Evidence Based Care Journal

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Effect of Self-Care Education Designed Based on Bandura's Self-efficacy Model on Patients with Hypertension: A Randomized Clinical Trial

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Abstract

Background: Self-care in patients with hypertension can be improved through education and implementation of learning theories.

Aim: The present study aimed to determine the effect of educating self-care in patients with hypertension through the implementation of Bandura's self-efficacy model.

Method: A randomized controlled clinical trial was conducted on 60 patients with hypertension who visited a randomly selected group of health centers in Mashhad, Iran, during 2017. The intervention group participated in a self-efficacy training program designed based on the self-efficacy theory in the form of four 45-minute weekly sessions. The control group received the routine treatment provided by community health centers. Self-care was measured with the questionnaire of self-care in patients with hypertension at three stages of before the intervention, immediately after the intervention, and one month later. Data were analyzed in SPSS (version 16) software using repeated measures ANOVA.

Results: The mean ages were reported at 62.0±6.9 and 59.3±9.2 in the intervention and control groups, respectively. The repeated measures ANOVA showed significant differences between the two groups after the intervention in terms of adherence to medication regimen (P=0.004), engagement in physical activity (P=0.002), adherence to weight management goals (P=0.006). Significant differences were observed between the two groups in terms of their total self-care score immediately after the intervention and one month later (P=0.002).

Implications for Practice: The use of Bandura's self-efficacy theory can improve the self-care in patients with hypertension. Therefore, it is recommended to conduct further studies to examine the long-term effects of training programs based on this theory on the self-care behaviors of patients with hypertension.

Keywords: Blood pressure, Clinical trial, Self-care, Self-efficacy

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Introduction
Hypertension is one of the most common risk factors for non-communicable diseases, such as myocardial infarction, transient ischemic attack, congestive heart failure, advanced kidney damage, and peripheral vascular disease, which causes 7.5 million deaths every year (approximately 13% of all deaths) (1-3). More than 40% of people aged 45-64 years and 70% of people older than 65 years suffer from hypertension (4). The prevalence of hypertension in different populations around the world is within the range of 15-35%, with low-income countries accounting for about two-thirds of all cases. Studies have shown that hypertension is one of the most common health problems in Iran (5).
Severe consequences of hypertension, including premature death, can impose a significant financial burden and emotional pressure on the affected patients and their families (6). Hypertension is one of the chronic diseases that requires the involvement of the patient in self-care and self-management activities for the rest of their life. In recent decades, researchers have put a large number of approaches based on different theories into the test to improve adherence to treatment in patients with hypertension. One of the effective approaches for hypertension management is to utilize the concept of self-efficacy.
Derived from Bandura's social learning theory, self-efficacy is an integral component of many health education and promotion models. Self-efficacy has been defined as a person's belief in their own ability to organize their behavior for the purpose of achieving the desired outcome. This belief, which Bandura describes as a determinant of how people think, behave, and feel, can play a key role in the management of chronic conditions, such as hypertension (7, 8, 9). As a result, the provision of enough information for people to understand that hypertension is a controllable disease can increase their confidence in living with this chronic condition.
People's self-efficacy or self-confidence regarding their own ability to engage in a certain behavior can affect the amount of effort that they make to reach that goal, and consequently their overall performance in this endeavor. Therefore, these concepts are typically among the components of the programs designed to improve self-care in patients with chronic diseases (9, 10). The improvement of self-efficacy can lead to the enhancement of physical and mental health of patients by changing their behavior and acceptance of treatment (11).
The main goal of self-care for patients with hypertension is to ensure adherence to diet and lifestyle recommendations, such as no smoking, managing weight, maintaining a low-salt and low-fat diet, remaining physically active, keeping alcohol consumption moderate, monitoring blood pressure, undergoing regular check-ups, and avoiding stress (6). Studies have also shown that teaching self-care to patients with hypertension improves adherence to the medication regimen (12, 13). Despite the importance of self-efficacy in empowering people to adapt well to stressful situations and difficult tasks and the important role of self-care in the management of chronic diseases, no study has investigated the dimensions of self-care in Iranian hypertension patients based on Bandura's self-efficacy model so far. To close this gap, this study was conducted to determine the effect of educational courses designed based on Bandura's self-efficacy model on self-care in hypertension patients.

Methods
This randomized controlled clinical trial was conducted on 60 patients with hypertension in the city of Mashhad, Iran, during 2017. The participants in the present study were selected using a two-stage random sampling technique. To this end, two of the five health districts of Mashhad were randomly selected (districts 1 and 3), followed by the selection of the random selection of three health centers from each precinct. The selected centers were then randomly assigned to intervention and control groups. The sample size was estimated based on the self-care scores reported by Reisi et al. (12) using the formula for the comparison of means of two independent populations at a confidence level of 95% and a test power of 80%. The mean self-care scores self-care score in the intervention and control groups were 48.95±11.58 and 40.94±9.12, respectively. Therefore, the study was performed on 60 people (30 in each group). No sample loss occurred during the study.
The inclusion criteria were 1) age range of 40-70, living with family, 2) residence in Mashhad, 3) diagnosed with hypertension for more than a year, 4) confirmation of this diagnosis by a cardiologist (according to the patient's medical record), 5) possession of an active medical file with records of hypertension in the same health center, 6) no cognitive impairment (e.g. mental

retardation, dementia, Alzheimer's), and 7) no participation in any educational program regarding self-care behaviors during the last 6 months. The exclusion criteria included absence for more than one session, participation in another educational program, and no participation in the post-test examination.

Out of the five health districts of Mashhad (1, 2, 3, 5, and Samen), two (districts 1 and 3) were randomly selected to perform sampling. In the next step, the names of the health centers located in these districts were written on cards, and they were put in a box. Subsequently, two cards were randomly drawn, the first center was assigned to the intervention group and the second one to the control group. The drawing process was repeated until there were three centers in the intervention group and three in the control group. The data collection instruments included a form of personal and demographic information and the questionnaire of self-care for patients with hypertension. The latter instrument contained 29 questions addressing 5 dimensions, including adherence to medication (3 questions), maintaining a low-salt diet (12 questions), physical activity (2 questions), smoking (1 question), use of alcohol (1 question), and weight management adherence (10 questions). Each question was scored as 0 or 1, making the total score of the questionnaire within the range of 0-29. A higher score in each dimension represents better self-care from the perspective of that dimension and a higher total score represents better overall self-care.

The questionnaire of self-care for patients with hypertension was the Persian translation of the self-care questionnaire developed for patients with hypertension by Findlow et al. (2012) (4). This questionnaire examines the status of self-care behaviors over the past 7 days with 30 questions in 5 subscales, including adherence to medication (3 questions), low-salt diet (12 questions), physical activity (2 questions), smoking and alcohol use (2 questions), and weight management (10 questions). Each question of this questionnaire is assigned a score of 0 or 1, and the total score of this questionnaire is within the range of 0-30, with higher scores indicating better self-care. For the easier interpretation of the results, the scores of the questionnaire were converted to a percentage (scores were scaled from the range of 0-29 to the range of 0-100).

The validity of the questionnaire was assessed by back-translation. Content validity was established by computing the content validity index and content validity ratio. For this purpose, the Persian translation was sent to 10 experts (instructors of the Nursing and Midwifery Faculty of the Mashhad University of Medical Sciences), and they were asked to assess the translation in term of readability, word choice, and Persian grammar. Finally, the questionnaire was modified according to the feedback received from the experts. In their study, Findlow et al. reported the Cronbach's alpha values of 0.71-0.93 for different subscales of their questionnaire. In the present study, the reliability of the translated questionnaire was assessed by measuring internal consistency with 10 volunteers with hypertension, according to which Cronbach's alpha of subscales was found to be in the range of 0.78-0.92 and the reliability of the whole instrument was measured at $\alpha= 0.84$.

The employed method of the trial was as follows. Before the intervention, all patients were asked to complete the demographic and self-care questionnaires. The patients in the intervention group participated in a self-efficacy training program designed based on Bandura's social learning theory (mastery experiences, vicarious experiences, verbal persuasion, and physiological and affective states). This program was in the form of four 45-minute sessions (once a week) held by the researcher. Mastery experiences were created by breaking larger goals down into smaller goals that are easier to achieve. To this end, patients were provided with a worksheet of achievable personal goals, which meant to stimulate them and reduce the effect of failure experiences. For more effective stimulation, the researcher also exchanged his/her phone number with the patients. As a result, s/he could easily encourage the patients when they were successful in adhering to the instructions and also provide counseling when they were experiencing failure.

For vicarious experiences, people with a successful experience of self-care outside the study were invited to the sessions and asked to talk about controlling their blood pressure. This was always followed by a targeted discussion with the participants to make it easier for them to accept the experience of the invitees. For verbal persuasion, patients were also encouraged after their success in maintaining self-care and controlling blood pressure. Moreover, family members, as an essential source of support in the process of learning self-efficacy, were invited to some of the sessions. In these sessions, family members were asked to encourage patients to maintain their success in self-care and support them in self-care activities. During the training, the psychological and mental benefits of

self-care behaviors were also extensively discussed so as to help patients develop positive beliefs about self-care activities (Table 1).

The educational content was prepared according to the research objectives, in accordance with the instructions of the Iranian Ministry of Health and Medical Education (13-15), and Bandura's self-efficacy theory for focused group discussions (14, 16). Sessions were held in classrooms at the investigated health centers, which were almost identical in terms of physical conditions. At the end of each session, a brief question and answer (Q&A) was held. The control group received no intervention other than the usual procedure followed in the health centers (i.e., provision of a pamphlet). The self-care scores of all patients were re-valuated immediately after intervention (self-efficacy training) and one month later (Table 1). The study was approved by the research ethics committee of Mashhad University of Medical Sciences, Mashhad, Iran, with the authorization code of IR.MUMS.REC.1396.320. During the study, the researcher was careful to respect all ethical requirements, including those about obtaining written consent, informing participants about the research objectives, patients' right to choose the time and place of the intervention, patients' right to leave the study at any stage, and ensuring the confidentiality of the collected information.

The collected data were analyzed using SPSS software (version 16). Frequency, percentage, mean, and standard deviation were computed by descriptive statistics methods. The hypotheses of the study were tested by the repeated measures ANOVA. P-value less than 0.05 was considered statistically significant. The normal distribution of quantitative and qualitative data was confirmed by the relevant tests (Kolmogorov-Smirnov and Shapiro-Wilk, respectively), which showed the homogeneity of all background and intervention variables.

Table 1. Details of the intervention program

	Educational content	Method	Provider
First session	Introduction Explaining objectives Providing part of the content related to mastery experiences, including the medication regimen, blood pressure measurement training Giving worksheet to the participants	Lecture and group discussion	Researcher (M.Sc. student in community health nursing), patients, and one of the family members of patients
Second session	Part of the content related to mastery experiences, including diet and exercise Giving worksheets to the participants Following up blood pressure measurement training Verbal persuasion Physiological and affective states	Lecture and group discussion Reviewing the worksheet of the previous session Verbal encouragement	Researcher, patients, and one of the family members
Third session	Vicarious experiences Part of the content related to mastery experiences, including the control overweight and smoking Giving worksheet to the participants Inviting two patients that have been successful in controlling the disease Verbal persuasion Physiological and affective states	Lecture and group discussion Reviewing the worksheet of the previous session Verbal encouragement	Researcher, patients, and one of the family members, two hypertension patients from outside the study
Fourth session	Verbal persuasion Physiological and affective states Summarizing the provided contents Answering questions Providing an educational booklet and a pamphlet	Lecture and group discussion Reviewing the worksheet of the previous session Verbal encouragement	Researcher, the family of patients

Results

The results of the independent t-test showed no statistically significant difference between the two groups in terms of mean age (P=0.103). In terms of gender distribution, 60% (n=18) and 53.3% (n=16) of patients in the intervention and control groups were male, respectively. The obtained results of the Chi-square test showed no statistically significant difference between the two groups in terms of gender (P=0.602).

Immediately after the intervention, the mean values of self-care score in the dimension of adherence to medication regimen were 91.5±14.4 and 74.5±27.2 in the intervention and control groups, respectively. One month after the intervention, these values were reported at 88.3±22.1 and 73.6±26.9, respectively. The result of repeated measures ANOVA showed that the effect of the group (P=0.006), the effect of time (P=0.04), and their mutual effect (P=0.01) on the score of adherence to medication regimen were all significant. The results of the Bonferroni post-hoc test showed that there was a significant difference between the mean scores of this dimension "immediately before and after the intervention" (P =0.001), "before and one month after adherence to medication regimen" (P=0.001), as well as the scores of the intervention and control groups immediately after the intervention (P=0.04) and one month after the intervention (P=0.02).

Immediately after the intervention, the mean value of self-care score in the physical activity dimension was 46.1±4.6 in the intervention group and 29.4±3.4 in the control group. Furthermore, one month after the intervention, these values were estimated at 45±3.5 and 30.3±3.1, respectively. The result of the repeated measures ANOVA showed that the effects of the group (P=0.001) and time (P=0.001), as well as their mutual effect (P=0.03) on this score were also significant. The Bonferroni post hoc test showed a significant difference between the obtained scores of this dimension "immediately before and after the intervention" (P=0.001) and "before and one month after" (P=0.002), and also between the scores of the intervention and control groups immediately after the intervention (P=0.02) and one month later (P=0.03).

Table 2. Demographic characteristics of participants

Characteristics/variables	Intervention group (30) n (%) or Mean (SD)	Control group (30) n (%) or Mean (SD)	P-value
Gender			
Male	18 (60)	16 (53.3)	0.60*
Female	12 (40)	14 (46.7)	
Relationship status			
Married	28(93.3)	24 (80)	0.12*
Single	2(6.7)	6 (20)	
Education status			
Illiterate	7 (23.3)	5 (16.7)	0.53*
Middle and high school	16 (53.3)	12 (40.0)	
High school diploma	7 (23.3	13 (43.3)	
Employment status			
Unemployed	20 (66.7)	15 (50.0)	
Self-employment	4 (13.3)	6 (20.0)	0.60*
Retired	5 (16.7)	7 (23.3)	
Employee	1 (3.3)	2 (6.7)	
Insurance status			
Yes	27 (90)	26 (86.7)	0.68*
No	3 (10.0)	4 (13.3)	
Smoking			
Yes	2 (6.7)	4 (13.3)	0.38*
No	28 (93.3)	26 (86.7)	
Age (Year)	Mean±SD 62±6.9	Mean±SD 59.3±9.2	0.10**

*Chi-square
**Independent t-test

Table 3. Comparison of self-care activities in two groups [a]

Self-Care Activities		Before intervention	Immediate after intervention	One month after intervention	Repeated Measured Variance
Adherence to medication	Intervention	72.3±22.1	91.5±14.4	88.3±22.1	Group P=0.006
	Control	73.7±24.1	74.5±27.2	73.6±26.9	Time P=0.04 Mutual P=0.01
Eating a low-salt diet	Intervention	79.2±13.8	83.4±13.7	0. 02	Group P=0.11
	Control	80.7±15.3	81.8±12.7	80.9±14.2	Time P=0.73 Mutual P=0.27
Engaging in physical activity	Intervention	26.7±2.7	46.1±4.6	45.0±3.5	Group P=0.001
	Control	28.3±3.9	29.4±3.4	30.3±3.1	Time P=0.001 Mutual P=0.03
Non-smoking and use of alcohol	Intervention	96.5±12.7	98.5±9.1	98.5±9.1	Group P=0.28
	Control	93.5±17.3	93.5±17.3	93.5±17.3	Time P=0.12 Mutual P=0.813
Weight management adherence	Intervention	64.7±9.1	87.6±12.8	84.7±11.4	Group P=0.006
	Control	66.7±7.0	69.7±9.7	68.8±10.1	Time P=0.008 Mutual P=0.02
Total score of self-care activities	Intervention	48.9±7.3	59.7±11.2	57.8±12.7	Group P=0.001
	Control	48.5±12.2	50.3±10.2	51.9±10.5	Time P=0.002 Mutual P=0.04

[a] Values are expressed as mean±SD.

For the weight management dimension, the mean scores of the intervention group and the control group immediately after the intervention were respectively 87.6±12.8 and 69.7±9.7, and one month after they were respectively estimated at 84.7±11.4 and 68.8±10.1. According to the results of the repeated measures ANOVA, the effect of the group (P=0.006), the effect of time (P=0.008), and their mutual effect (P=0.02) on this score were also significant. The obtained results of the Bonferroni post hoc test indicated significant differences between the scores of this dimension "immediately before and after the intervention" (P=0.001), "before and one month after" (P=0.001), and also between the scores of the intervention and control groups one month after the intervention (P=0.01).

Before the intervention, the mean±SD of total self-care score in the intervention and control groups were 48.9±7.7 and 48.5±12.2, respectively. However, immediately after the intervention, these values increased to 59.7±11.2 and 50.3±10.2 and one month after they were reported at 57.8±12.7 and 51.9±10.5, respectively. The repeated measures ANOVA showed that the effect of the group (P=0.001), the effect of time (P=0.002), and their mutual effect (P=0.04) on the total score was significant. The Bonferroni post hoc test showed a significant difference between the total scores "immediately before and after the intervention" (P=0.001), "before and one month after the intervention" (P=0.001), also between the total scores of the intervention and control groups immediately after the intervention (P=0.02) and one month after the intervention (P= 0.02, Table 3).

For other dimensions of self-care, namely "low salt diet" and "smoking and alcohol use", the scores showed no significant inter-group or intra-group difference (P>0.05, Table 3).

Discussion

The findings of this study showed that for patients with hypertension, it is beneficial to participate in training sessions and group discussions designed on Bandura's self-efficacy theory since such trainings can have a significant positive effect on their self-management and self-care in regard to hypertension. Likewise, Golshahi et al. (2019) mentioned that a theory-based self-care education could increase the consumption of vegetables, regular use of antihypertensive drugs, and reduced use of salt in the diet of patients with hypertension (12).

However, a study performed by Kauric-Klein et al. (2017) reported that 12 weeks of educational interventions with the purpose of improving self-efficacy and self-care outcomes in hypertensive hemodialysis patients did not increase the self-efficacy score of the intervention group. This study attributed this result to the short duration of the intervention (12 weeks) and the relatively good initial level of self-efficacy in the groups (13).

Another study conducted by Criswell et al. (2010) revealed that self-efficacy and social support programs significantly improved the patients' adherence to medication regimen (17). The present study also found that self-efficacy training was effective in the improvement of adherence to medication. The consistency between these results can be attributed to the similarity of two studies in terms of subjects and instruments.

With regard to the dimension of patient's adherence to the diet, the difference between the scores immediately after the intervention and one month after the intervention was insignificant. In a study carried out by Sedaghat et al. (2015), the majority of patients claimed that they adhered to a healthy lifestyle after their awareness about hypertension (18). However, it is difficult to maintain efforts to control weight and hypertension (19). Studies conducted by Sharfirad et al. (2011) and Mardani hammoleh (2010) showed that education based on the self-efficacy theory significantly increased the adherence to diet in diabetic patients (20, 21), which was not consistent with the finding of the present work. These studies argued that self-efficacy could provide a useful framework for understanding and predicting the patient's commitment to self-care behaviors and the effectiveness of self-management behaviors in the treatment of diabetes. Naturally, the health awareness of individuals depends on some issues, such as their basic knowledge, health literacy, life experiences, and information received from the media. Although knowledge and awareness are necessary for positive changes in health outcomes, they are not the only requirements of this change. In fact, the promotion of healthy habits and lifestyle should continue until there is a clear change in the people's attitudes and behavior, and a clear positive effects on public health (22).

Regarding the physical activity dimension of self-care, the mean score of the intervention group immediately after the intervention was significantly higher than that of the control group. A study performed by Motlagh et al. (2016) indicated a significant relationship between physical activity and hypertension control. Rajati et al. (2012) and Collins et al. (2019) also reported an increase in self-efficacy after an intervention involving physical activity (23, 24). This consistency in findings is due to the effect of educational strategies on awareness and on the performance of care processes, which lead to the improvement of quality of life.

The mean scores of smoking and alcohol use in the intervention group immediately after the intervention and one month after the intervention were lower than the corresponding values in the control group. However, the difference was not statistically significant (in the current study, smoking and alcohol use were merged into one category were not measured independently). The two groups were homogeneous in terms of smoking and alcohol use. In the case of alcohol, the fact that subjects were Muslim and living in Iran, where alcohol is prohibited for Muslim population, is likely to play a remarkable role in the weak effect of self-efficacy education. The findings reported by Nieuwlaat et al. (2013) showed that one of the effective factors in controlling hypertension is the person's ability to avoid illicit substances and alcohol. Training in this area can be helpful, especially if carefully designed based on health models (25).

The present study found that in both immediately and one month after the intervention, the intervention group had significantly higher mean scores of weight management than the control group. In this regard, a study by Mirzaei et al. (2012) on the self-efficacy of health promotion behaviors in patients with hypertension in the city of Faridan, Isfahan province, Iran, revealed that the lowest score of self-efficacy was related to weight management (2). Therefore, there seems to be a need for more extensive education in this area. The study of Fateh et al. (2013) also found that education was effective on the main indicators of adherence (behavior) and its prerequisites (awareness and attitude) as well as clinical indicators. This consistency in results can be attributed to the impact of education on adherence to self-care behavior.

In the present study, the mean total self-care scores of the intervention group immediately after the intervention and one month after the intervention were significantly higher than those of the control group. The study of Hejazi et al. (2015) also reported that an education session based on self-efficacy strategies improved self-care behaviors in diabetic patients (26). Despite the difference between the conditions of subjects in this study and the present work (diabetes vs. hypertension), the chronic nature of both conditions makes the results comparable.

One of the limitations of this study included the lack of any inquiry about the patients' initial knowledge regarding self-care and management of symptoms and the degree to which they can be affected by other sources of information, factors that can indeed affect self-care and self-efficacy

performance. Another limitation was the short length of the follow-up period for the assessment of the impact of Bandura's self-efficacy model though time and financial constraints, and the possibility of the loss of subjects made it impossible to prolong this period.

Implications for Practice
In the present study, before the intervention, there was no significant difference between the control and intervention groups in terms of mean self-care score. However, a significant difference was observed between the mean self-care scores of the two groups after the intervention based on self-efficacy theory. Overall, the findings of this study supported the existing evidence claiming the effectiveness of educational interventions based on the self-efficacy theory in the improvement of self-care in patients with hypertension.

Considering the educational role of nurses and their powerful impact on self-care behaviors of patients with chronic diseases, including hypertension, and given the improvement observed in the self-care scores of the intervention group in this study, this educational approach can serve as an accessible and effective intervention in health centers and medical facilities. It is also recommended to conduct further research on the long-term effects of education based on this theory on patients with hypertension.

Acknowledgments

Conflicts of Interest
The authors declare that there are no conflicts of interest regarding the publication of this article.

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