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The effects of self-performance management video program on patients receiving hemodialysis

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Abstract

Aim: This study attempted to investigate the effects of a self-performance management video program using a tablet PC on self-care knowledge, self-care behavior, state anxiety and physiological index in patients receiving hemodialysis.

Methods: This study was an experimental research design. The participants of this study were 46 patients who were diagnosed with end-stage renal failure and received hemodialysis on a regular basis in kidney centers (23: experimental group, 23: control group). The data collection period was from November 24, 2016 to January 3, 2017. The program was designed and organized by the researchers of this study according to previous studies consisting of six categories in a total 70-min video program. The contents of the self-performance management program were stored on the tablet PC, so that the patients were self-led. All the patients who participated in the program were asked to complete three categories in a week. Therefore, it took 2 weeks to complete all contents of the six categories. After that, the patients were asked to repeat the 2-week course twice. Therefore, the program was carried out for a total of 6 weeks. For the control group, a pamphlet was used.

Results: The anxiety of the experimental group was significantly decreased compared to the control group. Among the physiological index, potassium and albumin levels were statistically significant.

Conclusions: The self-performance management video program using a tablet PC developed in this study seems to be applicable to patients receiving hemodialysis who need anxiety and physiological index management.

KEYWORDS
anxiety, hemodialysis, self-care, self-management

1 | INTRODUCTION

The number of patients receiving renal replacement therapy worldwide continues to increase (United States Renal Data System, 2017). Hemodialysis is used as a renal replacement therapy when kidneys can no longer effectively remove body waste and fluids, and when kidney function is only 10% to 15% functional (National Kidney Foundation, 2018).

Patients receiving hemodialysis are evaluated for the adequacy of hemodialysis therapy by monitoring physiological index such as interdialytic weight gains. In addition, dietary and water restrictions are prescribed for treatment along with increased protein intake and limited potassium and phosphorus. This can be achieved by improving a patient's compliance with treatment. To improve treatment compliance, patients need to be actively engaged in their treatment (Grady & Gough, 2014; Miller, Lasiter, Ellis, & Buelow, 2015; National Kidney Foundation, 2018).

Patient's self-management is to participate in achieving compliance with prescribed diet, medication, exercise, and recommendations from healthcare providers (British Columbia Ministry of Health, 2011; Grady & Gough, 2014; Miller *et al.*, 2015). So, the self-management of patients receiving hemodialysis is very necessary for achievement in treatment compliance. Consequently, improved self-management of patients receiving hemodialysis will contribute to maintain good health status and quality of life (Grady & Gough, 2014; Li, Jiang, Lin, 2014; Lin, Liu, Hsu, & Tsai, 2017; Miller *et al.*, 2015). Therefore, self-management programs for patients receiving hemodialysis need to be developed to achieve treatment compliance such as improved self-management or well-controlled physiological index (Griva *et al.*, 2018; Slesnick *et al.*, 2015; Choi & Lee, 2012).

Meanwhile, in a study of factors affecting self-management of patients receiving hemodialysis, anxiety was found to be a significant associated factor (Feroze *et al.*, 2012; Li *et al.*, 2014). Patients who receive hemodialysis on a regular basis are highly anxious, and this negatively affects their self-management and quality of life (Li *et al.*, 2014; Li *et al.*, 2016). Therefore, it is also necessary to develop a self-management program that can reduce anxiety of patients receiving hemodialysis.

Previous studies related to self-management programs of patients receiving hemodialysis have been reviewed. Griva *et al.* (2018) conducted self-management education for patients receiving hemodialysis, and then examined serum potassium and phosphorus levels, and interdialytic weight gains. But there were limitations that focus on physiological effects and do not consider anxiety. Slesnick *et al.* (2015) studied the effects of self-management program on the health status, self-management behavior, and self-efficacy of 12 hemodialysis patients. Of the 12 patients, only nine patients attended five of the six sessions and three patients attended only three sessions. Nobody attended all six sessions. Therefore, this study had limitations in generalizing the study results because there was no control group and none of the participants attended all program sessions. In addition, healthcare provider-led workshop training was provided, not patient-led, and the self-management workshop was focused only on diet management, which limited its application to self-management of patients receiving hemodialysis. Choi and Lee (2012) have applied a face-to-face self-management program to patients with chronic kidney disease. The program contents were not applicable to patients receiving hemodialysis because of self-management before renal replacement therapy. In addition, since the program was a one-time education led by the healthcare provider, there may be limitations for the patient to remember and apply it continuously.

When reviewing existing self-management programs, there were limitations that only physiological aspects were considered, that healthcare providers led and not patients, or that the anxiety aspects were not considered (Griva *et al.*, 2018; Slesnick *et al.*, 2015; Choi & Lee, 2012). A patient's self-led program that can be easily used by themselves were effective in managing dietary restriction and complications of patients receiving hemodialysis (Palmer *et al.*, 2015). Also, the program provided to the patient by video media contributes greatly to the improvement of the patient's self-care and physiological index (Suk *et al.*, 2013).

Thus, this study attempted to develop a self-management program with video media and validate its effects, which was considered together with patient-led, physiological index, self-care, and anxiety aspects.

1.1 | The conceptual framework of this study

The conceptual framework of this study is based on Orem's (1995) Self Care Theory and related previous literatures. Orem stated that it is necessary to mediate the risk of self-care among people who are at risk of self-care to manage their illness on their own. Orem's theory includes theory of self-care and theory of nursing systems. The theory of self-care focuses on the practice of individuals to maintain their own lives, health and well-being. The main concept of the theory of self-care is self-care requisites, which implies the requirements of self-care actions. Self-care requisites consist of three categories: universal self-care requisites, developmental self-care requisites, and health deviation self-care requisites. Universal self-care requisites are necessary to maintain daily living such as maintaining adequate air, maintaining enough moisture, balancing activity and rest, and so on. Developmental self-care requisites are required during the growth and development process such as adapting to new physical changes, adapting to new occupations, and so on. Health deviation self-care requisites are required in conditions of illness and injury such as effectively carrying out prescribed treatment and rehabilitation, seeking safe medical assistance, and so on.

The theory of nursing system is activated when the client's self-care demand exceeds the available self-care ability. The nursing system consists of a wholly compensatory nursing system, partial compensatory nursing system, and supportive-educative system. The wholly compensatory nursing system is necessary for clients who do not have self-care at all, such as neonatal care and care provided to unconscious patients. The partial compensatory nursing systems are needed for clients who can perform some degree of self-care, such as patient self-care after abdominal surgery. The supportive-educative system is required when supporting a client or providing information or education. Examples include providing diet information, breastfeeding instructions, and so on.

As a result of reviewing the previous literatures, patients receiving hemodialysis have high anxiety levels, decreased self-care, and high risk of health problems due to physiological index (Borges *et al.*, 2017; Choi & Lee, 2012; Feroze *et al.*, 2012; Li *et al.*, 2016; Tsai *et al.*, 2016). The self-performance management video program developed in this study will improve self-care knowledge and behavior, reduce anxiety, and change physiological indicators positively (Figure 1).

1.2 | The purpose of this study

The purpose of this study was to examine effects of the self-performance management video program using a tablet PC on self-care knowledge, self-care behavior, state anxiety and physiological index in patients receiving hemodialysis.

1.3 | Research hypothesis

Hypothesis 1: The self-care knowledge of the experimental group will be increased more than the control group.

Hypothesis 2: The self-care behavior of the experimental group will be increased more than the control group.

Hypothesis 3: The state anxiety of the experimental group will be decreased more than the control group.

Hypothesis 4: The physiological index of the experimental group will be more changed than the control group.

2 | METHODS

2.1 | Study design

This study was experimental research design to investigate the effects of self-performance management video program using a tablet PC (Table 1).

2.2 | Participants

The target population of this study was patients who are diagnosed with end-stage renal failure and have received hemodialysis regularly for more than 1 year. The researchers visited hemodialysis centers with more than 100 beds and met with the physician in charge of the centers. The researchers explained to the physician the purpose, procedures, and methods of the study and were given permission to conduct the study. In order to recruit participants for the study, a "recruitment notice" was placed on the center wall with the help of a nurse and patients who expressed their willingness to participate were recruited as subjects of the study.

The inclusion criteria were: (a) agreed to participate; (b) had been receiving hemodialysis at least 1 year; and (c) were able to read and write. The exclusion criteria were: (a) undergone hemodialysis for less than 1 year; (b) receiving hemodialysis less than three times a week or had history of kidney transplant; and (c) exhibiting cognitive or communication problems.

The data collection period was from November 24, 2016 to January 3, 2017. The participants of this study were 48 patients who were diagnosed with end-stage renal failure and received hemodialysis three times a week for more than a year. The number of subjects was calculated using the G Power 3.1 program (Faul *et al.*, 2007) and the effect size proposed by Cohen (1988); effect size 0.5, significance level (.05), power 0.90, and 22 persons were calculated for each group. Considering the dropout rate, 25 subjects were assigned to both the experimental group and the control group, but two participants included in the control group refused to participate before starting the study. Therefore, 25 patients were in the experimental group and 23 patients were in the control group. Patients receiving hemodialysis

TABLE 1   Research design

Group	Pretest	Treatment	Post-test
Experimental group	E1	X	E2
Control group	C1	A	C2

Note: E1, C1 (Pretest): self-care knowledge, self-care behavior, state anxiety, physiological index. E2, C2 (Post-test): self-care knowledge, self-care behavior, state anxiety, physiological index. X: Self-performance management video program. A: Educational pamphlets.
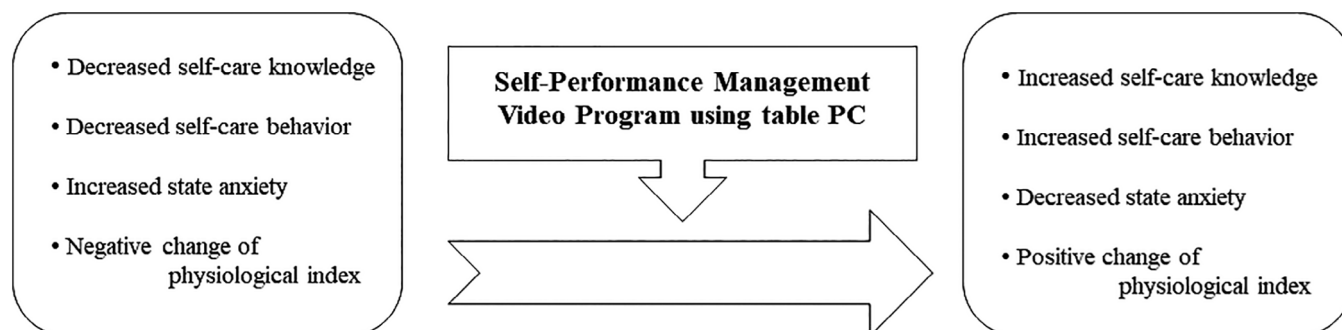

FIGURE 1   Conceptual framework of this study

on Monday, Wednesday and Friday were assigned to the experimental group and those receiving hemodialysis on the Tuesday, Saturday and Sunday were assigned to the control group to exclude the diffusion effects.

Since the program of this study began, one member of the experimental group was admitted to a general hospital due to complications and could not participate in the program for 3 weeks, and another patient moved out. Therefore, two patients from the experimental group were eliminated, and the final 46 data were analyzed (23: experimental group, 23: control group).

2.3 | Development and application of self-performance management video program using tablet PC

The program was developed and organized by the researchers of this study based on previous studies (Kim & Yoo, 2006; Suk et al., 2013), and all the contents were stored on the tablet PC, so that the patients receiving hemodialysis were self-driven

(Table 2). The program consisted of six categories (No. 1: understanding the role of kidneys and the principles of hemodialysis, No. 2: diet management, No. 3: vascular management, No. 4: medicine management, No. 5: exercise management, and No. 6: anxiety and daily management) in a 70-min video program. The developed six categories and contents were verified by experts' content validity. Experts were two nephrologists, two experienced nurses in kidney centers, and a professor of adult nursing. The content validity was measured by CVI (Content Validity Index), and only CVI values of 0.8 or more were included in the program. The contents of the program were loaded on a personal tablet PC that was placed next to the patient's bed. All patients of the experimental group were asked to complete the contents of three categories in a week. Therefore, it took 2 weeks to complete all contents of the six categories. After that, the patients were asked to repeat the 2-weeks course twice. Therefore, it took 6 weeks to complete all contents of program.

For the control group, a pamphlet printed with the video contents used for the experimental group was used as

TABLE 2 The categories and contents of self-performance management video program

No.	Categories	Contents	Methods	Time (min)	CVI
1	Understanding the role of kidneys and the principles of hemodialysis	Function and importance of kidney	PowerPoint/narration	17	0.85
		Chronic renal failure and hemodialysis			0.90
		The principle of hemodialysis			0.85
		Management of complications of hemodialysis			0.95
2	Diet management	The importance of diet management	PowerPoint/narration	12	0.95
		Potassium-restricted and phosphorus-restricted diet method			0.95
		Importance of protein and salinity limitation diet method			0.95
3	Vascular management	Review of arteriovenous fistula	PowerPoint/narration/ animation	12	0.80
		Self-management method of arteriovenous fistula			0.80
		Infection management of arteriovenous fistula			0.80
4	Medicine management	Importance of medication administration during hemodialysis	PowerPoint/narration	9	0.90
		Caution for taking blood pressure medicine			0.90
		Caution for taking diabetes medicine			0.90
5	Exercise management	How to exercise in hemodialysis	PowerPoint/narration	11	0.85
		The importance of improving muscle strength during hemodialysis			0.85
		Exercise program introduction, flexibility, strength, equilibrium improvement			0.85
6	Anxiety and daily management	Anxiety management in hemodialysis life	PowerPoint/narration/ animation	9	0.90
		Constipation management in hemodialysis life			0.80
		The importance of blood pressure and body weight management			0.90
		Hemodialysis and sexual activity			0.80

educational contents. The pamphlet was placed beside the patient's bed. The patient read the contents for 2 weeks, and then repeatedly read twice.

2.4 | Instruments

2.4.1 | Demographic and disease-related characteristics of the participants

Demographic characteristics were collected such as age, gender, religion, presence of spouse, and presence of occupation, and disease-related characteristics were collected such as duration of disease and presence of diabetes.

2.4.2 | Self-care knowledge

There were 20 questions for self-care knowledge developed by the researchers of this study. Among the existing instruments, there is no proper instrument to measure self-care knowledge of patients receiving hemodialysis. The developed instrument was tested by the content validity of the five experts. Content validity was measured by CVI, and only items with a CVI value of 0.80 or higher were included. A total of 20 items were developed on a two-point Likert scale.

The instrument for measuring knowledge was developed as a two-point Likert scale (one point: correct answer, zero point: wrong answer) since there are only correct answers and wrong answers. The contents of the instrument consisted of the role of kidneys and the principles of hemodialysis (five questions), diet management (four questions), medicine management (three questions), vascular management (four questions), exercise and daily management (four questions). The role of kidneys and the principles of hemodialysis consisted of questions about the function of the kidney, the cause of chronic renal failure, and the principles of dialysis. Diet management consisted of questions about dietary knowledge such as water, serum potassium, phosphorus, sodium, and protein. Medicine management consisted of questions about the management of medication for treatment, the medication that should be taken for health maintenance. Vascular management consisted of questions about arteriovenous fistula self-management and infection control management. Exercise and daily management consisted of questions about the importance of exercise and anxiety management. The higher the score, the higher self-care knowledge. The Kuder–Richardson 20 (KR-20) reliability (Kuder & Richardson, 1937) was used to measure the internal consistency of the developed instrumental items. The reliability was 0.91 in this study.

2.4.3 | Self-care behavior

To measure self-care behavior, the measurement tool for patients receiving hemodialysis developed by Song *et al.* (1999) was used. The tool consisted of a total of 24 questions using a five-point Likert scale, which included body management (two questions), diet management (six questions), medicine management (two questions), exercise and rest management (two questions), management of blood pressure and body weight (four questions), arteriovenous fistula management (two questions) and management of social life (two questions). Each question was measured from "hardly" as one point to "very likely" as five points; the higher the score, the higher self-care behavior. In the study of Song *et al.* Cronbach's α was .86 and it was .91 in this study.

2.4.4 | State anxiety

To measure state anxiety, the tool developed by Spielberger (1972) and adapted to and standardized in Korean by Kim and Shin (1978) was used. The tool consisted of a total of 20 questions using a four-point scale. Each question was measured from "hardly" as one point to "very likely" as four points; the higher the score, the higher state anxiety. In the study of Kim and Shin Cronbach's α was .91 and it was .93 in this study.

2.4.5 | Physiological index

Physiological index was measured by guidelines of the KDOQI (Kidney Disease Outcome Quality Initiative) (National Kidney Foundation, 2015). Specifically, five indicators were measured: potassium, phosphorus, albumin level, Kt/V and interdialytic weight gains. Kt/V was measured by the participants' BUN (blood urea nitrogen), weight and dialysis time before and after hemodialysis (Blake *et al.*, 2011), and interdialytic weight gains were obtained as the average of measurements each before and after the program.

2.5 | Data collection and ethical considerations

To take into consideration the ethical aspects of subjects, the research was carried out after obtaining approval from D University's Ethics Committee for Life Research (DUC-2015-11-001-01). The data collection period was from November 24, 2016 to January 3, 2017. After explaining the purpose, procedure, method of this study, the participants voluntarily agreed to participate in the study and were asked to sign a written consent form. Also, participants were explained about personal information protection clauses, protection of their benefits, ethical aspects of participation in the study, and there was no disadvantage for non-participation or dropout from the study.

2.6 | Data analysis

The data were analyzed SPSS version 23.0 program. The demographic and disease-related characteristics were obtained by descriptive statistics, and Chi-square and *t* test were used for homogeneity test. The *t* test and paired *t* test were used to test differences in self-care knowledge, self-care behavior, state anxiety, and physiological index.

3 | RESULTS

3.1 | Demographic and disease-related characteristics of the participants

The average age of the experimental group was 55.00 ± 9.82 years, while the control group was 53.66 ± 10.50 years. The gender was 14 males (experimental group: 8, control group:

6) and 32 females (experimental group: 15, control group: 17). The mean duration of disease was 20.95 ± 11.57 months for the experimental group and 20.95 ± 11.57 months for the control group (Table 3).

3.2 | Homogeneity test of characteristics of the participants and dependent variables

There was no difference between the characteristics of the participants and the dependent variables between the experimental group and control group. Specifically, self-care behavior was 3.05±0.21 in the experimental group and 3.09 ±0.25 in the control group, but the score of the control group was slightly higher, but not statistically significant ($t = -0.620$, $P = .538$). The state anxiety was 56.43±7.22 in the experimental group and 53.96±6.51 in the control group, but the

TABLE 3 Homogeneity test of characteristics of the participants and dependent variables (N = 46)

Variables	Experimental group (n = 23) n (%) or M ± SD	Control group (n = 23) n (%) or M ± SD	Chi-square/*t*	*P*
Age (year)	55.00 ± 9.82	53.66 ± 10.50	0.001	.635
Gender				
Male	8 (34.8)	6 (26.1)	0.411	.749
Female	15 (65.2)	17 (73.9)		
Religion				
Yes	13 (56.5)	15 (65.2)	0.365	.546
No	10 (43.5)	8 (34.8)		
Presence of spouse				
Yes	14 (60.9)	16 (69.6)	0.383	.536
No	9 (39.1)	7 (30.4)		
Presence of occupation				
Yes	14 (60.9)	12 (52.2)	0.354	.552
No	9 (39.1)	11 (47.8)		
Duration of disease (month)	20.95 ± 11.57	20.95 ± 11.57	0.247	.922
Presence of diabetes				
Yes	15 (65.2)	11 (47.8)	1.415	.234
No	8 (34.8)	12 (52.2)		
Self-care knowledge	15.09 ± 2.09	14.13 ± 2.55	1.393	.170
Self-care behavior	3.05 ± 0.21	3.09 ± 0.25	−0.620	.538
State anxiety	56.43 ± 7.22	53.96 ± 6.51	1.223	.228
Physiological index				
Potassium (mEq/L)	4.42 ± 0.34	4.43 ± 0.36	−0.168	.868
Phosphorus (mEq/L)	4.30 ± 0.26	4.32 ± 0.35	−0.226	.822
Albumin (g/dL)	3.95 ± 0.31	4.19 ± 0.58	−1.793	.080
Kt/V[a]	1.21 ± 0.05	1.20 ± 0.04	0.604	.549
Interdialytic weight gains (kg)	1.82 ± 0.51	1.82 ± 0.40	−0.042	.967

[a]K: Dialyzer clearance of urea, t: Dialysis time, V: volume of distribution of urea, approximately equal to patient's total body water.

score of the experimental group was slightly higher, but not statistically significant ($t = 1.223$, $P = .228$). There was no statistically significant difference between the experimental group and the control group in the physiological index (Table 3).

3.3 | Categories and contents of self-performance management video program with tablet PC

The six categories and contents of the self-performance management program were developed by the researchers of this study based on previous studies. The developed six categories and contents were verified by experts' content validity. The content validity of the experts was measured by the CVI value. The CVI values of all contents were measured and the range of CVI values was 0.80 to 0.95 (Table 2).

3.4 | Results of hypothesis test

3.4.1 | Hypothesis 1

The result of difference in self-care knowledge is presented in Table 4. Hypothesis 1 was not supported because the self-care knowledge of the experimental group was not significantly increased compared to the control group ($t = 1.49$, $P = .144$). However, both the experimental ($t = -5.27$, $P < .001$) and control groups ($t = -2.98$, $P = .007$) showed statistically significant increase in self-care knowledge (Table 4).

3.4.2 | Hypothesis 2

The result of difference in self-care behavior is presented in Table 4. Hypothesis 2 was not supported because the self-care behavior of the experimental group was not significantly increased compared to the control group ($t = 0.81$, $P = .421$).

TABLE 4 Effect of the self-performance management video program on dependent variables (N = 46)

Variables	Pretest M ± SD	Post-test M ± SD	t	P	Difference(post-pre) M ± SD	t	P
Self-care knowledge							
Experimental group	15.09 ± 2.09	17.22 ± 2.32	−5.27	<.001	2.13 ± 1.94	1.49	.144
Control group	14.13 ± 2.55	15.39 ± 2.31	−2.98	.007	1.26 ± 2.03		
Self-care behavior							
Experimental group	3.05 ± 0.21	3.45 ± 0.26	−8.38	<.001	0.40 ± 0.23	0.81	.421
Control group	3.09 ± 0.25	3.43 ± 0.25	−6.19	<.001	0.34 ± 0.27		
State anxiety							
Experimental group	56.43 ± 7.22	49.52 ± 5.85	5.12	<.001	−6.91 ± 6.48	−3.51	.001
Control group	53.96 ± 6.51	54.57 ± 6.72	−0.37	.718	0.61 ± 7.99		
Physiological index							
Potassium (mEq/L)							
Experimental group	4.42 ± 0.34	4.16 ± 0.20	3.61	.002	−0.26 ± 0.35	−1.00	.277
Control group	4.43 ± 0.36	4.33 ± 0.33	0.89	.385	−0.11 ± 0.58		
Phosphorus (mEq/L)							
Experimental group	4.30 ± 0.27	4.25 ± 0.28	0.55	.591	−0.04 ± 0.36	−0.86	.396
Control group	4.32 ± 0.35	4.34 ± 0.35	−1.57	.132	0.02 ± 0.08		
Albumin (g/dL)							
Experimental group	3.95 ± 0.31	4.35 ± 0.37	−5.65	<.001	0.40 ± 0.34	1.44	.158
Control group	4.19 ± 0.57	4.32 ± 0.61	−0.73	.476	0.13 ± 0.85		
Kt/V[a]							
Experimental group	1.21 ± 0.04	1.22 ± 0.05	−1.07	.295	0.01 ± 0.06	0.52	.609
Control group	1.20 ± 0.04	1.20 ± 0.04	−0.39	.697	0.04 ± 0.06		
Interdialytic weight gains (kg)							
Experimental group	1.82 ± 0.51	1.77 ± 0.46	0.46	.648	−0.05 ± 0.47	−0.87	.390
Control group	1.82 ± 0.40	1.90 ± 0.34	−0.75	.461	0.08 ± 0.53		

[a]K: Dialyzer clearance of urea, t: Dialysis time, V: Volume of distribution of urea, approximately equal to patient's total body water.

However, both the experimental ($t = -8.38$, $P < .001$) and control groups ($t = -6.19$, $P < .001$) showed statistically significant increase in self-care behavior (Table 4).

3.4.3 | Hypothesis 3

The result of difference in state anxiety is presented in Table 4. Hypothesis 3 was supported because the state anxiety of the experimental group was significantly decreased compared to the control group ($t = -3.51$, $P = .001$). In the experimental group, the state anxiety decreased significantly ($t = 5.12$, $P < .001$), but the control group showed a tendency to increase ($t = -0.37$, $P = .718$) (Table 4).

3.4.4 | Hypothesis 4

The results of difference in physiological index are presented in Table 4. Hypothesis 4 was not supported because the physiological index of the experimental group was not significantly changed compared to the control group. However, the potassium level in the experimental group was significantly decreased after the program ($t = 3.61$, $P = .002$), and the albumin level was significantly increased ($t = -5.65$, $P < .001$), but the control group showed no statistical significance (Table 4).

4 | DISCUSSION

This study was performed to verify the effects of a self-performance management video program using a tablet PC for patients receiving hemodialysis on self-care knowledge, self-care behavior, state anxiety and physiological index. The self-performance management video program developed in this study was found to be effective in reducing state anxiety. Lin *et al*. (2017) suggested that the effects of self-management programs on anxiety can be significant, as a result of a meta-analysis of the effects of self-management. Also, previous studies have claimed that anxiety is an associated factor in self-management, and anxiety is a factor that affects the quality of life of patients receiving hemodialysis (Kang *et al*., 2015). Therefore, the reduction of anxiety in patients receiving hemodialysis through a self-performance management program may contribute to the improvement in quality of life. This study indicated that the self-performance video program developed in this study was effective in reducing patients' anxiety which could be related to the video program that offers patients knowledge and consequently reduced patients' anxiety. We do recommend this program to be used in patient education.

The self-performance management video program developed in this study was found to be effective in reducing the potassium level and increasing the albumin level in the experimental group. The potassium, and protein levels in blood of patients receiving hemodialysis should be carefully controlled to prevent complications and death (Borges *et al.*, 2017; Brunelli *et al.*, 2017; Tsai *et al.*, 2016), and the program developed in this study provided statistical significance to the experimental group's potassium and protein levels. Kim *et al*. (2014) presented that the effect of the video meal education program in patients receiving hemodialysis exhibited a significant decrease in the experimental group's potassium levels. In the study of Borges *et al*. (2017), they attempted to track and manage patients receiving hemodialysis and reported that there was a significant increase in the experimental group's protein levels compared to control group. Kim, Park, and Park (2015) reported that individualized programs for patients receiving hemodialysis resulted in changes in physiological index. The self-performance program developed in this study was also applied to individual patients and positively changed potassium and albumin. However, there was no difference between the experimental and the control group in this study, and there was a positive change only in the experimental group. It may be the result of short-term application of the program, so further research is needed to verify the long-term effects of the program.

The physiological index and anxiety of patients receiving hemodialysis have an impact on the quality of life, complications, and mortality (Borges et al., 2017; Li et al., 2016). In this study, we found that positive change in anxiety and physiological index of patients receiving hemodialysis could occur not only in the existing medical staff-led program but also in self-performance management of this study. Therefore, the self-care management program developed in this study should be used actively for hemodialysis patients.

The self-care knowledge and behavior of the experimental group was not significantly increased compared to the control group. The study of Sim and Son (2012) yielded a significant increase in self-care knowledge and behavior after conducting individual education programs for kidney transplant patients. On the other hand, Lin *et al*. (2013) conducted a self-management program for patients with chronic kidney diseases but did not find an increase in self-care behavior. Differences in research results can be attributed to program differences, research tool differences, and so on. In this study, positive changes in knowledge and behavior occurred in both experimental and control groups. This means that self-management programs have a positive effect on the self-care knowledge and behavior of patients receiving hemodialysis. Therefore, we suggest the need for revalidation of this study.

The strength of this study was to develop the self-performance management video program for patients receiving hemodialysis and to check effects on physical and mental aspects such as physiological index and state anxiety. Also, the program of this study has the advantage that the patients can

access and utilize it regardless of time and place, if they want to install on their personal PC or smartphone. However, since this study is quasi-experimental research, the generalization of the research results is limited. Therefore, we suggest that clinical trial research is needed to verify more robust experimental effects.

The limitation of this study was that the self-care behavior of the patient was not measured using an observation tool but was measured by patient self-reporting. To compensate for this, efforts need to be made to maintain objective measurement of the patient's self-care behavior. When effects of the program of this study were verified, it was found to be effective in both experimental and control groups. This may be the result of different methods of providing the same self-performance management program to the experimental and control groups. Therefore, in order to compensate for this, it is necessary to provide the experimental and control groups with different program contents, and then confirm the results. In addition, this study only verified the effects of the 6-week program, and it is necessary to confirm whether there is a difference in results through an attempt to verify the long-term program effects in the future.

5 | CONCLUSION

The self-performance management video program using a tablet PC developed in this study was able to reduce anxiety and obtain positive changes in the physiological index in patients receiving hemodialysis. In addition, the program in this study had advantages that patients could apply it on their own when they want. Based on the results of this study, we suggest the development of a self-management program using virtual reality and clinical trial research related to self-management.

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CONFLICTS OF INTEREST

No conflicts of interest relevant to this article were reported.

AUTHORS' CONTRIBUTIONS

H.C. was involved in the overall research design and progress including program development, data collection and analysis. S.P. was involved in program development, research paper writing, and data analysis. All authors read and approved the final manuscript.

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