

The Effect of Education Given to Hemodialysis Patients on Independence and Self-Care: A Randomized Controlled Trial

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ABSTRACT

Objective: This randomized controlled trial aimed to determine the effects of training based on the Roper-Logan-Tierney Nursing Model on the independence levels and self-care agency of individuals receiving hemodialysis treatment in their daily living activities.

Methods: The study was conducted with 78 patients (40 in the experimental group, 38 in the control group) at a hemodialysis unit in Türkiye. The experimental group received a 6-week Roper-Logan-Tierney Nursing Model-based training program, while the control group received routine care. Data were collected using the Patient Information Form, the Modified Barthel Index, and the Self-Care Agency Scale at baseline, post-intervention, and at the 3-month follow-up.

Results: The experimental group had significantly higher Modified Barthel Index and Self-Care Agency Scale scores compared to the control group at post-intervention and follow-up ($P<.05$). Within-group comparisons revealed significant improvements in Modified Barthel Index and Self-Care Agency Scale scores from baseline to post-intervention and follow-up in the experimental group ($P<.05$). In contrast, no significant changes were observed in the control group.

Conclusion: Training based on the Roper-Logan-Tierney Nursing Model can effectively increase the independence levels and self-care agency of individuals receiving hemodialysis treatment in their daily living activities. This study highlights the importance of incorporating nursing models in patient education to promote independence and self-care among hemodialysis patients.

Keywords: Activities of Daily Living, Hemodialysis, Patient Education as Topic, Self care, Roper-Logan-Tierney Nursing Model

INTRODUCTION

Chronic diseases are long-term conditions that persist, progress gradually, and frequently result in permanent impairments. These conditions involve irreversible pathological changes, necessitating ongoing care, monitoring, and management, while affecting individuals across psychological, physical, economic, and social dimensions.¹ Chronic Renal Failure (CRF) is a significant chronic disease, characterized by its irreversible and progressive nature, affecting multiple bodily systems. Treatment modalities for CRF include dialysis and kidney transplantation. CRF affects approximately 8-16% of the global adult population.²⁻⁴ According to the Turkish Society of Nephrology, by the end of 2019, 83,783 patients in Türkiye were undergoing Renal Replacement Therapy (RRT), with hemodialysis being the predominant form (73.21%).⁵ These statistics underscore CRF as a major public health concern both in Türkiye and worldwide.⁶

Hemodialysis, the most prevalent CRF treatment, involves the removal of accumulated substances such as urea, creatinine, potassium, phosphate, and excess fluid through an external semi-permeable membrane.^{7, 8} Due to its chronic nature, individuals undergoing hemodialysis may experience significant treatment-related stressors.⁹ Consequently, hemodialysis impacts all aspects of patients' lives, including social relationships, self-esteem, mental state, physiological needs, and roles.⁴ The independence and self-care abilities of hemodialysis patients in their daily activities are influenced by biophysiological, psychological, socio-cultural, environmental, and politico-economic factors.

Nurses play a central role in encouraging self-care behaviors, supporting independence in daily activities, and facilitating patients' adaptation to long-term hemodialysis treatment.¹⁰ Nursing education and care are crucial in addressing existing or emerging issues faced by hemodialysis patients and facilitating their adaptation to life with their condition.¹¹ In this context, nurses must utilize nursing models or theories to guide individual care planning and education. The primary rationale is that nursing models and theories define and interpret the profession, providing significant benefits to nurses in their educational, practical, and research endeavors.¹²

The Roper, Logan and Tierney (RLT) nursing model, one of the most significant in the field, focuses on daily living activities. According to this model, the primary objective of care is to educate individuals to lead healthy and high-quality lives. Moreover, the RLT nursing model facilitates a holistic approach during the diagnostic stage of the healthcare process. The RLT's "life-activity based nursing model" emphasized care provision based on human attributes, recognized the importance of observations for measurable events and activities, and grounded nursing services on these principles.¹³

Hemodialysis is a life-sustaining treatment that imposes significant physical, psychological, and social challenges on patients, often leading to decreased independence in daily living activities and impaired self-care abilities.^{14,15} Previous studies have shown that educational and supportive nursing interventions can improve various outcomes in hemodialysis patients, such as treatment adherence, symptom management, and quality of life.¹⁶⁻¹⁸ However, much of the existing literature focuses on general educational programs, self-management interventions, or symptom-related training rather than structured, theory-based nursing models.¹⁶⁻²¹ Although educational interventions have demonstrated positive effects on self-care behaviors and treatment adherence in hemodialysis patients^{16, 17, 19, 22}, randomized controlled trials explicitly evaluating nursing model-based education remain limited. In particular, while the Roper-Logan-Tierney nursing model has been widely described in nursing theory¹³, studies examining its effectiveness in hemodialysis patients are scarce.

AIM

This study was conducted to address this gap by investigating the effects of RLT-based education on independence and self-care among individuals receiving hemodialysis treatment.

Research hypothesis

- **H1:** There is a significant difference in independence levels in activities of daily living between hemodialysis patients receiving RLT nursing model-based education and those receiving standard care.
- **H2:** There is a significant difference in self-care agency levels between hemodialysis patients receiving RLT nursing model-based education and those receiving standard care.

METHODS

Study design

This study employed an experimental approach utilizing a simple random method, implementing a randomized controlled two-group design with pretest and posttest evaluations. The four routine hemodialysis sessions in the unit were first listed and assigned numerical codes. An independent staff member. Two sessions were randomly allocated to the experimental group and the remaining two to the control group. This cluster-based randomization was conducted to prevent contamination between groups and to reduce selection bias. This procedure represents a cluster-based randomization at the session level (ClinicalTrials.gov ID: NCT04797234). The investigation was conducted between December 2020 and May 2021 at a public hospital hemodialysis unit in Eastern Anatolia, Türkiye, which comprises 28 hemodialysis machines serving both adult and pediatric patients.

Sample size calculation

Sample G*Power 3.1. Sample sizes were determined to ensure adequate statistical power.²³ Based on a similar study by Karasu and Aylaz²⁴, the effect size was 1.30. Calculations indicated that a total of 34 participants (17 in each group) were required to achieve a study power exceeding 95% at a 5% significance level and an effect size of 1.30. Although the power analysis indicated that a minimum of 34 participants would be sufficient, a larger sample (n=78) was recruited to account for potential attrition and clinical instability commonly observed in hemodialysis populations. Patients undergoing long-term hemodialysis frequently experience hospitalization, medical complications, or treatment discontinuation, which may result in participant loss during follow-up.¹⁶ In the context of conducting research in populations characterised by high clinical heterogeneity, methodological guidelines advocate the selection of a larger sample size. This approach is predicated on the premise that it enhances the statistical power of the analyses conducted and consequently ensures the

attainment of results that are more valid from both an ethical and scientific perspective.^{25, 26} Therefore, recruiting a larger sample was deemed necessary to preserve statistical power and enhance the robustness and generalizability of the findings.

Participants

The study population comprised 102 registered patients undergoing hemodialysis. From this cohort, 84 patients who met the inclusion criteria and consented to participate were included. Eligible patients were assigned to the experimental and control groups using simple random sampling, a probabilistic technique, across four separate sessions. Randomization was implemented to mitigate observable bias in the results between the two groups. Initially, 42 participants were assigned to each group. However, due to 4 deaths (1 in the experimental group and 3 in the control group) and 2 transfers to other hemodialysis units (1 in each group) during the study, the final sample consisted of 40 participants in the experimental group and 38 in the control group. Participant flow is presented in the CONSORT flow diagram (Figure 1).

Inclusion criteria

The study's inclusion criteria were individuals aged 18 years or older who provided informed consent to participate, had been undergoing hemodialysis three days a week for 4 hours daily for at least 1 year and continued to do so, and were free from cognitive, emotional, or mental impairments.

Randomization and prevention of contamination

Cross-contamination was prevented by assigning the experimental and control groups to different hemodialysis days and sessions. Patients in the experimental and control groups attended the unit on separate weekdays and time slots, eliminating contact during treatment sessions. In addition, group allocation was performed using simple randomization by an independent person to minimize bias.

Intervention protocol

Experimental group: After obtaining informed consent and confirming eligibility, participants completed the "Patient Information Form", "Modified Barthel Index (MBI)" and "Self-Care Agency Scale (SCAS)" as part of an initial evaluation. The experimental group subsequently participated in a 6-week training program based on the RLT nursing model. The experimental group's program was comprised of the following:

- Six weekly sessions were conducted during hemodialysis treatment,
- An initial 25-30 minute comprehensive overview of the RLT nursing model, supplemented with printed

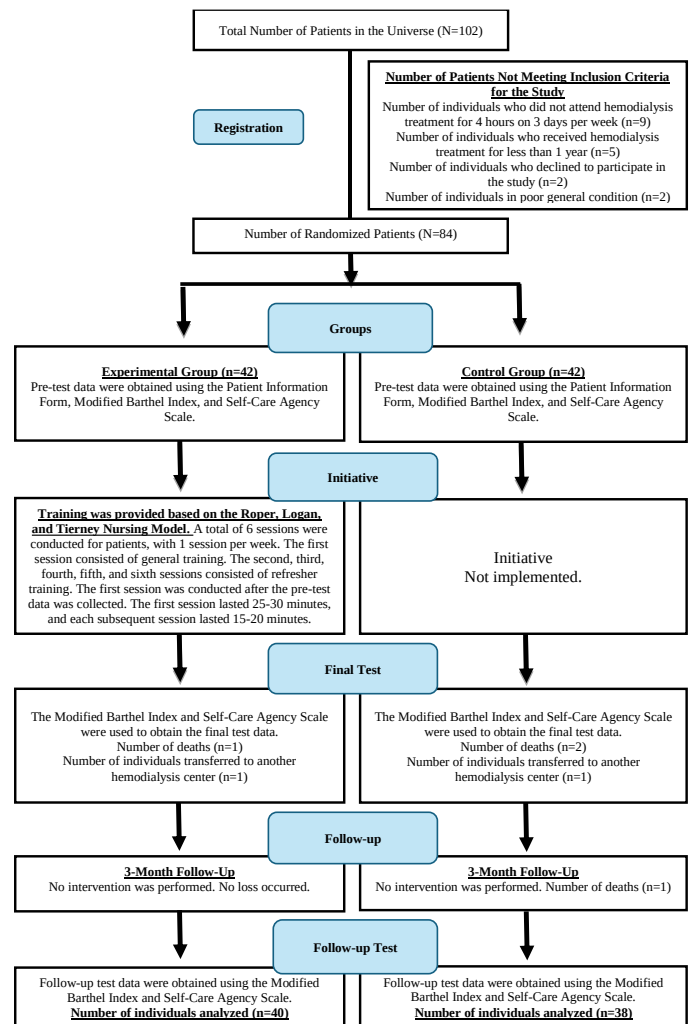


Figure 1. CONSORT flow diagram of the randomized controlled trial

and digital educational resources (including audio, video, and PDF formats),

- 15-20 minute follow-up sessions from weeks two through six,
- Individual face-to-face interviews,
- Oral presentations and discussion periods utilizing researcher-developed training materials (Table 1).

The RLT nursing model-based training program was formally implemented over 6 weeks. The content was structured basis, every week in accordance with the activities of daily living framework of the RLT nursing model. The duration of six weeks was selected to allow sufficient time for education, repetition, and behavioral adaptation, consistent with previous nursing and chronic disease self-management education programs.^{27, 28} Upon completion of the 6-week RLT nursing model-based training, the experimental group completed the MBI and SCAS as a post-test. A third assessment was performed three months later.

Table 1. Hemodialysis patient education program based on the RLT nursing model

Session	Duration of Training	Training Content
Session (1)	25-30 Minutes	• Meeting with patients • Providing printed and digital educational materials based on Roper, Logan, and Tierney's Nursing Model Patient Education Booklet for Hemodialysis Treatment Patient Education • Verbal explanation of the educational content and booklet usage • General education on hemodialysis treatment and its definition, at-risk individuals, signs and symptoms, potential effects on life, and management of problems that may arise in daily life activities
Session (2)	15-20 Minutes	• Providing refresher training on hemodialysis treatment and definition, at-risk individuals, symptoms and findings, potential effects on life, and managing problems that may arise in daily life activities.
Session (3)		
Session (4)		
Session (5)		
Session (6)		
RLT, Roper, Logan and Tierney		

Control group: For the control group:

- No intervention was implemented after the pretest.
- The participants received standard care and education in the hemodialysis unit.
- The MBI and SCAS were readministered 6 weeks after the initial meeting.
- A third evaluation was conducted three months after the post-test.
- To ensure equitable access to information, the control group participants received training booklets and digital materials following completion of the follow-up test.

Measurements

The study utilized patient information forms, MBI, and SCAS for data collection.

Modified Barthel Index (MBI): The MBI serves as a comprehensive instrument for assessing an individual's physical capabilities. Küçükdeveci et al.²⁹ conducted a Turkish validity and reliability study of MBI in individuals with stroke and spinal cord injury. The MBI total score ranges from 0 to 100; 0–20 indicates complete dependence, 21–60 indicates high dependence, 61–90 indicates moderate dependence, 91–99 indicates mild dependence, and 100 points indicate complete

independence. Cronbach alpha values were determined to be 0.93 for stroke and 0.88 for spinal cord injury.²⁹ The Cronbach's alpha value for this study is 0.93.

Self-Care Agency Scale (SCAS): The SCAS enables individuals to evaluate their self-care abilities and strengths. Nahcivan³⁰ adapted the Turkish version of the scale in 1993. During the Turkish adaptation study, eight items were removed, resulting in a 35-item scale. The SCAS is a 5-point Likert scale, with each item scored 0–4 (0 = does not describe me at all, 4 = describes me very well). In the Turkish adaptation, 8 items (3, 6, 9, 13, 19, 22, 26, and 31) are reverse-scored. The scale scores range from 0 to 140, with higher scores indicating greater self-care agency; there is no cutoff. The Cronbach alpha value for the Turkish translation of the 35-item scale is 0.92.³⁰ The Cronbach's alpha value for this study is 0.92.

Compliance with ethical standards

This research was conducted with ethical approval from the Scientific Research and Publication Ethics Committee of Muş Alparslan University (Date: 02.03.2020, Number: E.3490) and adhered to the principles stated in the Helsinki Declaration. The necessary permissions have been obtained from the relevant institution to conduct the research (Date: 30.03.2020, Number: 2661).

Statistical analysis

The research data were analyzed using IBM SPSS Statistics for Windows, version 22.0 (Statistical Package for Social Science; IBM Corp.). Numbers and percentages were used to represent categorical variables, while means and standard deviations (SD) were used for continuous variables. Various statistical methods, including t-tests, analysis of variance, chi-squared tests, Friedman tests, Cronbach's α , and kurtosis and skewness coefficients, were used to evaluate the data. Statistical significance was set at $P < .05$.

RESULTS

The study revealed that the average age of hemodialysis patients was 57.25 ± 12.96 in the experimental group and 58.68 ± 10.21 in the control group. The experimental and control groups were comparable with respect to sociodemographic and hemodialysis treatment characteristics, including age, gender, marital status, educational level, employment status, income level, duration of hemodialysis, and presence of other chronic diseases. The majority of participants in both groups were married, unemployed, and had primary or secondary education, and all received hemodialysis treatment three times per week. (Table 2). No statistically significant

Table 2. Socio-Demographic and Hemodialysis Treatment Characteristics of Individuals (N = 78)

Variables	Experimental		Control		Total		Significance	
	n	%	n	%	n	%	Test	P
Gender							$\chi^2 = 3.251$	.071
Female	25	37.5	16	42.1	37	52.3		
Male	15	62.5	22	57.9	41	47.7		
Marital status							*	1.000
Married	37	92.5	36	94.7	73	93.6		
Single	3	7.5	2	5.3	5	6.4		
Educational status							$\chi^2 = 2.118$	.347
Illiterate	15	37.5	20	52.6	35	45.1		
Primary school graduate	16	40.0	13	34.2	29	37.1		
High school graduate	9	22.5	5	13.2	14	17.8		
Work Status							$\chi^2 = 1.828$	.767
Yes	19	47.5	14	36.8	33	42.1		
No	21	52.5	24	63.2	45	57.9		
Income status							$\chi^2 = 0.149$	.928
Good	4	10.0	4	10.5	8	10.3		
Middle	25	62.5	25	65.8	50	64.1		
Bad	11	27.5	9	23.7	20	25.6		
Weekly hemodialysis number							-	-
3 times	40	100	38	100	78	100		
Hemodialysis treatment time							$\chi^2 = 1.430$	.698
1-3 years	14	35.0	17	44.7	31	39.9		
4-6 years	11	27.5	10	26.3	21	26.9		
7-9 years	6	15.0	6	15.8	12	15.4		
10 years and above	9	22.5	5	13.2	14	17.8		
Other chronic diseases							$\chi^2 = 0.905$	.341
Yes	29	72.5	31	81.6	60	77.0		
No	11	27.5	7	18.4	18	33.0		
Continuous Variables	n (Mean±SD)		n (Mean±SD)		n (Mean±SD)		Significance	
Age	40 (57.25±12.96)		38 (58.68±10.21)		78 (57.95±11.62)		t=0.541	.590

*Because of using Fisher's exact chi-square test, there is no χ^2 value; χ^2 , Chi-square; SD, Standard Deviation

differences were found between the groups at baseline ($P>.05$). Therefore, the groups were considered similar.

An examination of the study results, focusing on participants' dependence/independence status, revealed the following. In the initial MBI pre-test assessment, the mean score was 72.30±24.51, while that of the control group was 69.08±24.93, with no statistically significant difference between them ($P>.05$). Six weeks later, during the post-test evaluation, the experimental group's mean MBI score increased to 82.33±20.04. In contrast, the control group remained relatively stable at 68.76±24.59. This difference was statistically significant ($P<.05$). A follow-up test conducted three months after the post-test showed that the experimental group maintained a higher mean MBI score of 80.80±20.92, compared to the control group's 68.39±24.75, with the difference remaining statistically significant ($P<.05$). The experimental group exhibited statistically significant variations in mean MBI scores across the pre-test, post-test, and follow-up measurements ($P<.05$). Notably, the experimental group's post-test scores surpassed both their pre-test and follow-up scores, with the follow-up score also exceeding the pre-test score. In

contrast, the mean MBI scores of the control group showed no statistically significant changes throughout the study period ($P>.05$) (Table 3).

Table 3. Comparison of Modified Barthel Index Score Means (N = 78)

Scale	n	Pre-test Mean ±SD	Post-test Mean ±SD	Follow-up test Mean ±SD	Significance Test and P
MBI					
Experimental	40	72.30± 24.51	82.33± 20.04	80.80± 20.92	$\chi^2_F=66.857$ $P<.001$
Control	38	69.08± 24.93	68.76± 24.59	68.39± 24.75	$F=1.439$ $P=.244$

MBI, Modified Barthel Index; SD, Standard Deviation; χ^2_F =Friedman test; n, number of participants

An analysis of the study sample's self-care agency results revealed that in the pre-test, the experimental group exhibited a mean score of 100.20±16.06, while the control group demonstrated a score of 90.42±26.00, with no statistically significant difference observed between the groups ($P>.05$). After six weeks, the post-test indicated that the mean score increased to 115.50±12.43, whereas that of

the control group decreased to 87.50 ± 25.02 , resulting in a statistically significant difference ($P < .05$). A follow-up assessment conducted three months after the post-test indicated that the experimental group maintained a higher mean score of 113.43 ± 14.18 compared to the control group's 88.92 ± 25.10 , with the difference remaining statistically significant ($P < .05$). The experimental group exhibited statistically significant variations in the mean self-care agency scores across all three assessments ($P < .05$). Their post-test scores exceeded both pre-test and follow-up test scores, with the follow-up test scores surpassing the pre-test score. Similarly, the control group demonstrated statistically significant differences in mean scores ($P < .05$). However, their pre-test scores were higher than both their post-test and follow-up test scores, with the follow-up test score being higher than the post-test score (Table 4).

Table 4. Comparison of Self-Care Agency Mean Scores (N = 78)

Scale	n	Pre-test Mean ±SD	Post-test Mean ±SD	Follow-up test Mean ±SD	Significance Test and P
SCAS					
Experimental	40	100.20± 16.06	115.50± 12.43	113.43± 14.18	$\chi^2_F=67.532$ $P<.001$
Control	38	90.42± 26.00	87.50± 25.02	88.92± 25.10	$F= 15.768$ $P<.001$

MBI, Modified Barthel Index; SD, Standard Deviation; χ^2_F =Friedman test; n, number of participants

DISCUSSION

Individuals undergoing hemodialysis experience varying degrees of dependence on others for daily activities. Both the patient and their family must address psychological challenges alongside physical ones.³¹ In addition to addressing physiological issues, care for hemodialysis patients should incorporate social and psychological aspects into education, counseling, and guidance initiatives.^{22,31} Beyond addressing physiological needs, the present study demonstrates that education based on the RLT nursing model, which integrates social and psychological dimensions of care, significantly improved independence in daily living activities and self-care agency among hemodialysis patients. The observed increases in MBI and SCAS scores suggest that a holistic, model-based educational approach enables patients to better adapt to the physical, emotional, and social challenges of long-term hemodialysis treatment. These findings support the study's objective and highlight the value of incorporating structured nursing models into patient education to promote independence and self-care.

Hemodialysis patients can lead independent lives if they can perform daily activities without assistance.¹¹ However, long-term hemodialysis treatment requires patients to adapt to a restrictive lifestyle. Constant reliance on others and specific tools and equipment exacerbates dependency issues in patients.³¹ In this context, the present study demonstrates that education based on the RLT nursing model can mitigate dependency by supporting patients' ability to perform daily living activities independently. The observed improvement in MBI scores in the experimental group indicates that structured, model-based nursing education plays a key role in enhancing independence among hemodialysis patients.

A comparison of pre-test, post-test, and follow-up test measurements within the experimental group revealed a significant increase in post-test and follow-up test MBI mean scores compared to pre-test scores. These findings indicate that RLT-based education supports functional adaptation and sustained independence in hemodialysis patients by structuring daily living activities in a patient-centered manner.

While the use of MBI in hemodialysis patients is limited³², its widespread application across diverse patient groups supports its validity as a measure of functional independence, allowing meaningful interpretation of independence outcomes in the present study.³³⁻³⁸ Research by Altın Ertekin³³ on stroke patients and Huri³⁶ on metastatic prostate cancer patients found MBI mean scores indicating high dependence. Studies by Bayrak³² on hemodialysis patients, Koç³⁸ on stroke patients, and Hastaoğlu³⁵ on elderly individuals reported average MBI scores indicating moderate dependence. Investigations conducted by Zenginler³⁷ on patients with multiple sclerosis and Ayvat³⁴ on individuals with ataxia revealed MBI mean scores indicating slight dependence. In this study, the mean MBI score for all individuals in both the experimental and control groups indicated moderate dependence. These comparisons suggest that the functional dependence observed in hemodialysis patients is comparable to that seen in other chronic conditions, underscoring the clinical importance of interventions to improve independence in this population.

The findings of this study, demonstrating improved independence following RLT nursing model-based education, are consistent with previous research showing that structured, professionally guided interventions enhance functional outcomes across different patient populations. Supervised exercise programs, model-based nursing care, occupational therapy-based daily living activity training, and planned educational interventions

have all been associated with significant improvements in independence compared to routine care.^{33, 35-38} These parallels suggest that the positive outcomes observed in the present study are not incidental but reflect the broader effectiveness of structured and theory-based interventions in promoting independence among individuals with chronic and complex health conditions.

Consistent with these findings, the present study demonstrates that education based on the RLT nursing model leads to significant and sustained improvements in independence among hemodialysis patients. A review of the existing literature revealed no experimental studies on MBI use in patients undergoing hemodialysis. However, studies conducted in other patient groups have reported findings comparable to those observed in the present study.³³⁻³⁸

Hemodialysis treatment requires regular visits to treatment centers, which negatively impact patients' daily activities.⁴ These individuals often experience difficulties with self-care, fatigue and weakness, management of disease symptoms, adjustment to the disease, and psychological challenges. Inadequate self-care hinders adaptation to their health condition.³⁹ The findings of the present study indicate that education based on the RLT nursing model can effectively address these challenges by enhancing self-care agency and promoting greater independence in daily living activities. The significant improvements observed in the experimental group underscore the role of structured nursing education in supporting patients' adaptation to long-term hemodialysis treatment.

Comparison of pre-test, post-test, and follow-up measurements within the experimental group revealed significantly higher post-test and follow-up SCAS scores than pre-test scores. These findings suggest that RLT nursing model-based education may enhance self-care agency among hemodialysis patients in the present study.

A review of the literature reveals several studies examining SCAS use in hemodialysis patients.^{19-21,40-42} Since higher SCAS scores indicate greater self-care agency, the reported findings suggest variability in patients' self-care capacities. Research by Fırat Kılıç and Alpar²⁰ and Tüzün Özdemir and Akyol²¹, and others reported low mean SCAS scores, indicating limited self-care agency among hemodialysis patients. Studies by Kurban and Metin Akten⁴², Kalender and Tosun⁴¹ and Deveci¹⁹ found moderate mean SCAS scores, reflecting a moderate level of self-care capacity. Conversely, Durmaz Akyol and Karadakovan⁴⁰ observed high mean SCAS scores, suggesting stronger self-care

agency in their sample. In this study, moderate mean SCAS scores were observed in both the experimental and control groups. These comparisons suggest that self-care agency among hemodialysis patients may differ depending on individual and contextual factors, underscoring the importance of structured educational interventions aimed at improving self-care agency in this population.

Previous studies have demonstrated that educational interventions provided to hemodialysis patients positively affect self-care outcomes. Group-based education programs have been shown to significantly improve self-care agency and psychosocial adaptation compared to baseline measurements. Similarly, both randomized controlled and single-group experimental studies reported that structured educational interventions—whether delivered through multiple sessions or focused on specific topics such as arteriovenous fistula care—led to significant increases in self-care agency among hemodialysis patients.¹⁹⁻²¹

These findings support the effectiveness of patient education in enhancing self-care behaviors in this population. A review of the literature revealed experimental studies on the use of SCAS in hemodialysis patients. The findings of these experiments align with in this study's results.¹⁹⁻²¹

Limitations

The generalizability of the study is limited because both experimental and control groups were selected from a single center.

This study examined the effect of education based on the RLT nursing model provided to individuals undergoing hemodialysis treatment on their independence in daily living activities and self-care agency. The findings showed that the incidence of problems related to activities of daily living decreased in the experimental group, and their independence and self-care agency increased significantly over time. In contrast, no significant change was found between the pre-test, post-test, and follow-up measurements in the control group. The fact that the post-test and follow-up test scores were higher in the experimental group than in the control group indicates that the effect of model-based education is sustainable.

Based on these results, it can be said that model-based structured nursing education is an effective approach for increasing independence and self-care agency in daily living activities among hemodialysis patients. Further support for these findings through larger-scale and long-term experimental studies is recommended.

Ethics Committee Approval: Ethics committee approval was obtained from Muş Alparslan University Scientific Research and Publication Ethics Committee (Date: 02.03.2020, Number: E.3490)

Informed Consent: Written informed consent was obtained from all participants in this study.

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REFERENCES

1. Sinha K, Uddin Z, Kawsar HI, Islam S, Deen MJ, Howlader MMR. Analyzing chronic disease biomarkers using electrochemical sensors and artificial neural networks. *Trends Analyt Chem.* 2023;158:116861. <https://doi.org/10.1016/j.trac.2022.116861>
2. Wahida AZ, Rumahorbo H, Murtiningsih. The effectiveness of intradialytic exercise in ameliorating fatigue symptoms in patients with chronic kidney failure undergoing hemodialysis: A systematic literature review and meta-analysis. *J Taibah Univ Med Sci.* 2022;65:151584. <https://doi.org/10.1016/j.itumed.2022.11.004>
3. Yang J, Cho M-O, Lee H. Healthy life of Korean patients with chronic kidney failure undergoing hemodialysis: A situation-specific nursing theory. *Appl Nurs Res.* 2022;65:151584. <https://doi.org/10.1016/j.apnr.2022.151584>
4. Cho M-K, Shin G. Gender-based experiences on the survival of chronic renal failure patients under hemodialysis for more than 20 years. *Appl Nurs Res.* 2016;32:262-268. <https://doi.org/10.1016/j.apnr.2016.08.008>
5. Süleymanlar G, Ateş K, Seyahi N. *Registry of the Nephrology, Dialysis and Transplantation in Turkey.* Ankara: Published by the Turkish Society of Nephrology; 2020. <https://nefroloji.org.tr/tr/tnd-kayit-raporlari>
6. T.C. Sağlık Bakanlığı. Türkiye Böbrek Hastalıkları Önleme ve Kontrol Programı 2014-2017. Available at: <https://sbu.saglik.gov.tr/Ekutuphane/Yayin/503>. Accessed 09.04.2021, 2021.
7. Hegerty K, Jaure A, Scholes-Robertson N, et al. Australian workshops on patients' perspectives on hemodialysis and incremental start. *Kidney Int Rep.* 2022;8(3):478-488. <https://doi.org/10.1016/j.ekir.2022.11.012>
8. Htay H, Alrukhai M, Ashuntantang GE, et al. Global access of patients with kidney disease to health technologies and medications: findings from the Global Kidney Health Atlas project. *Kidney Int Suppl.* 2018;8(2):64-73. <https://doi.org/10.1016/j.kisu.2017.10.010>
9. Semaan V, Nouredine S, Farhood L. Prevalence of depression and anxiety in end-stage renal disease: A survey of patients undergoing hemodialysis. *Appl Nurs Res.* 2018;43:80-85. <https://doi.org/10.1016/j.apnr.2018.07.009>
10. Kim H, Cho M-K. Factors influencing self-care behavior and treatment adherence in hemodialysis patients. *Int J Environ Res Public Health.* 2021;18(24):12934. <https://doi.org/10.3390/ijerph182412934>
11. Yılmaz Karabulutlu E, Okanlı A. The evaluation of disease perception in hemodialysis patients. *Journal of Anatolia Nursing and Health Sciences.* 2011;14(4):25-30. <https://izlik.org/JA93HY65WD>
12. Birol L. *Hemşirelik Süreci.* 10 ed. İzmir: Akademisyen Kitabevi; 2016.
13. Roper N, Logan WW, Tierney AJ. *The Roper-Logan-Tierney Model of Nursing: Based on Activities of Living.* Edinburgh: Churchill Livingstone; 2012.
14. Rao H, Guo Y, Qiu L, Ren X. Exploring health challenges and coping strategies in young patients undergoing maintenance hemodialysis: a qualitative study. *BMC Nephrol.* 2025;26(1):378. <https://doi.org/10.1186/s12882-025-04320-y>
15. Sułkowski L, Matyja A, Matyja M. Social support and quality of life in hemodialysis patients: A comparative study with healthy controls. *Medicina.* 2024;60(11):1732. <https://doi.org/10.3390/medicina60111732>
16. Yangöz ŞT, Özer Z, Boz I. Comparison of the effect of educational and self-management interventions on adherence to treatment in hemodialysis patients: A systematic review and meta-analysis of randomized controlled trials. *Int J Clin Pract.* 2021;75(5):e13842. <https://doi.org/10.1111/ijcp.13842>
17. Tutur İ, Bicer EK. The Effect of Nurse-Led Telephone Patient Education and Counseling on Disease Management, Quality of Life, and Self-Care Behaviors in Hemodialysis Patients. *Worldviews Evid Based Nurs.* 2025;22(6):e70074. <https://doi.org/10.1111/wvn.70074>
18. Sajjadi SL, Ghafourifard M, Khosroshahi HT. The effect of individualized education on learning needs of patients undergoing hemodialysis: a randomized controlled clinical trial. *BMC Nephrol.* 2024;25(1):452. <https://doi.org/10.1186/s12882-024-03886-3>
19. Deveci G, Tel Aydın H. The Effect of Education on Hemodialysis Patients' Fatigue and Self-Care. *Journal of Nephrology Nursing.* 2022;17(1):1-9. <https://doi.org/10.47565/ndthdt.2022.48>
20. Fırat Kılıç H, Alpar ŞE. The Effect of Group Training Implemented on Hemodialysis Patients for Their Stress Management, Psychosocial Adjustment and Self-Care Strength. *Int J Hum Sci.* 2016;13(1):654-767. <https://doi.org/10.14687/ijhs.v13i1.3422>
21. Tüzün Özdemir ST, Akyol AD. Training of Hemodialysis Patients with Arteriovenous Fistulas Affect Self-Care Behaviors of Patients? *J Nephrol Nurs.* 2019;14(2):45-56. <https://izlik.org/JA67TC83WW>
22. Moattari M, Ebrahimi M, Sharifi N, Rouzbeh J. The Effect of Empowerment on The Self-Efficacy, Quality of Life and Clinical and Laboratory Indicators of Patients Treated With Hemodialysis: A Randomized Controlled Trial. *Health Qual Life Outcomes.* 2012;10(1):1-10. <https://doi.org/10.1186/1477-7525-10-115>
23. Faul F, Erdfelder E, Buchner A, Lang A-G. Statistical power

- analyses using G* Power 3.1: Tests for correlation and regression analyses. *Behav Res Methods*. 2009;41(4):1149-1160. <https://doi.org/10.3758/BRM.41.4.1149>
24. Karasu F, Aylaz R. Evaluation of meaning of life and self-care agency in nursing care given to chronic obstructive pulmonary patients according to health promotion model. *Appl Nurs Res*. 2020;51:151208. <https://doi.org/10.1016/j.apnr.2019.151208>
 25. In J, Kang H, Kim JH, et al. Tips for troublesome sample-size calculation. *Korean J Anesthesiol*. 2020;73(2):114-120. <https://doi.org/10.4097/kja.19497>
 26. Mascha EJ, Vetter TR. Significance, errors, power, and sample size: the blocking and tackling of statistics. *Anesth Analg*. 2018;126(2):691-698. <https://doi.org/10.1213/ANE.0000000000002741>
 27. Cameron-Tucker HL, Wood-Baker R, Owen C, Joseph L, Walters EH. Chronic disease self-management and exercise in COPD as pulmonary rehabilitation: a randomized controlled trial. *Int J Chron Obstruct Pulmon Dis*. 2014;513-523. <https://doi.org/10.2147/COPD.S58478>
 28. Laursen DH, Christensen KB, Christensen U, Frølich A. Assessment of short and long-term outcomes of diabetes patient education using the health education impact questionnaire (HeiQ). *BMC Res Notes*. 2017;10(1):213. <https://doi.org/10.1186/s13104-017-2536-6>
 29. Küçükdeveci AA, Yavuzer G, Tennant A, Süldür N, Sonel B, Arasil T. Adaptation of the modified Barthel Index for use in physical medicine and rehabilitation in Turkey. *Scand J Rehabil Med*. 2000;32(2):87-92. <https://europepmc.org/article/med/10853723>
 30. Nahcivan NO. A Turkish Language Equivalence of the Exercise of Self-Care Agency Scale. *West J Nurs Res*. 2004;26(7):813-824. <https://doi.org/10.1177/0193945904267599>
 31. Turgay G, Tural E, Sezer S. Evaluation of Hemodialysis Patients in Terms of Activities of Daily Living, Disability, Depression and Comorbidity. *Turk Nephrol Dial Trans J*. 2017;26(3):311-316. <https://doi.org/10.5262/tndt.2017.1003.11>
 32. Bayrak B, Özkan ÇG, Demirbag BC. The Effects of Nursing Interventions on the Level of Anxiety and Care Burden of the Caregivers of Bedridden Patients. *Niger J Clin Pract*. 2023;26(3):253-259. https://doi.org/10.4103/njcp.njcp_1352_21
 33. Altın Ertekin Ö, Gelecek N, Yıldırım Y, Akdal G. Supervised Versus Home Physiotherapy Outcomes in Stroke Patients With Unilateral Visual Neglect: A Randomized Controlled Follow-Up Study. *J Neurol Sci Turk*. 2009;26(3):325-334. <http://www.ins.dergisi.org/text.php3?id=310>
 34. Ayvat E, Kılınc M, Ayvat F, Onursal Kılınc Ö, Aksu Yıldırım S. The Effect of Whole Body Vibration on Postural Control of Ataxic Patients: a Randomized Controlled Cross-Over Study. *Cerebellum*. 2021;20(4):533-541. <https://doi.org/10.1007/s12311-021-01233-y>
 35. Hastaoglu F, Mollaoglu M. The effects of activities of daily living education on the independence and life satisfaction of elders. *Perspect Psychiatr Care*. 2022;58(4):2978-2985. <https://doi.org/10.1111/ppc.13149>
 36. Huri M, Huri E, Kayihan H. Determination of Effects of Occupational Therapy on Well-being and Mood of Individuals with Metastatic Prostate Cancer. *J Occup Therapy Rehabil*. 2015;3(2):71-78. <https://izlik.org/JA57CX52ZK>
 37. Zenginler Yazgan Y, Tarakci E, Tarakci D, Ozdinciler AR, Kurtuncu M. Comparison of the effects of two different exergaming systems on balance, functionality, fatigue, and quality of life in people with multiple sclerosis: A randomized controlled trial. *Mult Scler Relat Disord*. 2020;39:101902. <https://doi.org/10.1016/j.msard.2019.101902>
 38. Koç A, Tan M. Assessing the Efficiency of Exercises Intervention after Ischemic Stroke on Activities of Daily Living. *HealthMED*. 2012;6(5):1590-1599. <https://healthmed.ba/2012/05/01/volume-6-number-5/>
 39. Kılıç Akça N, Doğan A. Problems Experienced By Hemodialysis Patients and Their Home Care. *Bozok Med J*. 2011;1(1):15-22. <https://izlik.org/JA86ER62RL>
 40. Durmaz Akyol AD, Karadakovan A. The Investigation of Influence Factors on Self-Care Agency and Quality of Life on Hemodialysis Patients. *Ege J Med*. 2002;41(2):97-102. <https://izlik.org/JA42LU52LL>
 41. Kalender N, Tosun N. Determination of the Relationship Between Adequacy of Dialysis and Quality of Life and Self-Care Agency. *J Clin Nurs*. 2014;23(5-6):820-828. <https://doi.org/10.1111/jocn.12208>
 42. Kurban H, Metin Akten İ. Evaluating the Self-Care Ability and Quality of Life in Hemodialysis Patients. *Turk Nephrol Dial Trans J*. 2018;27(3):277-287. <https://doi.org/10.5262/tndt.2018.3229>