



Original Article

Self-Care Education Based on Learning Style and its Impact on Lifestyle of Patients with Hypertension

Ghorbani Z¹, Imani E^{2*}, Hoseini Teshnizi S³

1. Student Research Committee, Hormozgan University of Medical Sciences, Bandar Abbas, Iran

2. Department of Nursing, Faculty of Nursing and Midwifery, Hormozgan University of Medical Sciences, Bandar Abbas, Iran

3. Department of Biostatistics, Faculty of Nursing and Midwifery, Hormozgan University of Medical Sciences, Bandar Abbas, Iran

Received: 06 Feb 2021 Accepted: 12 Jan 2021

Abstract

Background & Objective: Hypertension is one of the leading causes of death in the world. Some more effective management of this disease can be achieved by making changes in the lifestyles of patients by self-care education. It is important to use new educational methods to better influence education on people's learning. Therefore, the aim of this study was to investigate the effect of using educational tools appropriate to learning style during self-care training on the lifestyle of hypertensive patients.

Materials & Methods: This quasi-experimental study was performed on 44 patients with hypertension who were divided into four groups of visual, auditory, reading/writing and kinesthetic based on their answers to the VARK learning style questionnaire. Patients' self-care training was conducted in the form of four 60-minute sessions based on the learning style of each group. Before and two months after the intervention, the LSQ lifestyle questionnaire was completed by all patients, and finally, data were analyzed using SPSS ver.21.

Results: According to the results of the present study, the mean score of lifestyle dimensions of all research units at all stages of lifestyle increased significantly after the educational intervention compared to before the intervention, ($p < 0.001$). Also, the increase in the mean of the total lifestyle score after the intervention compared to the time before it was statistically significant ($p < 0.001$).

Conclusion: Considering the favorable effect of self-care education based on learning style in promoting patients' lifestyle, this educational method can be used as a cheap and practical method in changing the behavior of hypertensive patients.

Keywords: High blood pressure, Learning, Lifestyle, Teaching methods, Self-care

Introduction

Arterial hypertension is a global public health issue that affects more than 1 billion people worldwide and leads to ten million deaths annually (1). Globally, 7.6 million premature deaths (about 13.5% of all global mortality),

about 54% of strokes and 47% of ischemic heart disease, as well as 92 million disability-adjusted life years (DALYs) occurs due to uncontrolled hypertension (2). This chronic disease can lead to very serious complications such as heart failure, kidney failure, stroke, and coronary artery disease (3). Due to the high prevalence of hypertension and its serious complications, the World Health Organization (WHO) has designated World Health Day 2013 to hypertension as a

***Corresponding Author:** Imani Elham, Department of Nursing, Faculty of Nursing and Midwifery, Hormozgan University of Medical Sciences, Bandar Abbas, Iran
Email: Eimani@hums.ac.ir
<https://orcid.org/0000-0003-3957-3343>



“silent killer, global public health crisis” (4). In Iran, several studies have been conducted with different results, but in general have shown that 25 to 35% of adults have high blood pressure (5). So that the prevalence of this disease has been reported in Gonabad 20.88%, Tabriz 20.82%, Kermanshah 14%, Tehran 32% (6) and Bandar Abbas 35.3% (7). The prevalence of hypertension has gained unprecedented momentum in low- and middle-income countries, while the problem has been stabilized or reduced in high-income countries. Some reports suggest that lowering blood pressure in high-income countries is the result of centralized prevention and management strategies (8). Effective management of high blood pressure is essential to reduce the risk of heart attack, stroke, chronic heart failure, and kidney disease (9). Lifestyle modification is the basis of preventive management in people with high blood pressure. It is recommended as an initial treatment before starting medication and as an adjunct treatment for people who are currently on medication. Lifestyle modifications include weight loss, salt restriction, physical activity, smoking cessation, and abstinence from alcohol (10). Some studies have shown that people with hypertension do not alter their lifestyle behaviors, as they are conscious of their disorder (11). While knowledge of the factors that contribute to patients’ lack of lifestyle and therapeutic interventions is limited, but it is believed that effective patient education (such as explaining hypertension and its goals, side effects of treatment, and good physician-patient relationships) to improve blood pressure control and achieve a better quality of life for patients and long-term clinical outcomes is very important (12).

One of the effective educational interventions in the management of hypertension is self-care education (13). Self-care includes simple health-promoting activities such as exercise and eating healthy foods to more sophisticated health-restoring measures such as receiving treatment and rehabilitation (14). Self-care measures in hypertension include medication, low-salt

and low-fat diets, exercise, alcohol restriction, non-smoking, weight loss, blood pressure measurement, regular visits, and stress reduction (15).

It is important to examine and determine the learning styles of the learners to achieve more desirable results through education (16). Learners have different ways of internalizing information, these differences reflect their specific learning styles. Learning style is the preferred method by which the learner sees, processes, and understands information (17). Assessing individual learning styles can provide instructors with effective teaching methods. In addition, knowing the learning preferences helps learners to find appropriate learning methods to understand and internalize the content (16). One of the tools that help to determine learners’ learning style is the VARK Learning Style Questionnaire, which was developed by Neil Fleming in 1998 and has acceptable validity and reliability and is available for free use on the Web (18,19). VARK stands for sensory principles used to provide information. V stands for visual, A stands for aural, R stands for reading/writing, and K stands for kinesthetic (18). Visual learners process information best by seeing. Aural learners like to hear information. People with reading/writing learning prefer written words, and kinesthetic learners like to gain information through experience and practice (20).

Since in Iran there is still no collective consensus on the role of educational method based on VARK learning style on the rate of learning due to the limited interventional studies on this issue and considering the high prevalence of hypertension and the important role that education plays in improving the lifestyle of this disease and, consequently, better control of blood pressure in these patients, the researchers of this study decided to conduct a study to determine the effect of using educational tools appropriate to learning style during self-care training on lifestyle of hypertensive patients referred to comprehensive health service centers in Bandar Abbas.



Materials & Methods

This research is a quasi-experimental study, pre-test-post-test without a control group that was performed on patients with hypertension referred to the comprehensive health services of Bandar Abbas during the period from January to December 2019. The sample size was obtained by using the sample size formula to estimate the average of a community taking into account $\alpha = 0.05$, power of 80% ($\beta = 0.20$), $S = 32.5$ and $d = 25$ in MedCalc software equal to 40 people (21). Since attrition of statistical samples was possible during the course of study, 10% was added to the sample size, Therefore, the final sample size was calculated to be 44 people. The sampling method in this study was two-stage. After obtaining the code of ethics from the Ethics Committee of Hormozgan University of Medical Sciences, 6 centers were selected by simple random sampling using a cluster sampling method from all of the comprehensive health service centers in Bandar Abbas. The researcher then selected 44 patients with hypertension who were eligible for inclusion in the study by referring to the mentioned centers by available sampling method and obtained informed oral and written consent to participate in the research while explaining the work process and expressing their voluntary participation in the study and gaining their trust in the field of confidentiality of information and observance of the principle of confidentiality. Literacy, no vision or hearing problems, willingness to participate in the study, medical diagnosis of major hypertension at least 6 months after diagnosis (according to patient records), age above 18 years and no learning disabilities due to mental disorders were the inclusion criteria and the absence of more than one session, the patient's unwillingness to continue attending training classes and attending the same training course were considered as exclusion criteria. Data collection tools included demographic characteristics form, VARK learning style questionnaire, LSQ lifestyle questionnaire. The demographic characteristics form was a researcher-made form used to record patients' demographic information

(age, sex, level of education, marital status, income level, employment status, smoking, underlying diseases, and drug/medications).

The VARK learning style questionnaire questions describe common situations in everyday life and therefore relate to one's learning experience. This questionnaire consists of 16 four-choice questions. Each option represents one of four learning styles. People can choose between zero and four when answering each question. Finally, the option that received the highest scores is the preferred learning style (22). Applicants based on the answers they give to the questionnaire are among individuals with a single-model learning style (visual, auditory, reading/writing or kinesthetic learning styles) or a multi-model learning style that can be a combination of 2, 3, or 4 the mentioned style is classified (23). In 2010, Leit et al. confirmed the validity and reliability of this questionnaire, in which they reported learning style subscales ranging from 0.77 to 0.85 (24). In the present study, the reliability of this questionnaire with a correlation coefficient of 0.81 was confirmed by the test-retest method with a two-week interval between tests with the distribution of the questionnaire among fifteen people with hypertension. To determine the patients' learning style (simultaneously with the selection of samples), the questionnaire was completed by patients, and based on their response to this questionnaire, patients were divided into four groups: visual, auditory, reading/writing, and kinesthetic.

The purpose of the LSQ questionnaire is to assess various aspects of people's lifestyles. This questionnaire contains 68 questions in the Likert scale as always (3), usually (2), sometimes (1) and never (0) and consists of 10 components that include physical health (8 questions), sport and wellbeing (7 questions), weight control and diet (7 questions), prevention from diseases (6 questions), psychological health (7 questions), Spiritual health (6 questions), social health (6 questions), preventing self-medication, drug abuse and others (6 questions), prevention from



accidents (8 questions) and environmental health (7 questions).

The validity and reliability of this questionnaire in Iran have been confirmed by Lali et al. in 2009 (25). In this study, its reliability was confirmed by distributing this questionnaire among fifteen people with hypertension referred to the comprehensive health service centers in Bandar Abbas using the intra-class correlation test with Cronbach's alpha of 96.6 ($\alpha = 96.6$).

The place of training sessions was the training hall located in Shahid Takhti Comprehensive Health Services Center in Bandar Abbas. In order to inform about the time and place of the training sessions, the necessary arrangements were made by telephone contact with the patients a few days before the sessions. Each group (visual, auditory, reading/writing, and kinesthetic) underwent self-care training in four 60-minute sessions (in a period of two weeks) based on the learning style specific to each group by the researcher. The content of the training sessions for each session is shown in Table 1.

The educational tools used to teach the visual group included pictures, PowerPoint, diagrams, charts, and videos. In the auditory group, the training was done by listening to an audio file containing educational content and group discussion. A training booklet was used to teach the reading/writing group, and patients were asked to read the booklet for 30 minutes, and rewrite what they learned from reading it in their own language. The role-playing and scientific practice were among the educational methods that were used to explain the educational content to the kinesthetic group. To evaluate the effect of education on people's learning, before the first training session and two months after, the LSQ questionnaire (after providing the necessary explanations on how to answer the questions) was completed by all participants. The data were analyzed by SPSS software version 21, using descriptive (mean and standard deviation) and inferential statistics (paired t-test, Wilcoxon, one-way analysis of variance and Kruskal-Wallis tests). It should be remembered that the level of significance was under 0.05.

Results

Of the total units studied, 12 had visual style, 17 had auditory style, 8 had reading/writing style and 7 had kinesthetic style. The mean age of the total sample was 57.22 ± 9.56 and the mean age of the visual, auditory, reading/writing, and kinesthetic groups was 60.08 ± 8.71 , 58.17 ± 8.59 , 52.37 ± 12.59 and 55.57 ± 9.03 respectively. The results of the one-way analysis of variance test did not show a statistically significant difference between the mean age of the people in these four groups ($p=0.329$). Also, there was no statistically significant difference between the four groups in terms of other demographic variables (gender, marital status, level of education, income, job, history of opium and drug use, and underlying diseases) ($p>0.05$).

According to the results of the present study, the mean score of lifestyle dimensions of all research units at all stages of lifestyle increased significantly after the educational intervention compared to before the intervention, ($p<0.001$). Also, the increase in the mean of the total lifestyle score after the intervention compared to the time before it was statistically significant ($p<0.001$) (Table 2).

In the visual and auditory groups, the mean score of all lifestyle levels increased significantly after the educational intervention compared to before ($p<0.05$). In the reading/writing group, this increase was significant at all levels except the level of weight control and nutrition ($p<0.05$) and in the kinesthetic group at the levels of sport and wellbeing, prevention from disease, spiritual health, social health and preventing self-medication, drug abuse and others, a statistically significant increase was observed ($p<0.05$). Nevertheless, at other levels, there was no significant increase after the intervention ($p>0.05$). In addition, after the educational intervention, compared to the previous time, the mean total score of lifestyle in all four groups increased significantly ($p<0.001$) (Table 3).

According to the results of analysis of variance, there was no statistically significant

**Table 1.** Content of educational materials presented in each training session

Training sessions	Educational content
First session	Familiarity with the purpose of education, definition of blood pressure, symptoms and complications of hypertension and the importance of continuing self-care behaviors in maintaining health and controlling complications and then evaluating the material presented in this session
second session	A review of the topics presented in the first session, the importance of a healthy lifestyle in a person's health and prevention of chronic diseases such as hypertension, training on how to use drugs and their side effects, how to measure blood pressure, the importance of diet, mobility and activity in Controlling hypertension and finally evaluating the material presented in this session
third session	A review of the material presented in the second session, teaching social health indicators and explaining the effects of smoking and alcohol consumption on blood pressure, and finally evaluating the material presented in this session
fourth Session	A review of the material presented in the third session, improving mental health by presenting information about the causes of stress and the role of stress on the onset, exacerbation and persistence of hypertension and ways to control stress with methods such as relaxation training and diaphragmatic breathing and improving spiritual health Individuals by presenting materials about the impact of religious duties on people's health and finally evaluating the materials presented in this meeting

Table 2. Comparison of mean score of lifestyle dimensions and total lifestyle before and after intervention of all research units

	Variables	Before intervention Mean \pm SD	After the intervention Mean \pm SD	P value
lifestyle dimensions	Body health	19.95 \pm 2.03	21.00 \pm 1.81	**<0.001
	Exercise and wellbeing	20.63 \pm 2.83	21.70 \pm 2.61	**<0.001
	Control weight and regime	22.18 \pm 2.49	23.15 \pm 2.48	**<0.001
	Prevention of diseases	19.61 \pm 2.23	20.68 \pm 2.11	**<0.001
	Psychologic health	22.93 \pm 2.07	23.75 \pm 2.05	**<0.001
	spiritual health	18.34 \pm 2.76	19.36 \pm 2.65	*<0.001
	Social health	18.84 \pm 2.92	19.75 \pm 2.64	**<0.001
	Prevention of drug and opium	17.59 \pm 2.59	18.63 \pm 2.42	*<0.001
	Prevention of evidences	22.70 \pm 2.29	23.40 \pm 2.12	**<0.001
	Environmental health	24.22 \pm 2.75	24.88 \pm 2.51	*<0.001
	Total lifestyle	207.02 \pm 14.94	216.34 \pm 14.11	*<0.001

**Table 3.** Comparison of mean score of lifestyle dimensions and total lifestyle before and after intervention in each group

Variables		Visual Mean \pm SD	Aural Mean \pm SD	Read/Write Mean \pm SD	Kinesthetic Mean \pm SD
Body health	Before	20.00 \pm 1.85	19.76 \pm 2.48	20.50 \pm 1.77	19.71 \pm 1.60
	After	21.33 \pm 1.66	20.88 \pm 2.17	21.37 \pm 1.30	20.28 \pm 1.70
	P value	* <0.001	* <0.001	*0.006	*0.103
Exercise and wellbeing	Before	21.58 \pm 2.23	20.58 \pm 2.69	19.12 \pm 1.72	20.85 \pm 3.28
	After	22.83 \pm 2.82	21.76 \pm 2.35	20.12 \pm 1.64	21.42 \pm 3.20
	P value	*0.001	* <0.001	*0.001	*0.030
Control weight and regime	Before	22.83 \pm 2.28	22.17 \pm 2.69	22.00 \pm 2.61	21.28 \pm 2.42
	After	24.00 \pm 2.17	23.41 \pm 2.71	22.75 \pm 2.12	21.57 \pm 2.43
	P value	**0.006	* <0.001	**0.109	**0.157
Prevention of diseases	Before	19.66 \pm 2.64	19.23 \pm 2.25	20.50 \pm 1.92	19.42 \pm 1.90
	After	21.00 \pm 2.08	20.29 \pm 2.08	21.62 \pm 2.32	20.00 \pm 1.91
	P value	* <0.001	**0.002	*0.038	*0.030
Psychologic health	Before	23.33 \pm 1.87	22.82 \pm 2.29	22.87 \pm 1.88	22.57 \pm 2.37
	After	24.16 \pm 1.52	23.82 \pm 2.18	23.87 \pm 2.35	22.71 \pm 2.28
	P value	**0.015	* <0.001	**0.038	**1.00
spiritual health	Before	18.58 \pm 2.15	18.47 \pm 3.35	17.62 \pm 3.46	18.42 \pm 1.13
	After	19.91 \pm 2.71	19.47 \pm 2.96	18.50 \pm 3.02	19.14 \pm 1.06
	P value	*0.007	* <0.001	*0.006	*0.008
Social health	Before	18.75 \pm 3.10	19.52 \pm 3.06	18.75 \pm 3.19	17.42 \pm 1.71
	After	20.00 \pm 2.37	20.41 \pm 2.73	19.50 \pm 3.16	18.00 \pm 1.73
	P value	*0.003	* <0.001	*0.003	*0.030
Prevention of drug and opium	Before	18.50 \pm 3.03	17.17 \pm 2.55	17.62 \pm 2.06	17.00 \pm 2.58
	After	19.50 \pm 2.61	18.52 \pm 2.50	18.50 \pm 1.77	17.57 \pm 2.50
	P value	**0.006	* <0.001	*0.041	**0.046
Prevention of evidences	Before	22.41 \pm 2.39	22.64 \pm 2.47	22.00 \pm 1.69	24.14 \pm 2.11
	After	23.41 \pm 2.31	23.35 \pm 2.08	23.00 \pm 2.20	24.00 \pm 2.16
	P value	*0.001	*0.041	*0.033	*0.356
Environmental health	Before	24.41 \pm 3.23	23.82 \pm 2.62	24.87 \pm 1.95	24.14 \pm 3.33
	After	25.08 \pm 2.87	24.70 \pm 2.39	25.50 \pm 1.77	24.28 \pm 3.19
	P value	*0.013	* <0.001	*0.049	*0.356
Total life style	Before	210.08 \pm 14.33	206.23 \pm 17.99	205.87 \pm 12.77	205.00 \pm 11.91
	After	221.25 \pm 13.03	216.64 \pm 15.97	214.75 \pm 12.06	209.00 \pm 12.27
	P value	* <0.001	** <0.001	* <0.001	* <0.001

* paired t-test; **Wilcoxon test



difference between the mean score of lifestyle dimensions before the educational intervention in the four groups ($p>0.05$), also this difference was not significant for the mean score of total lifestyle ($p>0.05$). But after the educational intervention, a statistically significant difference was observed in the mean difference before and after the intervention levels of physical health, sport and wellbeing, spiritual health, social health and preventing self-medication, drug abuse and others, as well as the total lifestyle in four groups ($p<0.05$), but there was no significant difference in the mean difference before and after the intervention of other levels ($p>0.05$) (Table 4). The results of comparing the pairs of groups using the non-parametric group's pair test showed that the difference in the mean before and after the intervention of the total lifestyle score in the visual group was more than other subgroups of education based on learning style and in the kinesthetic group was less than other subgroups.

Discussion & Conclusion

In the present study, the study of individuals' learning styles using VARK learning style questionnaire showed that 38.6% of the subjects had auditory learning style (highest percentage compared to the other three groups), 27.2% had visual style, 18/1% had a reading/writing style and 15.9% had a kinesthetic style. In the study of Anbarasi et al. and Koonce et al., the highest percentage of the subjects had an auditory learning style (26,27).

According to the results of the present study, self-care training based on VARK learning style caused a significant increase in the average score of all lifestyle levels of all research units. Arani et al. (2015) in their study to investigate the effect of education based on the BASNEF model on the lifestyle of patients with hypertension, concluded that the mean score of lifestyle dimensions at all levels, after educational intervention significantly increased (28). Saffari et al. also reported a positive effect of face-to-face health education on increasing the mean of all levels of lifestyle after the intervention

compared to before (29). Although the mentioned studies were different from our study in terms of method and educational content, but their results are consistent with the present study. Patient education is of particular importance in caring for patients with chronic diseases including hypertension. In fact, by educating these patients, positive changes in their health behaviors can be stimulated and maintained, thereby promoting health outcomes, reducing risk behaviors, risk factors, and mortality from their disease. Educating patients with the disease can be effective in performing behaviors that help control long-term blood pressure.

In the present study, the total lifestyle score of all research units also increased significantly after training. In Nejati et al. study, stress reduction program training through mindfulness was reported to be beneficial on the lifestyle of patients with hypertension (30). Elmir et al. also reported the effect of behavioral educational intervention on lifestyle improvement in patients with hypertension (31). The results of these two studies are consistent with the results of our study. Also, the results of the present study showed that although in all four groups studied, the use of this educational method in all groups could not cause a significant increase in the mean score of lifestyle dimensions at all levels, but the mean score of total lifestyle after the educational intervention compared to the time before that was a significant increase in all four groups. Milani et al. conducted a study to investigate the effect of home-based digital blood pressure programs on patients' blood pressure control and lifestyle, which used videos and educational booklets downloadable by patients to teach the intervention group. The results of their study showed a more favorable lifestyle improvement and better control of blood pressure in patients in the intervention group than in the control group who received only routine care (32). Liu et al reported a positive effect of e-consultation on long-term lifestyle changes (33). In the study of Van et al., 3 months of training based on the pattern of health belief along with the use of a comprehensive reminder system, further

**Table 4.** Intragroup comparison of mean difference before and after intervention in lifestyle dimensions' scores and total lifestyle scores in four groups of training based on learning style

Variables	Visual Mean \pm SD	Aural Mean \pm SD	Read/Write Mean \pm SD	Kinesthetic Mean \pm SD	P value
Body health	1.33 \pm 0.88	1.11 \pm 0.78	1.37 \pm 0.74	0.00 \pm 0.57	*0.004
Exercise and wellbeing	1.25 \pm 0.96	1.17 \pm 0.95	1.37 \pm 0.91	0.14 \pm 0.37	*0.037
Control weight and regime	1.16 \pm 0.93	1.23 \pm 0.83	0.75 \pm 1.16	0.28 \pm 0.48	*0.098
Prevention of diseases	1.33 \pm 0.77	1.05 \pm 0.89	1.37 \pm 1.06	0.28 \pm 0.48	*0.058
Psychologic health	0.83 \pm 0.83	1.00 \pm 0.79	1.00 \pm 0.92	0.14 \pm 0.37	*0.105
spiritual health	1.33 \pm 1.07	1.00 \pm 0.79	1.50 \pm 1.06	0.00 \pm 0.00	**0.009
Social health	1.25 \pm 1.13	0.88 \pm 0.78	1.12 \pm 0.64	0.14 \pm 0.37	*0.049
Prevention of drug and opium	1.00 \pm 0.73	1.35 \pm 0.93	1.37 \pm 1.40	0.00 \pm 0.00	**0.011
Prevention of evidences	1.00 \pm 0.73	0.70 \pm 1.31	1.00 \pm 1.06	0.14 \pm 0.37	*0.112
Environmental health	0.66 \pm 0.77	0.88 \pm 0.69	0.62 \pm 0.74	0.14 \pm 0.37	*0.146
Total lifestyle	11.16 \pm 4.85	10.41 \pm 4.56	11.50 \pm 1.41	1.00 \pm 1.15	**0.000

*One-way analysis of variance test;

**Kruskal Wallis test



promoted health behaviors and blood pressure control in patients with ischemic stroke (34). In their study, Hacıhasanog et al. examined the impact of home-based training on medication compliance, high blood pressure management, healthy lifestyle behaviors, and BMI at a primary health care facility in the Turkish province of Erzincan, and concluded that educational interventions in Patients with high blood pressure can make a major contribution to improving patients' lifestyle behaviors, adherence to medications, their blood pressure and BMI (35). Although in these studies, patients were not educated based on their learning style, the results of all four studies, which indicate the positive effect of education in improving and enhancing patients' lifestyles, are in line with the results of our study.

According to the results of the present study, self-care education based on the specific learning style of each patient caused significant positive changes in their lifestyle, which indicates the benefits of using this educational method in promoting patients' learning. Evidence suggests that effective education requires attention to the basic steps to effective learning, including differences in learners' learning styles. Effective learning occurs when the structure of the content and teaching materials and teaching methods are consistent with the learners' learning style. When teaching, knowing how to learn and how to facilitate and support this learning by the educator is a condition for better use of education by patients.

In the present study, the most changes in the mean total lifestyle score were related to the visual group. In fact, in the visual method, the possibility of using various methods such as PowerPoint, video, chart, diagram, presenting educational content in the form of attractive images and slides and diagrams, prominently displaying significant content, are among the advantages of this educational method. Which in itself can motivate learners to learn and the existence and survival of this motivation, causes volunteer activity, and direct involvement of the learner in the learning process and increases the

possibility of achieving educational goals. In addition, creating variety in the way of presenting the material reduces the feeling of boredom in the learner and can lead to a better understanding of the material. The use of video also allows the learner to see and hear educational content, which in turn leads to better processing of content in the mind of the audience. In the kinesthetic group, the effect of education on the overall score of lifestyle was much less, than other subgroups of education based on learning style. Perhaps one of the reasons is the better effect of the teaching method through role-playing and on learning practical and manual skills, but the concepts that in the present study, patients needed to understand and teach did not have such a feature. Other reasons include patients' lack of understanding of the relationship between performance and learning objectives and their misunderstanding of the material taught in this way.

In the present study, the effect of using self-care education based on VARK learning style on patients' learning rate was evaluated by evaluating the improvement of their lifestyle score. The results of the study showed the positive effect of using this educational method so that the use of this educational method caused a significant increase in the total lifestyle score of patients in all four groups as well as all patients. Due to the limited studies that have been done regarding the effectiveness of this educational method on patients' learning and the resulting clinical consequences, so conducting similar studies on patients with different diseases to ensure more than the desired effect of using this training method is required. One of the strengths of this study is the optimal and acceptable effect of using the educational method based on VARK learning style on promoting patients' learning and subsequently improving their lifestyle. Among the weaknesses of the study were the costly provision of tools and necessary arrangements to perform the mentioned educational method and the time-consuming implementation that health therapists, especially nurses, due to the large workload, do not have many opportunities

and desire to provide training in this way. Therefore, the educational method used in the study is not very applicable in practice.

Acknowledgements

This article is extracted from a master thesis and its ethics identifier is IR.HUMS.REC.1397.216. The authors highly appreciate all staff of medical library in nursing and midwifery faculty as well as staff at comprehensive healthcare centers, plus the cooperation of all patients participating in the study. The authors declare that they have no competing interests.

Conflict of Interest

The authors have no conflict of interest to declare.

References

1. Cherfan M, Vallée A, Kab S, Salameh P, Goldberg M, Zins M, et al. Unhealthy behaviors and risk of uncontrolled hypertension among treated individuals- the CONSTANCES population-based study. *Sci Rep*. 2020;10(1):1-12.
2. Perl S, Niederl E, Kos C, Mrak P, Ederer H, Rakovac I, et al. Randomized evaluation of the effectiveness of a structured educational program for patients with essential hypertension. *Am J Hypertens*. 2016;29(7):866-872.
3. Delavar F, Pashaeypoor S, Negarandeh R. The effects of self-management education tailored to health literacy on medication adherence and blood pressure control among elderly people with primary hypertension: A randomized controlled trial. *Patient Educ Couns*. 2020;103(2):336-342.
4. Javadzade H, Larki A, Tahmasebi R, Reisi M. A theory-based self-care intervention with the application of health literacy strategies in patients with high blood pressure and limited health literacy: a protocol study. *Int J Hypertens*. 2018;2018:4068538.
5. Kamran A, Sharifirad G, Shafaei Y, Azadbakht L. Sodium intake prediction with health promotion model constructs in rural hypertensive patients. *Indian J Public Health*. 2015;59(2):102-108.
6. Ganji S, Peyman N, Meysami Bonab S, Esmaily H. Effect of self-Care training program on quality of life and health literacy in the patients with essential hypertension. *Journal of Mashhad University of Medical Sciences*. 2018;60(6):792-803. [In persian]
7. Safari MA, Ghanbarnejad A, Nikparvar M, Dadipoor S, Fallahi S. Prevalance of hypertension and respective risk factors in adults in Bandar Abbas, Iran. *Hormozgan Medical Journal*. 2014;18(3):219-227. [In persian]
8. Kimani S, Mirie W, Chege M, Okube OT, Muniu S. Association of lifestyle modification and pharmacological adherence on blood pressure control among patients with hypertension at Kenyatta National Hospital, Kenya: a cross-sectional study. *BMJ open*. 2019;9(1): e023995.
9. Ruppar TM. Randomized pilot study of a behavioral feedback intervention to improve medication adherence in older adults with hypertension. *J Cardiovasc Nurs*. 2010;25(6):470-479.
10. Buda ES, Hanfore LK, Fite RO, Buda AS. Lifestyle modification practice and associated factors among diagnosed hypertensive patients in selected hospitals, South Ethiopia. *Clin Hypertens*. 2017;23(1):26.
11. Akbarpour S, Khalili D, Zeraati H, Mansournia MA, Ramezankhani A, Fotouhi A. Healthy lifestyle behaviors and control of hypertension among adult hypertensive patients. *Sci Rep*. 2018;8(1):1-9.
12. Nishigaki N, Shimasaki Y, Yoshida T, Hasebe N. Physician and patient perspectives on hypertension management and factors associated with lifestyle modifications in Japan: results from an online survey. *Hypertens Res*. 2020;43(5):450-462.
13. Chodosh J, Morton SC, Mojica W, Maglione M, Suttrop MJ, Hilton L, et al. Meta-analysis: chronic disease self-management programs for older adults. *Ann Intern Med*. 2005;143(6):427-438.
14. Ogunbayo OJ, Schafheutle EI, Cutts C, Noyce PR. Self-care of long-term conditions: patients' perspectives and their (limited) use of community pharmacies. *Int J Clin Pharm*. 2017;39(2):433-442.
15. Ademe S, Aga F, Gela D. Hypertension self-care practice and associated factors among patients in public health facilities of Dessie town, Ethiopia. *BMC Health Serv Res*. 2019;19(1):51.
16. Hamilton S. How do we assess the learning style of our patients? *Rehabil Nurs*. 2005;30(4):129-131.
17. El Aissaoui O, El Madani YE, Oughdir L, El Alloui Y. Combining supervised and unsupervised machine learning algorithms to predict the learners' learning styles. *Procedia Comput Sci*. 2019;148:87-96.
18. AlKhasawneh E. Using VARK to assess changes in learning preferences of nursing students at a public university in Jordan: Implications for teaching. *Nurse Educ Today*. 2013;33(12):1546-1549.
19. Meyer AJ, Stomski NJ, Innes SI, Armson AJ. VARK learning preferences and mobile anatomy software application use in pre-clinical chiropractic students. *Anat Sci Educ*. 2016;9(3):247-254.
20. Kharb P, Samanta PP, Jindal M, Singh V. The learning styles and the preferred teaching-learning strategies of first year medical students. *J Clin Diagn Res*. 2013;7(6): 1089-1092.
21. Saleh Moghadam AR, Hozhabr-Araghi F, Behnam Vashani H, Karimi Moonaghi H, Bazzi A. Evaluation of the effect of self-care education based on VARK learning style on HbA1c and FBS in patients with type II diabetes. *Med Surg Nurs J*. 2016;5(2):58-65.



22. Urval RP, Kamath A, Ullal S, Shenoy AK, Shenoy N, Udupa LA. Assessment of learning styles of undergraduate medical students using the VARK questionnaire and the influence of sex and academic performance. *Adv Physiol Educ*. 2014;38(3):216-620.
23. Kim RH, Gilbert T. Learning style preferences of surgical residency applicants. *JSR*. 2015;198(1):61-5.
24. Leite WL, Svinicki M, Shi Y. Attempted validation of the scores of the VARK: Learning styles inventory with multitrait-multimethod confirmatory factor analysis models. *Educ Psychol Meas*. 2010;70(2):323-339.
25. Lali M, Abedi A, Kajbaf MB. Construction and validation of the lifestyle questionnaire (LSQ). *J Psychol Res*. 2012;15(1):64-80.
26. Anbarasi M, Rajkumar G, Krishnakumar S, Rajendran P, Venkatesan R, Dinesh T, Mohan J, Venkidusamy S. Learning style-based teaching harvests a superior comprehension of respiratory physiology. *Adv Physiol Educ*. 2015;39(3):214-217.
27. Koonce TY, Giuse NB, Storrow AB. A pilot study to evaluate learning style-tailored information prescriptions for hypertensive emergency department patients. *J Med Libr Assoc*. 2011;99(4):280-289.
25. Milani RV, Lavie CJ, Bober RM, Milani AR, Ventura HO. Improving hypertension control and patient engagement using digital tools. *Am J Med*. 2017;130(1):14-20.
28. Arani MD, Taghadosi M, Gilasi HR. The effect of education based on BASNEF model on lifestyle in patients with hypertension. *Iran Red Crescent Med J*. 2017;19(11):e40731.
29. Saffari M, Sanaeinasab H, Rashidi Jahan H, Haji-jafar Namazi MH, Sepandi M, Samadi M, Azad Marzabadi E. A comparison between impact of a health education program using in-situ training and text-messaging on lifestyle and blood pressure in military personnel at risk of hypertension. *Iran J Health Educ Health Promot*. 2019;7(1):74-83.
30. Nejati S, Zahiroddin A, Afrookhteh G, Rahmani S, Hoveida S. Effect of group mindfulness-based stress-reduction program and conscious yoga on lifestyle, coping strategies, and systolic and diastolic blood pressures in patients with hypertension. *J Tehran Heart Cent*. 2015;10(3):140-148.
31. Elmer PJ, Obarzanek E, Vollmer WM, Simons-Morton D, Stevens VJ, Young DR, Lin PH, Champagne C, Harsha DW, Svetkey LP, Ard J. Effects of comprehensive lifestyle modification on diet, weight, physical fitness, and blood pressure control: 18-month results of a randomized trial. *Ann Intern Med*. 2006;144(7):485-495.
32. Milani RV, Lavie CJ, Bober RM, Milani AR, Ventura HO. Improving hypertension control and patient engagement using digital tools. *Am J Med*. 2017;130(1):14-20.
33. Liu S, Tanaka R, Barr S, Nolan RP. Effects of self-guided e-counseling on health behaviors and blood pressure: Results of a randomized trial. *Patient Educ Couns*. 2020;103(3):635-641.
34. Wan LH, Zhang XP, You LM, Ruan HF, Chen SX. The efficacy of a comprehensive reminder system to improve health behaviors and blood pressure control in hypertensive ischemic stroke patients: a randomized controlled trial. *J Cardiovasc Nurs*. 2018;33(6):509-517.
35. Hacıhasanoğlu R, Gözümlü S. The effect of patient education and home monitoring on medication compliance, hypertension management, healthy lifestyle behaviours and BMI in a primary health care setting. *J Clin Nurs*. 2011;20(5-6):692-705.