the process of SEEF and adaptation to the disease is accelerated with the help of the EPPM theory and increasing the understanding of the disease. Extended parallel process model increases sensitivity and the feeling of danger in patients of non-compliance with medication and food regimen. Extended parallel process model increased awareness of disease complications, treatment motivations, and disease follow-up in patients, ultimately increasing patients' SEEF and reducing treatment complications and costs.

Footnotes

Authors' Contribution: A. M. and E. M.: Data curation, formal analysis, software, writing - original draft, writing review & editing; S. R. and S. M.: Supervision, investigation, methodology, project administration, data curation; A. A., and M. S.: Formal analysis, methodology, data curation; M.M.: Cooperation in receiving the ethical code for present study and final editing of the manuscript.

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Informed Consent: Verbal and written consent was obtained from the participants to participate in the present study.

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