Validation of Basic Psychological Needs Scale in Terms of Autonomy and Competence

Yoonjung Kim [1,†], Taikyeong Jeong [2,†], *Seyong Jang [3]

1. *Department of Nursing, Changshin University, Changwon, Korea*
2. *School of Artificial Intelligence Convergence, Hallym University, Chuncheon, Korea*
3. *Department of Taekwondo, College of Arts and Physical Education, Gachon University, Seongnam, Korea*

*****Corresponding Author:** Email: naganolala@gachon.ac.kr
†The first two authors (Yoonjung Kim and Taikyeong Jeong) contributed equally to this work.
(Received 21 Jan 2023; accepted 05 Mar 2023)

Abstract

Background: Basic psychological needs affect intrinsic motivation. However, the relationship between selfcare behaviors and the basic psychological needs of patients undergoing renal dialysis has not been proven. We investigated the validity and reliability of the Basic Psychological Needs scale for patients undergoing renal dialysis.
Methods: At hospitals in Busan Metropolitan City, 120 patients with chronic renal failure receiving dialysis treatment were examined. The data were analyzed using SPSS 21.0 and AMOS 21.0 and criteria for positively affecting selfcare behaviors in these patients identified. The Basic Psychological Needs scale consists of two subfactors: autonomy and competence.
Results: The reliability of the 12 items of the scale based on Cronbach's α was 0.90; first factor autonomy was 0.90; second factor competence was 0.72; and there was homogeneity between the items.
Conclusion: Construct-, convergent-, discriminant-, criterion-related validity and internal consistency were verified. The scale was confirmed as a tool for measuring the basic psychological needs of patients undergoing renal dialysis.

Keywords: Autonomy; Basic psychological needs; Competence; Renal dialysis

Introduction

Chronic renal failure is a disease where the functioning of new parenchymal tissue gradually decreases. In Korea, there are approximately 1,000 people per million with chronic renal failure, and the number increases by 10% every year. The estimate is that 80,674 people are receiving renal dialysis treatment (1). Although the survival rate of patients with chronic renal failure has improved owing to the development of these new alternative therapies, such as renal dialysis (2), complications from this disease continue to be life-threatening. The causes of death associated with chronic renal failure include heart disease (32.5%), infection (26.8%), vascular disease (13.2%), and liver disease (2.2%) (1).

Although many patients undergoing renal dialysis are well educated, it has been reported that these patients exhibit poor selfcare. Peritoneal dialysis patients performed less selfcare than patients did in the early stages of dialysis because of long-term illnesses (3). Therefore, nursing intervention

is urgently needed to identify levels of selfcare in patients and find ways to improve selfcare.

Intrinsic motivation is the power to direct and sustain human behavior (4). Thus, such motivation can be more effective than external influences in achieving behavioral change in patients. The theory of self-determination focuses on getting individuals to take action on their own (5), the meeting of basic psychological needs, and environmental aspects that support autonomy. Self-determining behavior is induced through the synchronization of these factors (6).

Basic psychological needs are universal, natural needs of human beings and comprise three categories: autonomy, competence, and relatedness. These needs are satisfied when self-determining behaviors are triggered (7). Autonomy is the perception of directing one's own actions and having control (5). As a psychological need, it means voluntarily performing a given activity by organizing one's self and participating in an internal decision-making process (8). Autonomy has been identified as distinct from controlled intent following the introduction of the term self-determination by Deci and Ryan in 1980 (7). The belief is that competence can only be properly exerted if autonomy is guaranteed. Autonomy is the most important of the three basic psychological needs (9). A high degree of autonomy in people with obesity was found to affect weight loss (10), and a study on patients undergoing hemodialysis showed that the higher the autonomy, the more likely that continuous behavioral changes were effected and maintained (11).

A sense of competence is the perception that one's skills and abilities interact efficiently with the environment (5,12). In other words, it indicates confidence in one's ability to achieve expectations after effectively overcoming environmental factors (5). By increasing feelings of confidence and efficiency through behavior rather than by acquiring skills and abilities (9), competence promotes organization, internalization, and self-regulation of externally synchronized behavior (13). Competence also affects self-care behavior. It is shown to be a strong predictor of dietary

adjustment and drug administration in patients with hypertension and diabetes (3, 14).

Relatedness is the need to establish a positive and meaningful relationship with others. It refers to the feeling of being cared for by others and the sense of belonging to a community (9). Relatedness means being emotionally connecting after becoming involved, a sense of warmth and care, and the pursuit and development of solid relationships with others in a social context, which promotes implicit synchronization (9). Relatedness was associated with intrinsic motivation along with autonomy and competence, and that satisfaction with relationships played a more marginal role in promoting intrinsic motivation than that of autonomy or competence (9). However, the need for relatedness plays a decisive role in internalization. Individuals may not be easily influenced by the extrinsically synchronized behavior of others, although, in the context of relatedness actions, these can only begin when they are meaningful to others.

Ultimately, these basic psychological needs are influencing intrinsic motivation and healthy behaviors. A study on hemodialysis patients confirmed the relationship between autonomy and health behaviors (11). However, few studies have examined the relationship between basic psychological needs and selfcare behaviors in patients undergoing renal dialysis; specifically, hemodialysis and peritoneal dialysis.

To fill this gap in the literature, we looked to verify the validity and reliability of the Basic Psychological Needs scale developed by Deci and Ryan (5) for such patients. The scale addresses general needs satisfaction in life. It has 21 items that assess the three needs discussed above: competence, autonomy, and relatedness (5). Extensive studies have validated the use of the Basic Psychological Needs scale (BPN) for other Korean individuals. For example, in Kim's study (15), middle and high school students were targeted, and a qualitative approach was included in the scale to reflect the unique cultural characteristics of Korea. Considering this, we judged the scale inappropriate for measuring the basic psychological needs of patients undergoing renal dialysis in Korea.

Therefore, we investigated the validity and reliability of the Basic Psychological Needs scale in patients undergoing renal dialysis.

Materials and Methods

Participants

The study participants were patients in Busan Metropolitan City with chronic renal failure who were undergoing peritoneal dialysis or hemodialysis. Cho and Sung (11) selected patients with a dialysis period of 6 months or longer to investigate role behavior. Our study used this criterion as well. The inclusion criteria were as follows: (a) 20 years old or older; (b) diagnosed with chronic renal failure and undergoing dialysis for 6 months or more; (c) able to communicate, understand the questionnaire content, and answer directly; (d) understood the purpose of the study and provided written informed consent. Data were collected from 140 patients treated in two general hospitals with more than 100 beds, four hospitals with more than 30 beds, and two clinics located in Busan Metropolitan City, Korea. After excluding incomplete responses, 120 participants were analyzed. This satisfied the recommendation of including 5 to 10 times the number of tool items as the amount of data in the factor analysis, to verify construct validity (16).

Basic psychological needs

As stated above, we used the basic psychological needs questionnaire developed by Deci and Ryan (5) that includes 21 questions; seven questions regarding autonomy, six questions regarding competence, and eight questions regarding relatedness. The items in the questionnaire were measured on a seven-point Likert scale ranging from one (not at all) to seven (extremely). Higher scores indicated higher basic psychological needs. Autonomy was found to have a Cronbach's α of 0.72 among pre-hypertensive elderly patients (17) and 0.71 among hemodialysis patients (11). Competence had a Cronbach's α of 0.77 among pre-hypertensive elderly patients (17) and 0.86 among hemodialysis patients (11). Relatedness had a Cronbach's α of 0.75 among pre-hypertensive elderly patients (17) and 0.79 among hemodialysis patients (11).

Selfcare behavior

We used a measurement tool modified by Kim et al (18), based on 24 questions developed by Song (19) and 20 questions by Choi (20), to measure the degree of selfcare behavior of patients undergoing renal dialysis. Answers were measured on a five-point Likert scale ranging from one (never) to five (always). Higher scores indicated higher levels of selfcare behavior. The reliability using Cronbach's α was 0.89 for Kim et al tool (18), 0.85 for Song's (19), 0.68 for Choi's (20), and 0.77 for our study.

Data collection methods and procedures

As stated above, we visited two general hospitals, four hospitals, and two clinics. We met with the head of the nursing department to explain the purpose of the study and ask for approval. The head nurse identified patients who met the inclusion criteria. The purpose of the study was explained to the patients, their anonymity and confidentiality were assured, and written consent for participation was obtained. Individuals who could fill out the questionnaire directly completed it, and those who could not read and write completed the questionnaire through one-on-one interviews. The questionnaire was collected immediately after the responses were completed. The time required to complete the questionnaire was approximately 15 to 20 minutes. A gift of USD $7 was given for participation.

Ethical approval

This study was approved by the Institutional Review Board of Busan Paik Hospital (IRB number:2-1041024-AB-N-01-20150317-HR-179).
Written informed consent for participation was obtained from all patients. The conditions stipulated that participant data would not be used for purposes other than the study, and that participants could withdraw from the study at any time. All personal information was processed anonymously during analysis. The collected data were

stored in a cabinet with password protection and author-only access. All methods were performed in accordance with relevant guidelines and regulations.

Statistical Analysis

The collected data were analyzed utilizing SPSS/WIN 21.0 and AMOS 21.0 (IBM Corp., Armonk, NY, USA). We analyzed the following: (a) participants' characteristics, including demographic and disease-related characteristics, using frequency, percentage, mean, and standard deviation; (b) reliability to determine the internal consistency of the tool using Cronbach's α coefficient; and (c) validity using exploratory factor analysis. Before conducting the exploratory factor analysis, we determined the correlation coefficients of the correlation matrix and Bartlett's unit matrix; confirmatory factor analysis for convergent and discriminant validity, with the significance level set at $P<0.05$.

Results

Sociodemographic and disease-related characteristics

Participants' sociodemographic characteristics are listed in Table 1, and participants' disease-related characteristics are listed in Table 2.

Table 1: Sociodemographic characteristics of the participants

Characteristics	Categories	n	%
Gender	Men	74	61.7
	Women	46	38.3
Age (yr)	≤49	32	26.7
	50–59	39	32.5
	60–69	35	29.2
	≥70	14	11.7
Marital status	Single	29	24.2
	Married	72	60.0
	Divorced/Separated	8	6.7
	Widowed	11	9.2
Living with family	Yes	96	80.0
	No	24	20.0
Education	No education	1	0.8
	Elementary school	9	7.5
	Middle school	19	15.8
	High school	52	43.3
	College or higher	39	32.5
Religion	Protestant	27	22.5
	Catholic	8	6.7
	Buddhist	49	40.8
	Other	5	4.2
	None	31	25.8
Occupation	Yes	34	28.3
	No	86	71.7
Monthly income ($USD)	None	66	55.0
	≤1,000	31	25.8
	>1,000–2,000	11	9.2
	>2,000	6	5.0
Household monthly income (USD)	None	53	44.2
	≤1,000	23	19.2
	>1,000–2,000	14	11.7
	>2,000–3,000	18	15.0
	>3,000	12	10.0

Sleeping time (hours)	≤6	59	49.2
	7–8	49	40.8
	≥9	12	10.0
Drinking	Yes	22	18.3
	No	98	81.7
Smoking	Yes	14	11.7
	No	106	88.3

Table 2: Disease-related characteristics

Characteristics	*Categories*	*n*	*%*
Duration since diagnosis (years)	<3	18	15.0
	3–5	27	22.5
	6–9	18	15.0
	≥10	57	47.5
Treatment	Hemodialysis	105	87.5
	Peritoneal dialysis	15	12.5
Dialysis treatment periods (year)	<3	28	23.3
	3–5	35	29.2
	6–9	22	18.3
	≥10	35	29.2
Other diseases (number)	None	27	22.5
	One	56	46.7
	Two	32	26.7
	Three	5	4.2
Blood pressure levels	Know	116	96.7
	Don't know	4	3.3
Blood pressure control	Well	89	74.2
	Not well	31	25.8
Blood pressure management education	Received	49	40.8
	Not received (didn't have a chance)	71	59.2
Blood sugar level	Know	89	74.2
	Don't know	31	25.8
Blood sugar control	Well	102	85.0
	Not well	18	15.0
Blood sugar management education	Received	43	35.8
	Not received (didn't have a chance)	77	64.2
Medical coverage burden	Patient	21	17.5
	Family	21	17.5
	Others	78	65.0
Rare and intractable diseases medical support service	Know	95	79.2
	Don't know	25	20.8

Exploratory factor analysis

We performed exploratory factor analysis using the Kaiser-Meyer-Olkin (KMO) measure to determine how well the correlation between the items was explained by other items. The KMO measure of the BPN scale was 0.87; thus, suitable for factor analysis. Bartlett's sphericity test value was 800.45 (df=78) and the significance level was $P<0.001$. This demonstrated that there were common factors, also indicating the suitability of factor analysis. Our exploratory factor and reliability analyses determined the subfactors for validating the BPN. The correlation between the items demonstrated a total score of lower than

Available at: http://ijph.tums.ac.ir

0.40 for items 3 (I often do not feel competent), 4 (I feel that my life is being suppressed), 7 (I tend to be alone and do not have much social contact), 10 (I was able to learn interesting new skills recently), 11 (In my daily life, I often have to do what others tell me), 15 (I did not have much opportunity to show how capable I am in my life), 16 (I do not have many close friends), 18 (The people I meet regularly do not like me very much), and 20 (I do not have the opportunity to decide how to handle my daily life). Thus, these were excluded from the analysis. Ultimately, we conducted exploratory factor analysis on 12 items, with the above nine items excluded. The total explanation was 56.38%, followed by 36.85% for the first factor and 19.53% for the second factor. The first factor was autonomy, with nine items, while the second factor was competence, with three items (Table 3).

Table 3: Factor Analysis and Item Correlation of Basic Psychological Needs Scale

Item	Factor loading	
	Factor 1 Autonomy	Factor 2 Competence
14	0.82	
8	0.79	
2	0.78	
6	0.76	
21	0.71	
17	0.67	
12	0.65	
1	0.57	
9	0.54	
19		0.77
5		0.76
13		0.74
Total eigen values	4.79	2.54
% of variance	36.85	19.53
Cumulative % of variance	36.85	56.38

Verification of the reliability of the BPN scale

Cronbach's α for all 12 items on the BPN scale was 0.90. The Cronbach's α value for confirming the degree of internal consistency of each subarea was 0.90 for the first factor (autonomy, nine items) and 0.72 for the second factor (competence, three items). The homogeneity of the questions was also verified (Table 4).

Verification of convergent validity

Confirmatory factor analysis was performed on the two factors extracted from the exploratory factor analysis. The item that satisfied the condition of significance (construct reliability [CR]>1.96, *P*<0.05) with a standardized loading value of 0.50 was selected (Fig. 1). The degree of agreement of the factor structure model was x2=151.28, *P*<0.001, x2/df=2.85, goodness-of-fit-index (GFI)=0.84, normed fit index (NFI)=0.82, Turker–Lewis index (TLI)=0.84, comparative fit index (CFI)=0.87, and root mean square error of approximation (RMSEA)=0.13 (Table 5). Convergent validity was verified by meeting the rejection ratio of 5.96–9.73, average variance extracted (AVE)>0.50, and CR>0.70 (Table 5).

Table 4: Item correlation and internal consistency

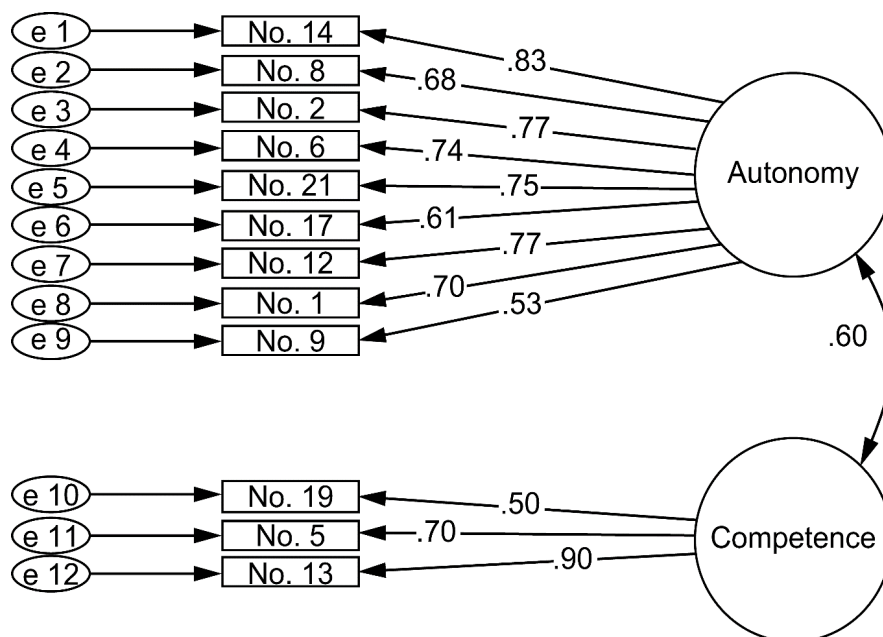| Factor	Item	Corrected item total correlation	If item deleted Cronbach's α	Total Cronbach's α
Autonomy	14	0.83	0.88	0.90
	8	0.75	0.89	
	2	0.80	0.88	
	6	0.77	0.88	
	21	0.79	0.88	
	17	0.68	0.89	
	12	0.77	0.89	
	1	0.73	0.89	
	9	0.59	0.90	
Competence	19	0.77	0.76	0.72
	5	0.80	0.62	
	13	0.84	0.53	

Fig. 1: Measurement model for confirmatory factor analysis

Table 5: Confirmatory factor analysis of basic psychological needs

Path		Unstandardized estimates	S.E.	C.R. (p)	FL	CR	AVE
Autonomy	→ No.14	1.00	-	-	0.83	0.96	0.74
	→ No.8	0.91	0.11	8.14 (<0.001)	0.68		
	→ No.2	1.01	0.11	9.61 (<0.001)	0.77		
	→ No.6	1.01	0.11	9.07 (<0.001)	0.74		
	→ No.21	0.98	0.11	9.24 (<0.001)	0.75		

	→ No.17	0.83	0.12	7.06 (<0.001)	0.61		
	→ No.12	1.06	0.11	9.73 (<0.001)	0.77		
	→ No.1	1.08	0.13	8.26 (<0.001)	0.70		
	→ No.9	0.75	0.13	5.96 (<0.001)	0.53		
Compe-tence	→ No.19	1.00	-	-	0.50	0.86	0.68
	→ No.5	1.28	0.28	4.64 (<0.001)	0.70		
	→ No.13	1.72	0.34	5.09 (<0.001)	0.90		

$x2=151.28$, df=53, x2/df=2.85, GFI=0.84, NFI=0.82, TLI=0.84, CFI=0.87, RMSEA=0.13
S.E.; Standard error, C.R.; critical ratio, FL; Factor loading, CR; construct reliability, AVE; average variance extracted, GFI; goodness-of-fit-index, NFI; normed fit index, TLI; Turker–Lewis index, CFI; comparative fit index, RMSEA; root mean square error of approximation

Verification of discriminant validity

Discriminant validity refers to the differences between latent variables. The AVE value was greater than the square of the correlation between autonomy and competence, indicating discriminant validity (Table 6).

Table 6: Correlation among constructs and average variance extracted

Variable	Autonomy	Competence
Autonomy	0.74	
Competence	0.60 (<0.001)	0.68

Verification of criterion-related validity

We examined the correlation with selfcare behavior to verify the criterion-related validity of the BPN scale. Selfcare behavior was positively correlated with autonomy (r=0.48, *P*<0.001) and competence (r=0.38, *P*<0.001).

Discussion

As stated, the basic psychological needs, such as autonomy, competence, and relatedness, are universal, natural needs and the core concepts of the theory of self-determination developed by Deci and Ryan (5). The self-determination theory emphasizes the satisfaction of these basic human psychological needs and intrinsic motivation, while motivational theory addresses the question of what triggers human behavior (5).

This theory started with research on students who had been neglected. Subsequently, it was applied to hypertension management (21), and self-management among patients with diabetes (22). Recently, it has been applied and verified in various fields, such as role behaviors in hemodialysis patients (11). To test whether the BPN scale could be used as a tool to measure the level of selfcare among patients undergoing renal dialysis, we investigated the construct-, convergent-, discriminant-, and criterion-related validity of the BPN scale.

Our exploratory factor analysis verified construct validity and confirmed the usefulness of 12 items and two factors (autonomy and competence) on the BPN scale, which differed from the composition of the scale at the time of development. We eliminated three items from the autonomy and relatedness factors: item 2 (I really like the people around me), item 6 (I get along well with the people I meet), and item 9 (I think of the people I often meet as my friends). There was also a difference in items 12 (People around me care about me) and 21 (People usually treat me kindly).

Autonomy means that an individual is directing his/her own actions based on values that are integrated with his/her interests. Autonomy began

to be discussed when Ryan and Deci (9) proposed the term self-determination in 1980; it is said to be the most essential element of the basic psychological needs. It encompasses self-control, self-regulation, and dignity. Self-control refers to the ability that involves controlling one's actions, thoughts, and emotions without external instruction or supervision, refraining from immediate satisfaction, and achieving self-regulation. It entails cognitive and behavioral factors (23). The cognitive factors are self-examination, problem-solving, planning, and evaluation ability, while behavioral factors include self-checking, self-assessment, and self-reinforcement (24). Habitual behavior is taught through self-control training (25).

Self-regulation can delay actions that impede a desired goal or purpose and support socially stable actions without utilizing external restrictions (23). Higher self-regulation abilities among elementary school students have been shown to lead to better basic lifestyle habits (26). Autonomy has been found to predict the transition to role performance in patients undergoing hemodialysis (18). Research results have shown a positive correlation between health behavior transition and autonomy in the pre-hypertensive elderly (21); in other words, people with higher autonomy have higher self-regulation abilities. Thus, autonomy can be an important factor in the transition to healthy behaviors through self-control (21). Competence included three items that were eliminated in our study, based on the exploratory factor analysis out of six items at the time of development. Competence refers to the strong internal motivational tendency to use and develop one's own abilities and motor skills. It is the opposite of lethargy. As sense of competence is similar to that of self-efficacy, which refers to the feeling or expectation that one can solve a problem by taking appropriate action in a specific situation. However, the sense of competence is the feeling of confidence and efficiency through actions rather than through acquiring skills and abilities (27). It is satisfied when one experiences an opportunity to use one's abilities or skills and talents.

Patients with type 2 diabetes were found to have better self-management behaviors and higher competence (22). Competence was also found to influence the behavior of patients undergoing hemodialysis, including their diets, use of medication, exercise habits, dialysis plans, and arteriovenous fistula management (13). The implication is that this sense of competence enables the intrinsic motivation to move past a feeling of helplessness. Moreover, those with higher competence should be able to cope with various situations with more confidence. Our confirmatory factor analysis was conducted to validate the BPN scale, and we were able to confirm the validity of the two-factor structural model extracted from our exploratory factor analysis. In addition, when considering the discriminant validity comparing the square value of the AVE and the correlation coefficient between the concepts, the discriminant validity satisfied the standard variance extraction and construct reliability criteria.

However, some limitations of our study warrant comment. First, our sample size was small; therefore, the results of the factor analysis should not be generalized. Second, in future studies, content validity and reliability could be analyzed by amending the existing concept-item relationship. However, by verifying the criterion validity compared with tools that measure basic psychological needs and selfcare behavior, we confirmed that selfcare behavior was an appropriate criterion, as the validity of both showed a statistically significant correlation.

Conclusion

We aimed to establish a basis for measuring the basic psychological needs of patients undergoing renal dialysis by verifying the reliability and validity of the BPN scale. The revised BPN scale contains two subfactors: autonomy and competence. The construct, convergent, discriminant, criterion validity, and internal consistency of the scale was verified as a tool to measure the basic psychological needs of patients undergoing renal dialysis. The results suggest that the BPN scale can be

used to develop a program to identify selfcare ability and promote selfcare behaviors in such patients.

Journalism Ethics considerations

Acknowledgements

Conflict of Interest

The author declares no conflicts of interest.

References

1. The Korean Society of Nephrology (2014). *Current Status of Kidney Replacement Therapy in Korea.* Korean Society of Nephrology, Seoul, Korea.
2. Sinnakirouchenan R, Holley JL (2011). Peritoneal dialysis versus hemodialysis: risks, benefits, and access issues. *Adv Chronic Kidney Dis,* 18(6):428–432.
3. So HS, Kim AY, Kim EA, et al (2006). Effects of a structured drug education program on knowledge and medication compliance for hemodialysis patients. *Taehan Kanho Hakhoe Chi,* 36(7):1135–1144.
4. Kim AY (2002). Validation of Taxonomy of Academic Motivation based on the Self-determination Theory. *J Korean Educ Psychol,* 16(4):169–187.
5. Deci EL, Ryan RM (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychol Inq,* 11:227–268.
6. Kim HJ. A Study of Factors Explaining Adolescents' Well-Being by Developing Parent-Adolescent Communication and Basic Psychological Needs Scales [Unpublished PhD Thesis]. Chungnam National University, Chungnam, Korea; 2010.
7. Deci EL, Ryan RM (1980). Self-determination Theory: When Mind Mediates Behavior. *J Mind Behav,* 1(1):33–43.
8. Ryan RM, Deci EL (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *Am Psychol,* 55(1):68–78.
9. Ryan RM, Deci EL (2004). *Overview of self-determination theory: An organismic-dialectical perspective. In: Handbook of Self-Determination Research.* Deci EL, Ryan RM, editors. Rochester, NY: University of Rochester Press.
10. Williams GC, Grow VM, Freedman ZR, et al (1996). Motivational predictors of weight loss and weight-loss maintenance. *J Pers Soc Psychol,* 70(1):115–126.
11. Cho YM, Sung KW (2012). The association of compliance with sick role behavior with satisfaction of basic psychological needs Among hemodialysis patients. *Korean J Health Promot,* 12(1):58–65.
12. Deci EL, Ryan RM (1985). *Intrinsic motivation and self-determination in human behavior.* Plenum Publishing Co, New York, USA.
13. Jeon SH, Shin M, Yoo MS (2011). A Study on Factors Affecting Life satisfaction and wellbeing in Youth. *Korean J Youth Stud,* 18(1):275–296.
14. Williams GC, Patrick H, Niemiec CP, et al (2009). Reducing the health risks of diabetes: how self-determination theory may help improve medication adherence and quality of life. *Diabetes Educ,* 35(3):484–492.
15. Kim MH. A Study in the Development and the Construct Validity of a Basic Psychological Need Scale base on Self-determination Theory (SDT) for Korean. [Unpublished master's thesis]. Ewha Womans University, Seoul, Korea; 2008.
16. Bryant FB, Yarnold PR (1995). *Principal-components analysis and exploratory and confirmatory factor analysis.* In: Reading and understanding multivariate statistics. Grimm, LG, Yarnold, PR, editors. Washington, DC, US: American Psychological Association.
17. Lee EH (2011). Effects of Self-Determination Theory Based Motivation-Enhanced Program on the Health Behavior Maintenance for the Elderly with Prehypertension. [Unpublished PhD thesis]. Ajou University, Suwon, Korea; 2011.

18. Kim AY, Kim SJ (2008). The effect of education program on early hemodialysis patients' knowledge, self-care practice and physiologic index. *Chonnam J Nurs Sci,* 13(1):95–109.

19. Song MR (2000). The Development and Test of Self-Efficacy Promotion Program on Self-care of Hemodialysis Patients. *J Korean Acad Nurs*, 30(4):1066–1077.

20. Choi ES. Effects of a Structured Self-Management Education Program on Knowledge, Self-Care, and Renal Function in Patients with Chronic Kidney Disease. [Unpublished master's thesis]. Kyung Hee University, Seoul, Korea; 2012.

21. Lee EH, Park JW (2012). A structural equation model on health behavior adherence for elders with prehypertension: Based on self-determination theory. *J Korean Acad Fundam Nurs,* 19(3):343–352.

22. Seo YM, Choi WH (2011). A predictive model on self-care behavior for patients with type 2 diabetes: based on self-determination theory. *J Korean Acad Nurs*, 41(4):491–499.

23. Kopp CB (1982). Antecedents of self-regulation: A developmental perspective. *Dev Psychol,* 18(2):199–214.

24. Kendall PC, Wilcox LE (1979). Self-control in children: development of a rating scale. *J Consult Clin Psychol,* 47(6):1020–1029.

25. Yun SJ. A Study on the Effect of a Self-Control Training Program for Middle School Student on Smart-Phone Addiction and Self-Control. [Unpublished master's thesis]. Keimyung University, Daegu, Seoul; 2016.

26. Woo JO . The Relation between Children's Self-Regulation Ability and Basic Life Habits. [Unpublished master's thesis]. Seoul National University of Education, Seoul, Korea; 2011.

27. Deci EL, Ryan RM (2002). *Handbook of self-determination research.* Rochester, NY: University of Rochester Press, USA.

Available at: http://ijph.tums.ac.ir