Global Health & Medicine. 2025; 7(1):57-63.
BRIEF REPORT
DOI: 10.35772/ghm.2024.01090

Relationship between ego depletion and health promotion behaviors in older adults with diabetes: A cross-sectional study in Shanghai, China

Zhongying Guo[1], Li Chen[2], Jiaojiao Bai[1,*], Rui Chen[3,*], Yanyuan Zhu[1], Jingyi Zhu[1]

[1] Diabetic Foot Multidisciplinary Team Clinic, Huadong Hospital Affiliated with Fudan University, Shanghai, China;
[2] Changning District Xinhua Subdistrict Community Health Center, Shanghai, China;
[3] Yangpu District Yanji Subdistrict Community Health Center, Shanghai, China.

Abstract: In recent years, the prevalence of diabetes in the elderly has risen sharply, and diabetes and its related complications seriously affect the physical and mental health of patients. Health promotion behaviors are extremely important in preventing the onset and development of diabetes. Ego depletion is a common negative psychological experience among most patients with chronic disease, which affects their performance of health-promoting behaviors. However, the relationship between ego depletion and health-promoting behaviors in elderly patients with diabetes is unclear. We assessed the relationship between ego depletion and health-promoting behaviors in older people with diabetes, and the factors influencing health-promoting behaviors. The 751 participants had an ego depletion score of 44.55 ± 6.62 and a health-promoting behavior score of 77.61 ± 18.72, with a significant negative correlation between ego depletion and health-promoting behavior (r = -0.320, $p < 0.001$). The level of health promotion behaviors was higher in patients with a high school level of education and above ($p < 0.001$), living with a spouse and children ($p = 0.010$) and having received diabetes-related health education ($p < 0.001$), and the cognitive ($p < 0.001$), emotional ($p < 0.001$) and behavioral control dimensions of ego depletion ($p = 0.016$) were significant predictors of health promotion behaviors. Nursing staff should provide personalized care for patients with a low level education, who are living alone, and who have not received health education to prevent or respond to patient ego depletion and to improve patients' health promotion behaviors.

***Keywords*:** ego depletion, health promotion behaviors, diabetes, the elderly, influencing factors

Introduction

In recent years amidst increasing urbanization, further aging of the population, and lifestyle changes, the prevalence of diabetes mellitus (DM) and the number of people suffering from the disease have been proliferating at an alarming rate, making it another major challenge in the field of chronic diseases globally, after cancer and cardiovascular and cerebrovascular diseases (*1*). According to the global diabetes map published by the International Diabetes Federation (*2*), about 537 million adults (20-75 years old) worldwide have diabetes, accounting for 11.30% of the total. The number of older adults with diabetes ages 65 years and above is up to 136 million, accounting for 19.9%. China has the most significant number of diabetes patients, the prevalence of diabetes among the elderly (≥ 60 years old) is 30.49%, the number of patients totals 78.13 million, and the elderly have become the main population suffering from diabetes in China (*3*). The bodily functions of elderly patients decline with age, and the disease is more protracted. Long-term abnormalities of glucose metabolism and lipid metabolism increase the incidence of complications such as peripheral neuropathy, vasculopathy, and podiatry and even lead to amputation (toes) or death of the patient, causing grave harm to the patient and his/her family (*4*). Therefore, preventing and controlling the development of diabetes is imperative.

Pender *et al.* integrated nursing and behavioral medicine in the concept of health-promoting behavior, stating that health-promoting behavior is a multidimensional model of behavior that encompasses cognitive, emotional, and behavioral components and is a series of actions that an individual actively undertakes in order to maintain and promote health (*5*). Health-promoting behaviors are recognized as key to treating chronic diseases such as coronary heart disease and diabetes (*6*). At least 80% of chronic diseases, including

diabetes, can be managed through the implementation of health-promoting behaviors such as exercise adherence and medication compliance (*7,8*), and adherence to these behaviors and lifestyle changes can be effective in mitigating the progression of the disease and reducing the cost of health care (*9,10*). Studies have shown that sustaining health-promoting behaviors provides additional health benefits for people with diabetes, improves their quality of life, and reduces the risk of disability or death (*11*), and it also delays the onset of diabetes in people at high risk of diabetes and reduces the overall incidence of diabetes over 10 years (*12*).

DM is characterized by a prolonged and recurrent course, many complications, and complexity. To effectively prevent the disease, patients must engage in long-term health-promoting behaviors such as dietary control, exercise, insulin injections, and glucose-lowering medication. Baumeister *et al.* (*13*) suggested that individual self-management is embodied in self-control and that performing self-control can cause energy depletion in an organism. When this energy depletion reaches a certain amount, the individual is in a state of low control, *i.e.*, ego depletion. When patients are in a state of ego depletion, it affects the activities that they need to control themselves afterward, and they experience a decrease in their ability or willingness to control cognitive, emotional, and behavioral aspects, which can lead to barriers to the management of the patient's health (*14*). Previous studies (*15,16*) have shown that ego depletion is a common negative psychological experience for most chronic disease patients. Patients have to suffer from the pain caused by the disease as well as regulate the anxiety and depression caused by the disease, which rapidly depletes their self-control resources, resulting in patients not having sufficient self-control resources to manage their health and not being able to demonstrate better health-promoting behaviors (*17*).

Previous studies (*18,19*) have focused on ego depletion and health-promoting behaviors in diabetics, but they have focused on adult diabetics, and older diabetics have unique physiopathological characteristics due to metabolic disorders and multiorgan dysfunction. Therefore, the ego depletion and health promotion behaviors of elderly diabetics need to be determined and the health promotion behaviors of different patients and their association with ego depletion need to be explored to assist medical personnel in implementing interventions and enhancing patients' health promotion behaviors.

Patients and Methods

Study setting and participants

Patients were recruited from five community health hospitals in Shanghai, China. Inclusion criteria for elderly diabetics: *i*) age ≥ 60 years; *ii*) meeting the 2006 (WHO) diagnostic criteria for DM; *iii*) being able to communicate and voluntarily participating in this study. Patients with severe mental disorders, cognitive dysfunction, physical activity limitations due to complications or comorbidities, and severe cardiac, pulmonary, and cerebral diseases were excluded.

The study was conducted in accordance with the Declaration of Helsinki and was approved by the ethical committee of the Huadong Hospital Affiliated with Fudan University(20240065). All participants gave informed consent.

Research instruments

General information questionnaire

Demographic characteristics included sex, age, education, residence, and mean monthly income. Disease information included disease duration, diabetes health education, smoking status, and comorbidities.

Self-Regulation Fatigue Scale (SRF-S)

First developed in 2013 by Nes *et al.* (*20*), the SRF-S is mainly used to measure the degree of ego depletion of an individual and consists of a total of 18 entries in 3 dimensions, with a total scale Cronbach's alpha of 0.81. Chinese researchers (*21*) revised the scale in 2016 to consist of 16 items, which were cognitive (6 items), behavioral (5 items), and emotional (5 items). Each item was rated on a 5-point Likert scale, with the options ranging from "very poorly" to "very well," and 5 of the items were reverse-scored. The scale score ranges from 16 to 80, with a higher score indicating more significant ego depletion. This scale is reliable and valid and has been used by several researchers to study Chinese patients with chronic diseases (*22,23*). In the current study, the Cronbach's alpha for this scale was 0.747.

Type 2 Diabetes and Health Promotion Scale (T2DHPS)

Developed by Chen *et al.* (*24*) in Taiwan in 2013, the T2DHPS specifically assesses the level of health promotion behaviors among diabetics, and its reliability and validity were later re-tested by Cao *et al.* (*25*) based on a mainland population. The Cronbach's alpha for the total scale was 0.943, and the Cronbach's coefficient for the dimensions ranged from 0.819 to 0.931. The scale consists of 28 items, including 6 dimensions of exercise (7 items), risk avoidance (7 items), stress management (5 items), health responsibility (3 items), healthy eating (3 items), and life appreciation (3 items). Each entry was scored on a 5-point Likert scale, with scores of 1, 2, 3, 4, and 5 representing never (0-10%), occasionally (11-30%), about half (31-50%), often (51-80%), and always (81-100%), respectively. The total scale score was 28-140, with a higher score indicating a higher level of a patient's health-promoting behaviors. In the current study, Cronbach's alpha was 0.97, with dimension coefficients of 0.907, 0.832, 0.840, 0.894, 0.800, and

0.855, respectively.

Data collection methods

A researcher explained the purpose, significance, and content of filling out the questionnaire to the respondents and answered the patients' questions as they filled out the questionnaire to ensure that the patients understood what was being asked. If the respondent who could not answer the questionnaire by himself or herself or had a low level of education, the researcher repeated the questions one by one, filled in the questionnaire on behalf of the respondents according to their answers, and verified it again. The questionnaire was filled out anonymously and collected on the spot after completion. Eight hundred questionnaires were distributed in this study, and 751 valid questionnaires were received, with a validity rate of 93.88%.

Statistical analysis

Socio-demographic and disease variables of the study population and the main study variables (ego depletion and health-promoting behaviors) were described using descriptive statistical analysis based on the type of variables and normality assessment. One-way ANOVA, a *t*-test, and Pearson correlation analyses were used to assess the relationship between dependent and independent variables. Multiple linear stepwise regression analysis was used to analyze the predictors of health promotion behaviors among elderly diabetics. Data were analyzed using SPSS 26.0, and all statistical tests were two-tailed, with $p < 0.05$ indicating a statistically significant difference.

Results and Discussion

Characteristics of participants

A total of 751 patients were included in this study, 320 (42.61%) of whom were male, and 431 (57.39%) of whom were female; their ages ranged from 60 to 94 (69.97 ± 7.04) years; 40.6% of them had a junior high school education, 28.0% had a high school or secondary school education, and 11.3% had a college education. In addition, 47.6% of the patients lived with their spouses, 20.5% lived with their children, and a few patients (13.1%) lived alone. Other general information is shown in Table 1.

Scale means for ego depletion and health promotion behaviors

The ego depletion score for 751 patients was 44.55 ± 6.62, with the highest score of 3.12 ± 0.51 in the cognitive dimension. The health-promoting behavior score was 77.61 ± 18.72. The mean scores for the entries in each dimension were, in descending order: appreciation of life (3.20 ± 0.98), healthy eating (3.12 ± 0.92), responsibility for health (3.02 ± 0.93), stress management (2.87 ± 0.83), risk avoidance (2.63 ± 0.75), and exercise (2.40 ± 0.78) (Table 2).

Findings showed that the degree of ego depletion among elderly diabetics is at a high level, which is consistent with findings of Wang *et al.* (*18*). DM is characterized by a disease with a long duration and difficulty recovering completely, requiring patients take medications over a long period and make lifestyle changes to prevent complications. These long-term stressors constantly deplete patients' self-control resources. According to the ego depletion theory, an individual's self-regulation resources are limited. Long-term self-control, such as suppressing eating impulses and engaging in physical exercise, as well as the accompanying prolongation of disease and deterioration and the painful experience brought by the symptoms, continue to wear down the patient's self-control resources, which makes them physically and mentally exhausted (*13*). Notably, the highest score in this study was for the cognitive control dimension, meaning that older diabetics had the highest level of depletion in cognitive control. This differs from the findings of Gao *et al*. (*26*). The difference may be due to the fact that the subjects of the current study were elderly patients who have a reduced ability to understand and acquire information about the disease and deep-rooted cognitive perceptions. Implementing the process of cognitive control requires a significant number of psychological resources, which results in the highest attrition of cognitive control in patients. That said, individuals' thoughts and emotions gradually stabilized with age; they can control their emotions and behaviors better, and impulsive behaviors subsequently decrease. Therefore, healthcare professionals should pay more attention to identifying and intervening in the cognitive control depletion of elderly diabetics, helping patients to improve their misperceptions of the disease and practice health-promoting behaviors.

This study showed that the health promotion behavior score for elderly diabetics was 77.61 ± 18.72, with a score of 55.44%, which was lower than the results reported by Du *et al.* (*27*). This may be because the subjects of this study were elderly diabetics, most of whom suffer from comorbidities, who may have multifunctional disorders, and who may be taking multiple medications compared to younger patients (*28*). In elderly diabetics, disease management is more complex, leading to a decrease in tolerance and self-care awareness, which in turn results in a low level of health-promoting behaviors among patients. A point worth noting is that elderly diabetics in this study had the lowest scores on the risk avoidance dimension, which disagreed with the findings of Du *et al.* (*27*). A single item analysis revealed that the possible reason

Table 1. Impact of different characteristics on health promotion behaviors of older adults with DM

Variables	*n* (%)	Mean ± SD	F/t	*p*
Age			6.294	0.002
60-70	471 (62.7)	79.14 ± 18.41		
71-80	221 (29.4)	76.21 ± 19.36		
> 80	59 (7.9)	70.61 ± 18.72		
Sex			1.939	0.164
Male	320 (42.6)	76.51 ± 18.17		
Women	432 (57.4)	78.43 ± 19.10		
Level of education			20.575	< 0.001
Primary school and below	151 (20.1)	70.53 ± 19.13		
Junior high school	305 (40.6)	76.35 ± 16.72		
High school or Junior college	210 (28.0)	79.96 ± 17.55		
College and above	85 (11.3)	88.91 ± 21.42		
Monthly income (RMB)			6.052	< 0.001
< 3,000	53 (7.1)	78.57 ± 16.27		
3,000-5,999	121 (16.1)	74.69 ± 18.63		
6,000-8,999	357 (47.5)	75.83 ± 18.71		
≥ 9,000	220 (29.3)	81.89 ± 18.69		
Residential status			6.410	< 0.001
Live alone	99 (13.1)	74.27 ± 22.37		
With a spouse	358 (47.6)	79.37 ± 17.54		
With children	154 (20.5)	73.05 ± 20.25		
With children and spouse	140 (18.6)	80.51 ± 15.77		
Smoking			0.924	0.337
Smoking	128 (17.0)	76.16 ± 17.90		
Never	623 (87.0)	77.91 ± 18.88		
Course of the disease (years)			2.569	0.037
≤ 1	38 (5.1)	76.18 ± 21.57		
1-5	232 (30.9)	80.68 ± 17.64		
6-10	268 (35.7)	76.37 ± 17.88		
11-20	131 (17.4)	76.53 ± 19.36		
≥ 20	82 (10.9)	74.22 ± 21.10		
Health education on diabetes			10.611	< 0.001
Yes	569 (75.8)	78.86 ± 18.82		
No	182 (24.2)	73.70 ± 17.90		
Comorbidities			4.018	0.018
No	242 (32.2)	79.53 ± 18.45		
1-2	363 (48.3)	77.78 ± 18.40		
≥ 3	146 (19.5)	74.01 ± 19.55		

Table 2. Distribution of mean scores for patients' ego depletion and health promotion behaviors

Variables	Domain Mean ± SD	Item Mean ± SD	Rank
Ego depletion, total	44.55 ± 6.62		
Cognitive control	18.75 ± 3.05	3.12 ± 0.51	1
Emotional control	13.64 ± 2.50	2.72 ± 0.50	2
Behavioral control	12.16 ± 3.36	2.43 ± 0.67	3
Health-promoting behaviors, total	77.61 ± 18.72		
Risk aversion	18.44 ± 5.22	2.63 ± 0.75	5
Movement	16.82 ± 5.49	2.40 ± 0.78	6
Stress management	14.34 ± 4.17	2.87 ± 0.83	4
Life appreciation	9.60 ± 2.94	3.20 ± 0.98	1
Healthy eating	9.37 ± 2.77	3.12 ± 0.92	2
Health responsibility	9.05 ± 2.78	3.02 ± 0.93	3

for this was that most of the patients in this study were not well-educated, had a reduced ability to understand and perceive the information about the disease and its associated complications, and were not aware of the importance of foot care and healthy eating. The exercise dimension scores were similarly low in the current study, which is consistent with the findings of Hernandez *et al.* (*29*). This may be related to the poor understanding of exercise among older patients, who believe that doing housework, farming, and casual activities are all that is required to maintain regular exercise. In elderly patients, physiological functions gradually decline, and physical activity is also limited due to long-term illness, fear of falling, and other psychological factors. Given this situation, how to provide appropriate exercise guidance to elderly diabetics and devise an exercise plan that meets the needs of the patients has become the focus of instructing them on how to improve their health promotion behaviors.

Factors influencing health promotion behaviors in elderly patients with DM

Results showed that age, level of education, monthly income, residential status, diabetes health education, and

number of comorbidities were factors influencing the health promotion behaviors of elderly diabetics, and the difference was significant ($p < 0.05$), as shown in Table 1.

Pearson's correlation coefficient analysis showed that scores on the SRF-S were negatively correlated with scores on the T2DHPS in elderly diabetics (r = -0.320, $p < 0.001$), with the cognitive dimension being the most significant variable (r = -0.415, $p < 0.001$). Correlations between behavior and exercise (r = 0.071, p = 0.052), risk aversion (r = 0.053, p = 0.143), stress management (r = -0.051, p = 0.162) and health behavior (r = -0.04, p = 0.278) were not significant, but the correlations between the remaining variables were negative (r = -0.415 to -0.118, $p < 0.001$) (Table 3).

Pearson's correlation analysis showed that ego depletion was negatively correlated with health promotion behaviors and all dimensions, which means that when patients' level of ego depletion increases, their health promotion behaviors decrease (*19*). This may be related to the fact that the higher the patient's degree of ego depletion, the more his or her psychological resources or energy are depleted. However, the individual's resources or energy are limited, and once they are not replenished promptly, the patient's subsequent control behaviors will be biased or even fail. They will be prone to engage in behaviors detrimental to their health (*17*). Therefore, healthcare professionals should promptly assess the degree of ego depletion in elderly diabetics, provide patients with strategies to cope with ego depletion, help patients establish a correct knowledge of the disease, reduce patients' ego depletion, and improve patients' health-promoting behaviors.

Multiple linear stepwise regression analyses incorporated significant variables for differences in health promotion behaviors among older people with diabetes in both univariate and correlational analyses, and all variance inflation factors were close to 1 and less than 10, indicating no multicollinearity in the data. As shown in Table 4, level of education, living with a spouse and children, having received diabetes health education, and behavioral dimensions were positive predictors of health promotion behaviors; cognitive and emotional dimensions were negative predictors of health promotion behaviors, explaining 25.0% of the total variance (F = 35.668, $p < 0.001$).

The current results indicated that level of education, residential status, and diabetes health education independently influenced the health promotion behaviors of elderly diabetics. This is consistent with a previous study (*30*), which stated that the higher the level of education of the patients, the higher the level of their health promotion behaviors. People with a high level of education perceive a greater need to be healthy and will use more ways to acquire knowledge related to health behaviors; at the same time, people with a high level of education perceive a greater need to accept and understand, and they are more apt to adopt positive coping styles to establish health behaviors, which is more conducive to the performance of health behaviors by the patients (*31*). The current results showed that patients who lived with their children and spouses exhibited better health promotion behaviors compared to patients who lived alone. A meta-analysis (*32*) showed that patients living alone, lacking the companionship and care of their loved ones, are more likely to experience self-abandonment, depression, and other psychological aspects, which in turn affects their performance of health-promoting behaviors while patients living with their spouses and children are able to receive more support in terms of life, emotional, and economic aspects. This

Table 3. Correlations between ego depletion and health promotion behaviors

Variables	Ego depletion	Cognitive	Emotion	Behavior
Health-promoting behaviors	-0.320*	-0.415*	-0.04	-0.286*
Risk aversion	-0.187*	-0.371*	0.071	-0.139*
Movement	-0.180*	-0.313*	0.053	-0.166*
Stress management	-0.329*	-0.424*	-0.051	-0.284*
Life appreciation	-0.405*	-0.387*	-0.161*	-0.384*
Healthy eating	-0.224*	-0.190*	-0.118*	-0.204*
Health responsibility	-0.300*	-0.243*	-0.143*	-0.307*

*$p < 0.001$.

Table 4. Multiple linear stepwise regression analysis of factors influencing health promotion behaviors in elderly patients with DM

Variables	B	SE	β	t	p	R^2
constant	124.667	4.626		26.951	< 0.001	25.0
Level of education (ref. Primary school and below)						
High school and junior college	3.241	1.405	0.078	2.307	0.021	
College and above	7.608	1.922	0.129	3.958	< 0.001	
Residential status (ref. Living alone)						
Living with a spouse and children	3.988	1.538	0.083	2.593	0.010	
Diabetes health education						
Yes	4.870	1.398	0.112	3.484	< 0.001	
Ego depletion						
Cognitive control	-1.838	0.231	-0.299	-7.967	< 0.001	
Emotional control	-1.528	0.360	-0.204	-4.243	< 0.001	
Behavioral control	0.590	0.245	0.106	2.406	0.016	

facilitates the management of their condition, promotes patients' independent learning of relevant knowledge, and improves the level of patients' health-promoting behaviors (*33*). In addition, the current study showed that health promotion behaviors were higher in patients who had received diabetes health education than in those who had not. This finding may be related to the patient's basic knowledge of diabetes, as lack of knowledge about the disease often leads to a blind response to the disease, and the more patients know about diabetes-related complications, the more they will pay more attention to self-health management and practice health-promoting behaviors (*34*). Given this, healthcare professionals should provide diabetes health education and support to every patient (*35*).

Multiple linear stepwise regression analyses showed that cognitive control, behavioral control, and emotional control of ego depletion were significant predictors of health-promoting behaviors. Cognitive control and emotional control were negative predictors of health promotion behaviors, which was similar to the findings of a previous study (*36*), which showed that negative emotions and abnormal cognitions caused by an imbalance of ego depletion in elderly diabetics reduced the patients' subjective initiative to practice health promotion behaviors. This had a detrimental effect on health promotion behaviors.

This study had several limitations. It was conducted only in community hospitals in Shanghai, with limited sample representativeness, and future studies could be expanded to conduct related surveys in other regions. In addition, this study only used a cross-sectional research methodology, which is less able to establish causality, and further research could be conducted using longitudinal or qualitative studies.

In conclusion, this study explored the factors influencing health promotion behavior and the relationship between ego depletion and health promotion behavior. Level of education, residential status, and diabetes health education were the individual-level factors influencing health promotion behaviors among older adults with DM. Results suggested that healthcare personnel should pay more attention to the health promotion behaviors of patients with a low level of education, who are living alone, and who have not received diabetes health education. In addition, ego depletion is prevalent and is a significant predictor of health promotion behaviors among elderly patients with diabetes. Healthcare personnel should provide personalized care to prevent or cope with patients' ego depletion and enhance their health promotion behaviors.

Acknowledgements

The authors would like to thank all of the participants involved in this study.

Funding: This work was supported by a grant from the 2023 Fudan University-Fosun Nursing Research Fund Project (FNF202301).

Conflict of Interest: The authors have no conflicts of interest to disclose.

References

1. Balakumar P, Maung-U K, Jagadeesh G. Prevalence and prevention of cardiovascular disease and diabetes mellitus. Pharmacol Res. 2016; 113:600-609.
2. Sun H, Saeedi P, Karuranga S, *et al.* IDF Diabetes Atlas: Global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045. Diabetes Res Clin Pract. 2022; 183:109119.
3. Li Y, Teng D, Shi X, *et al.* Prevalence of diabetes recorded in mainland China using 2018 diagnostic criteria from the American Diabetes Association: National cross sectional study. BMJ. 2020; 369:m997.
4. American Diabetes Association. Introduction: Standards of medical care in diabetes-2022. Diabetes Care. 2022; 45:S1-S2.
5. Walker SN, Sechrist KR, Pender NJ. The health-promoting lifestyle profile: Development and psychometric characteristics. Nurs Res. 1987; 36:76-81.
6. Schaper NC, van Netten JJ, Apelqvist J, Bus SA, Fitridge R, Game F, Monteiro-Soares M, Senneville E; IWGDF Editorial Board. Practical guidelines on the prevention and management of diabetes-related foot disease (IWGDF 2023 update). Diabetes Metab Res Rev. 2024; 40:e3657.
7. Khuwaja AK, Khawaja S, Motwani K, Khoja AA, Azam LS, Fatmi Z, Ali BS, Kadir MM. Preventable lifestyle risk factors for non-communicable diseases in the Pakistan Adolescents Schools Study 1 (PASS-1). J Prev Med Pub Health. 2011; 44:210-217.
8. Zhang M, Guo L, Namassevayam G, Wei M, Xie YY, Guo YL, Liu YJ. Factors associated with health behaviours among stroke survivors: A mixed-methods study using COM-B model. J Clin Nurs. 2024; 33:2138-2152.
9. Bezo BH, Huang YT, Lin CC. Factors influencing self-management behaviours among patients with type 2 diabetes mellitus in the Solomon Islands. J Clin Nurs. 2020; 29:852-862.
10. Nerat T, Locatelli I, Kos M. Type 2 diabetes: Cost-effectiveness of medication adherence and lifestyle interventions. Patient Prefer Adherence. 2016; 10:2039-2049.
11. Blonde L, Umpierrez GE, Reddy SS, *et al.* American Association of Clinical Endocrinology Clinical Practice Guideline: Developing a diabetes mellitus comprehensive care pland – 2022 update. Endocr Pract. 2022; 28:923-1049.
12. Zou D, Zhang Z, Ji L. Consensus of Chinese experts on the remission of type 2 diabetes mellitus. Chin Gen Practice. 2021; 24:4037-4048. (in Chinese)
13. Baumeister RF, Bratslavsky E, Muraven M, Tice DM. Ego depletion: Is the active self a limited resource? J Pers Soc Psychol. 1998; 74:1252-1265.
14. Baumeister RF, Gailliot M, DeWall CN, Oaten M. Self-regulation and personality: How interventions increase regulatory success, and how depletion moderates the effects of traits on behavior. J Pers. 2006; 74:1773-1801.

15. Nes LS, Carlson CR, Crofford LJ, de Leeuw R, Segerstrom SC. Self-regulatory deficits in fibromyalgia and temporomandibular disorders. Pain. 2010; 151:37-44.
16. Solberg Nes L, Ehlers SL, Patten CA, Gastineau DA. Self-regulatory fatigue in hematologic malignancies: Impact on quality of life, coping, and adherence to medical recommendations. Int J Behav Med. 2013; 20:13-21.
17. Solberg Nes L, Ehlers SL, Patten CA, Gastineau DA. Self-regulatory fatigue, quality of life, health behaviors, and coping in patients with hematologic malignancies. Ann Behav Med. 2014; 48:411-423.
18. Wang M, Li D, Gu M, Fan CC, Cao JL, Cai FL, Wang DD. Mediating effect of mindfulness and self-control On the relationship between ego-depletion and health promotion among diabetic patients. J Nursing Sci. 2019; 34:26-28, 63. (in Chinese)
19. Wang X, Zhang F, Ge Y, Ding Y, Liu T. The associations between social support, self-regulatory fatigue, and health-promoting behaviors among people with type 2 diabetes mellitus: A cross-sectional survey. Front Public Health. 2023; 11:1281065.
20. Nes LS, Ehlers SL, Whipple MO, Vincent A. Self-regulatory fatigue in chronic multisymptom illnesses: scale development, fatigue, and self-control. J Pain Res. 2013; 6:181-188.
21. Wang LG, Zhang JY, Wang J, Tao T, Fan CL, Gao WB. Validity and reliability of the Chinese version of the Self-Regulatory Fatigue Scale in young adults. Chin Mental Health J. 2015; 29:290-294. (in Chinese)
22. Li X, Gao Q, Sun L, Gao W. Effect of self-control on health promotion behavior in patients with coronary heart disease: Mediating effect of ego-depletion. Psychol Health Med. 2022; 27:1268-1276.
23. Zeng H, Zhao L, Zhang C, Fan Y, Luo W, Zhou J. Analysis of influencing factors and pathway of self-regulatory fatigue in maintenance hemodialysis patients. Chin J Nursing. 2024; 59:156-164. (in Chinese)
24. Chen CP, Peng YS, Weng HH, Fan JY, Guo SE, Yen HY, Tseng YF, Chen MY. Development and preliminary testing of a brief screening measure of healthy lifestyle for diabetes patients. Int J Nurs Stud. 2013; 50:90-99.
25. Cao W, Sun Y, Chen M, Guo C, Zheng J. Reliability and validity of Type 2 Diabetes and Health Promotion Scale among type 2 diabetes patients in China. Chin J Public Health. 2016; 32:1510-1512. (in Chinese)
26. Gao Y, Shan Y, Jiang T, Cai L, Zhang FL, Jiang XX, Li X, Wang H. Dietary adherence, self-regulatory fatigue and trait self-control among Chinese patients with peritoneal dialysis: A cross-sectional study. Patient Prefer Adherence. 2021; 15:443-451.
27. Du Y, Li R, Tian Y, Liu P, Zhang N, Sun Z. Ego depletion status and its impact on health promotion in patients with type 2 diabetes mellitus. Occupation Health. 2019; 35:798-801, 805. (in Chinese)
28. American Diabetes Association. Older Adults. Diabetes Care. 2014; 38:S67-S69.
29. Hernandez-Tejada MA, Campbell JA, Walker RJ, Smalls BL, Davis KS, Egede LE. Diabetes empowerment, medication adherence and self-care behaviors in adults with type 2 diabetes. Diabetes Technol Ther. 2012; 14:630-634.
30. Kim SH, Lee SY, Kim CW, Suh YJ, Hong S, Ahn SH, Seo DH, Nam MS, Chon S, Woo JT, Baik SH, Park YS, Lee KW, Kim YS; KNDP Study Group. Impact of socioeconomic status on health behaviors, metabolic control, and chronic complications in type 2 diabetes mellitus. Diabetes Metab J. 2018; 42:380-393.
31. Mogre V, Abanga ZO, Tzelepis F, Johnson NA, Paul C. Adherence to and factors associated with self-care behaviours in type 2 diabetes patients in Ghana. BMC Endocr Disord. 2017; 17:20.
32. Luo X, Liu T, Yuan X, Ge S, Yang J, Li C, Sun W. Factors influencing self-management in Chinese adults with type 2 diabetes: A systematic review and meta-analysis. Int J Environ Res Public Health. 2015; 12:11304-11327.
33. Cho D, Park CL. Barriers to physical activity and healthy diet among breast cancer survivors: A multilevel perspective. Eur J Cancer Care (Engl). 2018; 27:10.1111/ecc.12772.
34. Wang H, Zhang ZZ, Sun YM, Li W, Zhang WH. Self-management behaviors and its influencing factors among mid-aged adult patients with type 2 diabetes in a suburb of Beijing. Nursing J Chin PLA. 2020; 37:15-19. (in Chinese)
35. Powers MA, Bardsley J, Cypress M, Duker P, Funnell MM, Fischl AH, Maryniuk MD, Siminerio L, Vivian E. Diabetes self-management education and support in type 2 diabetes: A joint position statement of the American Diabetes Association, the American Association of Diabetes Educators, and the Academy of Nutrition and Dietetics. Clin Diabetes. 2016; 34:70-80.
36. Zhou Y, Shan Y, Li Y, Du LP, Jiang TT, Cai L, GaoYJ, Jiang XX. Impact of self-regulatory fatigue on activation level among peritoneal dialysis patients. J Nursing Sci. 2020; 35:34-36. (in Chinese)

Received December 10, 2024; Revised January 26, 2025; Accepted February 3, 2025.

Released online in J-STAGE as advance publication February 7, 2025.

Address correspondence to:
Jiaojiao Bai, Diabetic Foot Multidisciplinary Team Clinic, Huadong Hospital Affiliated with Fudan University, 221 West Yan'an Road, Jing'an District, Shanghai 200040, China.
E-mail: bjj163163@163.com

Dr Rui Chen, Yangpu District Yanji Subdistrict Community Health Center, 383 Shuifeng Road, Yangpu District, Shanghai 200093, China.
E-mail: 2307976188@qq.com