

Self-management by Hospitalized Older Adults Based on Self-regulation: a Structural Equation Model

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Abstract

Background: Based on the common-sense model of self-regulation, this study aimed to examine the process of self-management through the proposed framework of “Self-system (type D personality)” → “Cognitive illness perception,” “Emotional illness perception (Depression)” → “Coping strategies (Approach coping)” → “Illness Appraisal (Self-management),” using a structural equation model.

Methods: The study was conducted at two care hospitals with 300 or more beds located in Jeolla Province, South Korea. The participants were 287 hospitalized older adults. The data collection period was February 17–March 10, 2021. The data were analyzed using SPSS WIN 23.0 and AMOS 23.0. To investigate the overall relationships among the factors influencing self-management among participants, a hypothetical model was created based on the common-sense model of self-regulation. The fit of the model and significance of its paths were analyzed.

Results: The hypothetical model showed a good fit based on the following results: CMIN/DF(Q)=2.852, CFI=.955, TLI=.947, and RMSEA=.08. Type D personality had a significant direct effect on cognitive illness perception ($\beta=-.491, p<.001$) and depression ($\beta=.844, p<.001$). Cognitive illness perception ($\beta=.650, p<.001$) and depression ($\beta=-.433, p<.001$) had a direct effect on approach coping. Approach coping ($\beta=.326, p<.001$) had a direct effect on self-management. Notably, approach coping mediated illness perception and self-management. The explanatory power of the variables for self-management was 78.8%.

Conclusion: These findings demonstrated the following mechanism: “type D personality” → “cognitive illness perception” and “depression” → “approach coping” → “self-management,” and highlighted the potential threat of type D personalities and depression on self-management. Cognitive illness perception and approach coping both contribute toward older adults’ self-management.

Background

South Korea has become an aged society, with 16.6% of the population being over 65 years old [1]. Among older adults, 60.5% have multimorbidity [2]. The increased number of patients with multimorbidity has exacerbated problems related to medical costs, due to increased prescriptions of various drugs, increased hospital admission and readmission rates [2], and increased length of hospitalizations [3]. The reduced cognitive and physical functions accompanying health issues eventually drive older adults with multimorbidity to consider the use of long-term care hospitals as a form of social care [4]. The number of long-term care hospitals has increased nearly twofold over the past decade, from 867 in 2010 to 1,585 in 2020 [5].

Multimorbidity is a condition in which a patient has two or more major diseases [6]. The goal of nursing for hospitalized older adults with multimorbidity is to enhance patients’ health outcomes and quality of life by managing their chronic diseases [2, 7], and to help them determine their therapeutic preferences for daily life and health management [8, 9]. Self-management strategies have been shown to improve older adults’ quality of life, self-efficacy, and depression in cognitively impaired older adults in long-term care hospitals by promoting partnerships with medical staff, providing training in problem-focused coping and communication techniques, and offering goal-setting support and feedback regarding disease management [7, 10].

Self-management resets patients’ therapeutic direction from a passive to an active role and attitude toward treatment, through cooperation with medical staff to manage chronic diseases [11]. It involves patients’ understanding of their symptoms and respective treatments, devising problem resolutions, and the management of

physical, emotional, and social relationships [12]. A relevant aspect is self-regulation, which refers to patients' conscious efforts to monitor their diseases and control their cognitive, emotional, and behavioral functioning [13]. Successful self-regulation improves achievement in the learning process, improves mental health and social skills [14], enhances the quality of life [15], and reduces depressive symptoms [16].

The common-sense model of self-regulation (CSM) describes self-regulation in terms of health behaviors [17] and has served as a conceptual framework to describe self-management in adults and older adults with chronic diseases [18]. It allows coping strategies to be developed by activating cognitive and illness perceptions against risks posed by situational stimuli such as diseases or new symptomatic experiences, and subsequently enables patients to understand their health outcomes and feedback [19]. Cognitive illness perception is a subjective belief in accepting diseases or symptoms as risk; it is a key concept in self-regulation and a critical variable in interpreting disease outcomes [20]. Emotional illness perception refers to emotional reactions to illnesses, which should also be considered for older adults in long-term care hospitals as they experience loneliness and depressive feelings in the process of adapting to their new environments [21]. Cognitive and emotional illness perceptions can be revised through the feedback loop, with coping strategies as a parameter in the process of self-regulation, and can be used to develop nursing strategies to improve health outcomes [18, 20]. For self-regulation, personal preferences should be reflected, as they influence coping and disease outcomes [17]. Recently, studies have reported that being a type D personality leads to low motivation for self-management, as the inherent susceptibility to negative emotions and tendency toward social isolation pose difficulties in communicating with medical staff and sharing treatment plans. Thus, there is a need to assess and manage older adults who have type D personalities [22, 23].

Previous studies have suggested that strategies should be developed through comprehensive analyses of correlations among patients' personal preferences, subjective illness perceptions, and coping strategies, to promote self-management in older adults seeking long term care in hospitals [7, 15, 20, 24]. Nevertheless, to the best of the authors' knowledge, no study has yet investigated self-management using self-regulation for older adults in long-term care hospitals. Thus, this study aimed to develop self-management strategies for older adults in long-term care hospitals by applying and verifying the effectiveness of the CSM.

Conceptual framework and hypothetical model

The main variables in this study were selected using the CSM as the theoretical framework, and from findings from previous relevant studies. A self-system is defined as a biological factor with psychological characteristics such as personal preferences, attitudes, and motivations that influence the process of self-regulation [17]. In this study, the type D personality was selected as a self-system concept, as it negatively impacts the level of depression and self-management among patients with multimorbidity.

Illness perception is divided into cognitive and emotional illness perception. Cognitive perception allows patients to recognize disease symptoms, deduce causes, and consider disease duration, expected outcomes, and treatment possibilities. Emotional illness perception relates to patients' fear, depression, and anxiety. In this study, cognitive illness perception was measured based on disease identification, timeline, consequences, personal control, treatment control, and coherence; while emotional illness perception was measured based on depression.

Coping is a dynamic process for managing cognitive and emotional responses by activating illness perceptions [17]. In this study, approach coping was selected as a coping strategy, as it involves active coping, emotional support, information research, positive reframing, planning, and acceptance.

Appraisal is the result of active self-regulation to maintain optimal health. In this study, it was conceptualized as self-management, defined as the ability to recognize correctly the current state of disease, communicate with medical staff regarding treatment plans and collaboratively set therapeutic goals, and adequately control one's physical functions, emotional states, and social activities.

Using these variables based on the CSM and relevant research, we constructed a structural equation model aligned with the following hypothesized pathway: "Self-system (type D personality)" → "Cognitive illness perception" and "Emotional illness perception (Depression)" → "Coping strategies (Approach coping)" → "Illness Appraisal (Self-management)" (Figure 1).

Methods

Design

This was a cross-sectional, descriptive study to develop a structural model of self-management among hospitalized older adults in long-term care hospitals.

Sample

Participants were selected through convenience sampling based on certain inclusion and exclusion criteria, from two long-term care hospitals with 300 or more beds in Jeolla province, South Korea. The selected long-term care hospitals have been certified as first grade by the authorized medical institution certification agency. The study period was from February 17 to March 10, 2021. The inclusion criteria were (a) hospitalized older adults aged 65 years with no psychiatric history and the ability to communicate and respond to the questionnaire; (b) diagnosis of two or more chronic diseases for over a year [6]; and (c) hospitalization in the general ward for 6 months or more (as patients often experience maladjustment periods of 3-6 months after being admitted to these facilities) [25,26]. The exclusion criteria were (a) diagnosis with severe dementia, (b) hospitalization in dementia wards, and (c) diagnosis of only a single chronic disease.

In the structural model, the sample size was estimated via maximum likelihood, while the minimum adequate ratio between parameter estimation and the sample size was 10:1 [27]. Thus, considering the 25 unknown parameters in this study, data were collected from 300 participants to satisfy the minimum requirement of 250 participants while accounting for a potential 20% dropout rate. In the final analysis, responses from 287 participants were used, with 13 incomplete responses excluded.

Ethics approval and consent to participate

To protect the subjects, this study was conducted with the approval of the Institutional Review Board at Yonsei University (Project No. Y-2020-0221). After explaining the study purpose, patients who submitted a signed consent form were enrolled.

Data collection

Data collection was conducted by convenience sampling based on eligible recommendations from directors of each hospital. To ensure that participants clearly understood the questionnaire, the research assistants read each question aloud, and gave participants time to respond or ask questions. The research assistants were three trained nurses with a minimum of five years of clinical experience in nursing older adults at care hospitals. In a meeting a

week before data collection, the nurses were given a 30-minute training session on the study's purpose, participants, precautions, and ethical considerations, as well as about each data collection tool.

All tools in this study were used with the permission of the corresponding authors. Prior to the structural model analysis, the tools were validated through confirmatory factor analysis. They satisfied the $\geq .50$ factor loading, confirming their validity. Data for various variables were collected using the following tools:

General characteristics

General data were collected regarding age, sex, religion, marital status, educational background, length of stay, insurance type, and number and types of chronic diseases; while cognitive function was measured by the Korean version of the Mini-mental state exam, K-MMSE.

Self-management

For self-management, 12 questions from the Partnership in Health (PIH) scale [28] translated and modified in Korean [29] were used. The subcategories were coping, partnership, awareness and management of symptoms, and knowledge of disease and treatment. Each question was rated on a nine-point Likert scale, with a higher score indicating a higher level of self-management [28]. Cronbach's α for the reliability of the PIH was .86 in the Korean study [29], and .98 in this study.

Type D personality

For the type D personality, 14 questions from the type D Personality Scale-14 [22] translated and modified into Korean [30] were used. The subcategories were negative affectivity (NA, seven questions) and social inhibition (SI, seven questions). Each question was scored on a five-point Likert scale, with a higher score indicating a higher level of personal disposition [22,30]. The original Cronbach's α was .87; .88 for NA and .86 for SI [22]. In this study, Cronbach's α was .93 for both NA and SI, and .96 for the total score of the type D personality.

Cognitive illness perception

For cognitive illness perception, the Brief Illness Perception Questionnaire (Brief-IPQ) [31] was used in its Korean translation [32]. Among the nine questions constituting the Brief-IPQ, six items that measure cognitive illness perception were used in this study, which were: consequences, timeline, personal control, treatment control, identity, and coherence [31,32]. Each question was rated on a 10-point Likert scale, in which an inverse scale was used for the questions on the consequences, identity, and timeline, with higher scores indicating lower levels of perceived risk. The Cronbach's α in this study was .95 for the total score of cognitive illness perception.

Depression

For depression, the Center for Epidemiologic Studies Depression - 10 (CES-D 10) scale was used. The CES-D 10 is comprised of 10 questions rated on a five-point Likert scale, with higher scores indicating higher levels of depression. The total score ranges between 0 and 30, as inverse scoring was used for questions 5 and 8. Scores ≥ 10 indicate clinical depression [33]. Cronbach's α was .71 in the original study [34] and .92 in this study.

Approach coping

For approach coping, 12 questions from the brief-coping orientation to problems experienced (COPE) [35] in their Korean translation [36] were used. The subcategories were active coping, emotional support, use of information, positive reframing, planning, and acceptance. Questions are scored on a four-point Likert scale (0–3), with higher scores indicating higher levels of coping [35,36]. In the original study, Cronbach's α was .68 for active coping, .71 for emotional support, .64 for use of information, .64 for positive reframing, .73 for planning, and .57 for acceptance [35]. In this study, Cronbach's α was .95 for the total score of approach coping.

Data analysis

Data were analyzed using SPSS version 23.0, AMOS 23.0, and SEM. Baseline characteristics were measured using descriptive statistics, skewness, and kurtosis parameters. The fitness of the proposed model with data was measured using the chi-square/degree of freedom ratio (X^2/DF), Tucker-Lewis index (TLI), comparative fit index (CFI), and root mean squared error of approximation (RMSEA). The validity of the model was determined based on $CMIN/DF \leq 3$ [37], CFI and TLI ≥ 0.90 [38], and RMSEA ≥ 0.06 and ≤ 0.08 [39]. The direct, indirect, and total effects of the model were verified using bootstrapping with a sample size of 2,000 and a confidence level of 95% for testing statistical significance. Convergent validity, which is used to verify high correlations among measured variables constituting the potential variables, was measured using construct reliability (CR) (≥ 0.7) and average variance extracted (AVE) (≥ 0.5) [27]. Discriminant validity was measured by comparing the AVE and ρ^2 values of each construct to determine whether the former exceeded the latter [37].

Results

General characteristics

In terms of demographics, 73.2% of participants were aged more than 75 years, 73.9% were females, and 86.1% were atheists. In terms of educational and social conditions, 69.3% were elementary school graduates, and 81.15% of female participants were widows. In terms of health, most participants had been hospitalized for 18.69 ± 8.66 months; the mean number of diagnosed chronic diseases was 3.91 ± 1.29 with the most common diseases being cardiovascular diseases (40.6%), neurological disorders (17.1%), and endocrine disorders (10.8%); and 63.8% of them had health insurance. Most K-MMSE scores were 19.00 ± 1.67 , indicating mild cognitive impairment (Table 1).

Descriptive statistics, convergent validity, and discriminant validity

Table 2 presents descriptive statistics, which satisfied the skewness ($\pm 2-3$) and kurtosis ($\pm 7-10$) criteria for the normality hypothesis of data distribution [27]. All variables in this study satisfied the criteria of convergent validity to an acceptable level (≥ 0.7 CR and ≥ 0.5 AVE). Table 3 presents the discriminant validity, which satisfied that the AVE was greater than ρ^2 .

Validation of the structural model of self-management

The hypothetical model in this study showed $CMIN/DF(Q)=2.852$, CFI=.955, TLI=.947, and RMSEA=.08, hence it was determined to have a good fit. Each path coefficient for the hypothetical model in this study was tested for significance, and six out of nine paths were found to be significant. For cognitive illness perception, type D personality showed both direct and total effects ($\beta = -.491$, $p = .001$). For depression, type D personality showed both direct and total effects ($\beta = .844$, $p = .001$). For approach coping, type D personality showed an indirect effect ($\beta = -.684$, $p = .001$) and total effect ($\beta = -.591$, $p = .002$); and cognitive illness perception showed both direct and total

effects ($\beta = .650, p < .001$), as did depression ($\beta = -.433, p < .001$). For self-management, type D personality showed an indirect effect ($\beta = -.482, p = .001$) and total effect ($\beta = -.601, p = .001$) with statistical significance; cognitive illness perception showed a direct effect ($\beta = .480, p < .001$), indirect effect ($\beta = .212, p = .001$), and total effect ($\beta = .692, p < .001$) with statistical significance; and depression showed an indirect effect ($\beta = -.141, p = .001$) and total effect ($\beta = -.204, p = .011$) with statistical significance. Finally, approach coping showed a significant direct effect and total effect ($\beta = .326, p < .001$) for self-management. The explanatory power of cognitive illness perception, approach coping, type D personality, and depression was 78.8% for self-management (Figure 2, Table 4).

Discussion

The validation of the structural model demonstrates that self-management among hospitalized older adults in long-term care hospitals is influenced by, in descending order of total effects, cognitive illness perception, type D personality, approach coping, and depression. The explanatory power of these variables for self-management was 78.8%.

These results indicate that cognitive illness perception had the greatest influence on self-management in older adults in long-term care hospitals. Cognitive illness perception has a direct effect on approach coping and self-management via positive paths, as well as an indirect effect on self-management through approach coping. This aligns with the theoretical framework by explaining the influence of cognitive illness perception, combined with emotional illness perception, on disease evaluation through approach coping [17,19]. Previous studies have found that cognitive illness perception, perceptions of higher disease severity, longer disease durations, and poorer disease outcomes lead to a greater reduction in physical and social functions [15], while higher therapeutic or personal control and understanding of diseases correlate with adaptive behaviors and problem-solving coping strategies [15]. In other studies, cognitive illness perception has been found to mediate the relationship between type D personality and health behaviors [40], corroborating the results of this study. First, this suggests that cognitive illness perception may be the key variable with direct and indirect effects on self-management among older adults with a type D personality and multimorbidity.

These results also emphasize the role of type D personalities. Individuals with these personalities are known to be vulnerable to negative emotions such as anger, sorrow, fear, and instability, with a tendency to suppress their emotional and behavioral expressions [22]. In this study, 56.8% of participants had type D personalities, which was most common among those with hypertension (53%) [22] and those with coronary artery disease (36.1%) [41]. Type D personality had an indirect effect through negative correlation with self-management and cognitive illness perception; an indirect effect on approach coping through negative correlation; and a direct effect on depression through positive correlation. This result aligned with previous findings in which the type D personality negatively correlated with cognitive illness perception and health behaviors in patients with coronary artery diseases [40], and with other studies where it had an impact on depression through positive correlation [22,42]. These effects may be attributed to the fact that individuals with a type D personality show far greater negative emotions toward experiencing diseases or symptoms than others, while simultaneously facing difficulties with potentially beneficial social interactions [22]. For these individuals, social support based on group training, and assistance with coping through counseling, have been reported to positively influence disease outcomes and coping, implying a need for interest and intervention from medical staff [43].

Approach coping was found to positively correlate with self-management. However, participants' scores for approach coping were relatively low, ranging from 0 to 3, with a mean score of 1.40. This may be due to high

percentages of participants with type D personalities (56.8%) and depression (54%), both of which have been found to correlate with low levels of approach coping such as planning [42]. In the case of multimorbidity patients, coping mechanisms such as denial and avoidance has been most frequently observed [44]. Further, in this study, approach coping significantly correlated with cognitive illness perception. Previous studies have also found positive correlations between the therapeutic and personal control subcategories of cognitive illness perception, approach coping, and positive outcomes [45]. In addition, approach coping was found to mediate the effect of illness perception on disease evaluation [17]. While it is difficult to determine which coping strategy is more beneficial [17], it is crucial to be able to ascertain levels of disease adaptation and outcomes to determine how individuals accept, assess, and interpret stressful situations, and determine which resources they may apply in selecting a coping strategy [46]. To improve self-management, coping strategies should be selected based on patients' personalities and preferences.

Depression also correlated with self-management. Although it did not have a direct effect on self-management, it negatively impacted approach coping; hence it indirectly, negatively affected self-management. In a study conducted on liver transplant recipients, depression was the key variable with a direct effect on self-management [47]. In this study, the percentage of patients with clinical depression, with a score ≥ 10 out of 30, was high (54%), explaining the results and corroborating previous findings which found that hospitalized older adults commonly reported severe level of depression [21], and that patients with multimorbidity are 2.13 times likelier to report depression than others [48]. For older adults in long-term care hospitals, the level of depression increases as self-respect decreases, potentially as long-term hospitalization and unfamiliar environments separate them from familial support and comfort [21]. However, older adults with chronic diseases tend to regard depression as a physical symptom and avoid active treatment, causing medical staff to conduct comprehensive assessments for depression that addresses physical symptoms as well as psychological and environmental factors [48]. In a previous study, patients' depression symptoms, as well as self-efficacy and quality of life improved after self-regulation-based nursing interventions, such as relaying objective information about depression, early differentiation of depressive symptoms, setting short- and long-term goals to alleviate symptoms, discussions based on group activities, and monitoring and feedback activities [16]. Hence, such self-regulation-based interventions should be considered to promote self-management.

Collectively, these results highlight the need for more active intervention by medical staff, especially when patients show a type D personality. Key strategies to enhance self-management should focus on improving cognitive illness perception, reduce depression, and encourage approach coping strategies.

This study does have some limitations. First, the Brief IPQ is limited in describing cognitive illness perception among patients with multimorbidity. In a previous study, patients with multimorbidity were characterized by higher levels of emotional expression, higher treatment burdens, difficulty in prioritizing, limited cause-effect analyses, and behaviors toward diseases, as compared to patients with a single chronic disease [49]. Therefore, the influence of cognitive illness perception could not be clearly reflected from this sample. In addition, as participants were only from two hospitals in the Jeolla province, the results may not be generalizable to patients with different cultural backgrounds, regional and environmental characteristics, or other diseases. Furthermore, as the tools used in this study were first developed overseas and then translated into Korean, their cultural context should be reviewed, as it is necessary to evaluate participants' understanding of and relevance toward questionnaires. Despite these limitations, this study validated the proposed theoretical model describing self-management through a comprehensive analysis of self-systems, illness perceptions, coping strategies, and evaluation, through self-

regulation. The findings of this study are significant as the dynamic process of self-regulation has been accounted for by analyzing mediation paths, and effects of the type D personality on self-management have been identified.

Conclusion

This study was conducted to develop self-management strategies for older adults with multimorbidity in long-term care hospitals by applying and verifying the effectiveness of the CSM. Our results revealed that for nursing practice, key strategies to improve hospitalized older adults' self-management should be based on a comprehensive analysis of their personalities, cognitive and emotional illness perceptions, and coping strategies. This study found that people having type D personality are known to be vulnerable to negative emotions and social interaction, and need more social support and assistance with medical staff.

These findings could provide medical staff with new insights for self-management strategies using self-regulation, which is also linked to improvement of patient's condition and quality of nursing care. Additionally, in the recent times, the main trend of health care policy is to enable the elderly with chronic diseases to receive necessary home services while living in the local community. In this context, it is important to seek continuous self-management strategies.

Therefore, future research could develop self management programs using this study's results, and evaluate its effectiveness to promote older adults's quality of life in long-term care hospitals.

Abbreviations

AVE: average variance extracted

Brief-IPQ: Brief Illness Perception Questionnaire

CES-D: Center for Epidemiologic Studies–Depression

CFI: comparative fit index

COPE: coping orientation to problems experienced

CR: construct reliability

CSM: Common-Sense Model of self-regulation

DF: degree of freedom

K-MMSE: Korean version of the Mini-Mental State Examination

NA: negative affectivity

PIH: partnership in health

RMSEA: root mean squared error of approximation

SEM: structural equation model

SI: social inhibition

TLI: Turker-Lewis index

Declarations

Ethics approval and consent to participate: To protect the subjects, this study was conducted with the approval of the Institutional Review Board at Yonsei University Health System (Project No. Y-2020-0221). The Research Ethics Committee approved the study protocol and ruled. Our Research team carried out in accordance with relevant guideline and regulations(Declaration of Helsinki). Written informed consent of all participants was obtained before participation.

Consent for publication: Not applicable.

Availability of data and materials: The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests: The authors declare that they have no competing interests.

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Authors' contributions: SK participated in the study design, performed the survey and statistical analysis, and drafted the manuscript. MN participated in the study design and guided the revision of the manuscript. JH, HJ, and H-J contributed to the discussion and guided the revision of the manuscript. KJ contributed to the discussion statistics and guided the revision of the manuscript. All authors have read and agreed to the final submitted manuscript.

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Tables

Table 1

Descriptive statistics for general characteristics (N=287)

Characteristics	Category	n(%) or Mean±SD	Characteristics	Category	n(%) or Mean±SD
Age(years)	65~74	77 (26.8)	Education level	≤Elementary school	199 (69.3)
	≥75	210 (73.2)		≥Middle school	88 (30.7)
Sex	Male	75 (26.1)	Length of admission (months)		18.69±8.66
	Female	212 (73.9)		Type of insurance	Medicaid
Religion	Yes	40 (13.9)		Health insurance	183 (63.8)
	No	247 (86.1)	K-MMSE(Score)		19.00±1.67
Marital status	Married	49 (17.1)	Number of disease		3.91±1.29
	widowed	233 (81.2)		Type of disease	Circulatory disease
	Others	5 (1.7)		Neurologic disease	185 (17.1)
				Endocrine disease	116 (10.8)
				Musculoskeletal disease	92(8.5)
				Respiratory disease	75(7.0)
				Rheumatic disease	57(5.3)
				Others	116(10.7)

Table 2

Descriptive statistics of measured variables (N=287)

Variables	Mean	SD	Range	Skewness	Kurtosis	SE	CR	AVE
Self-management	4.99	1.34	0–8	-0.19	-1.15		0.966	0.876
Coping	5.03	1.45	0–8	-0.05	-1.18	.939		
Partnership in treatment	5.03	1.39	0–8	-0.24	-1.17	.943		
Recognition and managing Symptoms	5.01	1.43	0–8	-0.19	-1.02	.934		
Knowledge	4.81	1.35	0–8	-0.39	-1.06	.927		
Type D personality	1.81	0.81	0–4	0.38	-1.05		0.977	0.954
Negative affectivity	1.78	0.82	0–4	0.46	-0.99	.960		
Social inhibition	1.85	0.82	0–4	0.26	-1.05	.972		
Cognitive illness perception	6.45	1.69	0–10	-0.32	-0.76		0.951	0.766
Consequences	6.57	1.63	0–10	-0.63	-0.40	.853		
Timeline	6.72	1.80	0–10	-0.46	-0.53	.707		
Personal control	6.39	2.01	0–10	-0.29	-0.72	.902		
Treatment control	6.33	2.04	0–10	-0.27	-0.82	.928		
Identity	6.37	1.90	0–10	-0.24	-0.65	.907		
Coherence	6.30	1.93	0–10	-0.14	-0.93	.933		
Depression	1.17	0.60	0–3	0.70	-0.46	.945	0.921	0.796
Approach coping	1.40	0.63	0–3	0.45	-1.04		0.944	0.736
Active coping	1.47	0.65	0–3	0.28	-0.90	.887		
Emotional support	1.38	0.71	0–3	0.38	-0.35	.854		
Use of informational support	1.42	0.71	0–3	0.21	-0.76	.852		
Positive reframing	1.39	0.71	0–3	0.32	-0.54	.874		
Planning	1.28	0.79	0–3	0.47	-0.74	.866		
Acceptance	1.46	0.68	0–3	0.10	-0.79	.833		

$\chi^2(df)=510.472(179)$, $\chi^2/df=2.852$, CFI=.955, TLI=.947, RMSEA=.080

SE, standardized estimate; CR, construct reliability; AVE, average variance extracted; CFI, comparative fit index; TLI, Tucker-Lewis index; RMSEA, root mean squared error of approximation

Table 3

Discriminant Validity of Latent variables (N=287)

	TD	CIP	D	C	SM	AVE
TD	1	.241	.712	.349	.361	0.954
CIP	-.491	1	.260	.681	.706	0.766
D	.844	-.510	1	.471	.399	0.796
C	-.591	.825	-.686	1	.699	0.736
SM	-.601	.840	-.632	.836	1	0.876

Lower of diagonal= ρ , Upper of diagonal= ρ^2

TD, type D personality; CIP, cognitive illness perception; D, depression; C, approach coping; SM, self-management; AVE, Average variance Extracted

Table 4

Standardized direct, indirect, total effects of model (N=287)

Endogenous variables	Endo/ Exogenous variables	Direct effect			Indirect effect			Total effect		
		B	β	<i>p</i>	B	β	<i>p</i>	B	β	<i>p</i>
Cognitive illness perception	← Type D personality	-.872	-.491	<.001				-.872	-.491	<.001
Depression	← Type D personality	.615	.844	<.001				.615	.844	<.001
Approach Coping	← Type D personality	.068	.093	.186	-.505	-.684	.001	-.436	-.591	.002
	← Cognitive illness perception	.270	.650	<.001				.270	.650	<.001
	← Depression	-.438	-.433	<.001				-.438	-.433	<.001
Self-management	← Type D personality	-.207	-.119	.069	-.836	-.482	.001	-1.043	-.601	.001
	← Cognitive illness perception	.469	.480	<.001	.207	.212	.001	.677	.692	<.001
	← Depression	-.149	-.063	.411	-.336	-.141	.001	-.486	-.204	.011
	← Approach Coping	.768	.326	<.001				.768	.326	<.001

Figures

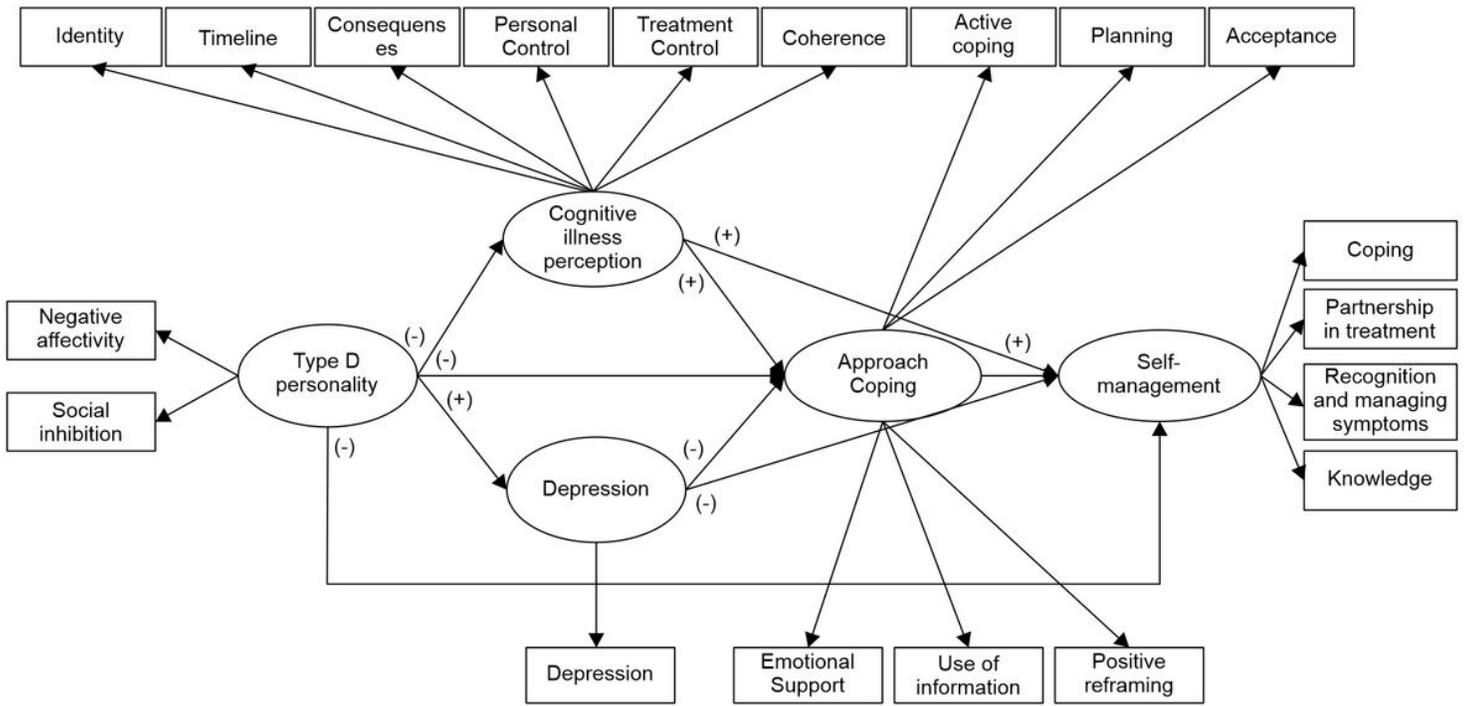


Figure 1

Hypothesized model pathway

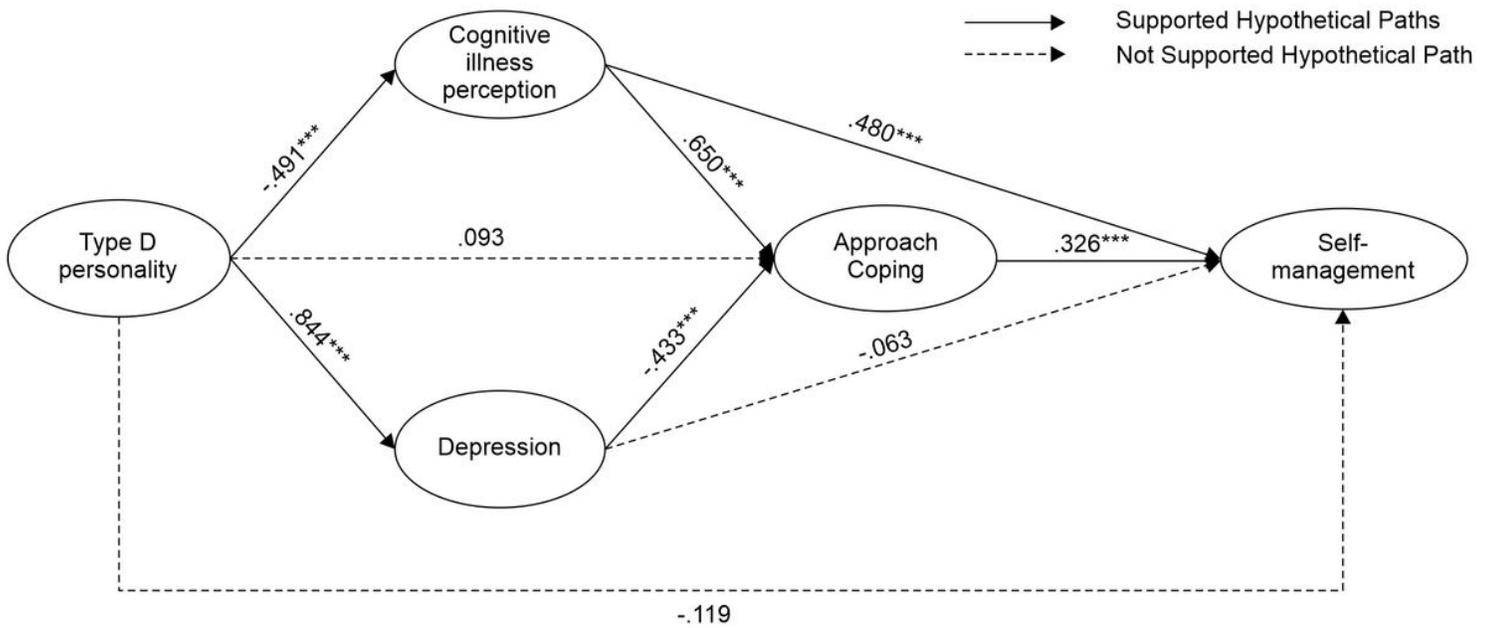


Figure 2

Final Model of This Study