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Self-Regulatory Fatigue in Chronic Disease Self-Management: A Narrative Review of Assessment, Associations, and Potential Interventions

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Abstract: Self-regulatory fatigue may contribute to difficulties in sustaining self-management among patients with chronic diseases. This narrative review summarizes its conceptual development and assessment, examines its relationship with self-management, and reviews potential interventions. Current evidence suggests that self-regulatory fatigue is associated with poorer self-management and may serve as a process variable linking psychological, social, and disease-related factors with self-management behaviors. Available assessment instruments differ in their conceptual focus and target populations. The Self-Regulatory Fatigue Scale most directly assesses this construct, whereas other instruments primarily assess related aspects of ego depletion, including its state, sources, and consequences. Potential interventions include psychological and social resource support, physical activity and self-regulation training, and digitally supported multicomponent approaches. However, direct intervention evidence remains limited, and current observational studies do not establish temporal or causal relationships. Future research should improve disease-specific assessment, clarify longitudinal relationships, identify potential pathways within appropriate theoretical frameworks, and evaluate targeted interventions through rigorous randomized controlled trials.

Keywords: Ego depletion; Health behavior; Psychological resources; Patient engagement; Treatment adherence; Digital health

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1. Introduction

Chronic diseases require patients to perform ongoing self-management activities. These activities include medication adherence, symptom monitoring, dietary modification, physical activity, and psychosocial adjustment. Such behaviors are important for maintaining health and preventing complications. However, sustaining them over time requires continuous cognitive, emotional, and behavioral regulation. Repeated

self-regulatory demands may gradually reduce an individual's capacity or willingness to sustain goal pursuit. This phenomenon is commonly described as self-regulatory fatigue [1]. In patients with chronic diseases, self-regulatory fatigue may present as difficulty maintaining treatment adherence, reduced motivation for health behaviors, impaired emotional regulation, and withdrawal from disease management activities [2]. An increasing number of studies have examined self-regulatory fatigue in different chronic disease populations. However, the available evidence remains fragmented. Differences exist across disease groups, measurement instruments, and intervention approaches. Therefore, this narrative review summarizes the conceptual development and assessment of self-regulatory fatigue. It also synthesizes current evidence on its relationship with chronic disease self-management and reviews nursing and behavioral strategies that may help reduce self-regulatory fatigue.

2. Overview of self-regulatory fatigue

Self-regulatory fatigue originates from ego depletion theory and is an important concept for explaining declines in functioning during sustained self-control. In 1998, Baumeister et al. systematically proposed this theory and suggested that self-control relies on limited psychological resources [3]. Sustained or intensive self-regulation may deplete these resources, resulting in reduced cognitive, emotional, and behavioral control. In 2010, Hagger et al. provided empirical evidence for the effects of psychological resource depletion and further proposed the strength–energy model [4]. According to this model, self-control relies on a limited and general psychological resource that can be depleted during self-control activities, potentially leading to failures in self-regulation. This resource may recover through rest and may be strengthened through sustained training.

As ego depletion theory developed, its application gradually expanded to the field of chronic disease. In 2013, Nes et al. introduced the concept of self-regulatory fatigue into chronic disease research [5]. Patients with chronic diseases must continuously cope with physical discomfort, emotional regulation, and behavioral control during ongoing disease management. These demands may consume psychological resources and increase susceptibility to fatigue. In 2016, Evans et al. further explored the underlying mechanisms of ego depletion [6]. They proposed that ego depletion cannot be attributed to a single physiological or psychological factor. Instead, it may reflect the dynamic allocation of resources by the central nervous system through the integration of physiological signals and psychological motivation. In 2024, Baumeister et al. further developed the original limited resource model by emphasizing resource conservation [7]. They proposed that individuals may reduce subsequent effort after energy expenditure to preserve remaining resources. This process may involve physiological energy systems, including glucose, and may also extend to executive functions such as decision-making and planning.

Currently, self-regulatory fatigue in chronic disease research generally refers to a reduction in an individual's capacity or willingness to regulate cognition, emotion, and behavior because of the continued consumption of psychological resources during self-management or self-control [1]. This concept provides a theoretical perspective for understanding difficulties in maintaining self-management behaviors among patients with chronic diseases. It may also inform the development of interventions aimed at supporting sustained self-management.

3. Assessment tools for self-regulatory fatigue

Several instruments have been used to assess self-regulatory fatigue and the closely related construct of ego depletion (**Table 1**). These instruments differ in their theoretical focus, target populations, and assessment domains. The Self-Regulatory Fatigue Scale (SRF-S) directly assesses the manifestations of self-regulatory fatigue, whereas other instruments focus on ego depletion, its sources, or its consequences. More recently, disease-specific measures of ego depletion have also been developed for patients with chronic diseases.

Table 1. Characteristics of instruments for assessing self-regulatory fatigue

Instrument	Developer, year	Population	Items	Reliability
Self-regulatory fatigue scale (SRF-S)	Nes et al., 2013 [8]	Patients with chronic multi-symptom illnesses	18	Cronbach's α = 0.81
Ego depletion questionnaire (EDQ)	Lin and Johnson, 2015 [11]	General population	5	Cronbach's α = 0.91
Ego-depletion source scale (EDS-S)	Tang et al., 2016 [12]	Initially developed in graduate students; subsequently applied in patients with diabetes	48	Cronbach's α = 0.94; test-retest reliability = 0.66
Ego-depletion aftereffects scale (EDA-S)	Tang et al., 2016 [13]	Initially developed for graduate students	38	Cronbach's α = 0.95; domain α = 0.73–0.91
Ego depletion scale for patients with heart failure	Tao et al., 2025 [14]	Patients with heart failure	19	Cronbach's α = 0.926; test-retest reliability = 0.887
Ego depletion scale for patients with type 2 diabetes	You et al., 2025 [15]	Patients with type 2 diabetes	22	Cronbach's α = 0.911; content validity index = 0.860

3.1. Self-regulatory fatigue scale (SRF-S)

The Self-Regulatory Fatigue Scale (SRF-S) was developed by Nes et al. in 2013 to assess self-regulatory fatigue in patients with chronic multi-symptom illnesses [8]. The original scale consists of 18 items across three dimensions: cognitive, emotional, and behavioral fatigue. The total score ranges from 18 to 90, with higher scores indicating greater self-regulatory fatigue. The original scale demonstrated good internal consistency, with a Cronbach's α coefficient of 0.81. It has subsequently been translated and adapted into Chinese and Turkish [9,10].

In 2015, Wang et al. translated and culturally adapted the SRF-S for use in China. Based on its applicability to the Chinese population, two items, "I never feel hysterical" and "I rarely feel frustrated", were removed, resulting in a 16-item version that retained the original three-dimensional structure [9]. Items are rated on a 5-point Likert scale, yielding a total score ranging from 16 to 80, with higher scores indicating greater self-regulatory fatigue. The Chinese version demonstrated good psychometric properties, with a Cronbach's α coefficient of 0.84 and a test-retest reliability coefficient of 0.73, together with satisfactory construct validity. It is currently the most widely used instrument for assessing self-regulatory fatigue among patients with chronic diseases in China.

3.2. Ego depletion questionnaire (EDQ)

The Ego Depletion Questionnaire (EDQ) was developed by Lin and Johnson in 2015 as a unidimensional measure of ego depletion [11]. It consists of five items assessing subjective experiences of mental exhaustion, difficulty concentrating, depleted mental resources, and diminished willpower. Items are rated on a 5-point Likert scale, with total scores ranging from 5 to 25; higher scores indicate greater ego depletion. The EDQ

has demonstrated good internal consistency, with a Cronbach's α coefficient of 0.91.

The EDQ is brief and easy to administer and has been used in studies of ego depletion among student populations. However, evidence regarding its psychometric performance and applicability among patients with chronic diseases remains limited. Further research is therefore needed before it can be routinely used to assess self-regulatory resource depletion in chronic disease populations.

3.3. Ego-depletion source scale (EDS-S)

The Ego-Depletion Source Scale (EDS-S) was developed by Tang et al. in 2016 to assess potential sources of ego depletion [12]. Its development was informed by the ego-depletion paradigm proposed by Baumeister and Wagner, together with a literature review and an open-ended questionnaire addressing the learning and daily-life experiences of university students. The scale comprises 48 items across 11 dimensions: thought suppression, impulse control, emotion control, decision-making, social distress, self-presentation, highly demanding tasks, compulsory tasks, procrastination, uncompleted goals, and habit change. Items are rated on a 5-point Likert scale, yielding a total score ranging from 48 to 240, with higher scores indicating greater exposure to sources of ego depletion.

The EDS-S demonstrated good psychometric properties, with a Cronbach's α coefficient of 0.94 and a test-retest reliability coefficient of 0.66. The SRF-S developed by Nes et al. and subsequently adapted into Chinese by Wang et al. was used as a criterion measure [8,9]. A positive association was observed between the EDS-S and SRF-S, suggesting a potential relationship between exposure to ego-depletion sources and self-regulatory fatigue. The EDS-S provides a relatively comprehensive assessment of factors that may contribute to ego depletion and has primarily been used in student populations. It has also been applied in research involving patients with diabetes. Nevertheless, further validation is required to determine its suitability for broader chronic disease populations.

3.4. Ego-depletion aftereffects scale (EDA-S)

The Ego-Depletion Aftereffects Scale (EDA-S) was developed by Tang et al. in 2016 to assess ego depletion through its subsequent psychological, cognitive, behavioral, and physical manifestations [13]. The scale comprises 38 items across nine dimensions: difficulties in emotion regulation, social withdrawal, low self-efficacy, impaired working memory, low processing fluency, work burnout, fatigue, physical discomfort, and low persistence. Items are rated on a 5-point Likert scale, with total scores ranging from 38 to 190; higher scores indicate greater ego depletion.

The EDA-S demonstrated good internal consistency, with an overall Cronbach's α coefficient of 0.95 and coefficients ranging from 0.73 to 0.91 across its dimensions. The instrument was primarily developed for and applied to graduate student populations. Therefore, although it provides a multidimensional assessment of the consequences associated with ego depletion, its applicability and psychometric performance among patients with chronic diseases remain to be established.

3.5. Ego depletion scale for patients with heart failure

The Ego Depletion Scale for Patients with Heart Failure was developed by Tao et al. in 2025 and validated in a study examining latent classes of ego depletion and their associations with self-management behaviors among patients with heart failure [14]. The scale consists of 19 items across five dimensions: symptom distress, psychological burden, changes in social life, cognitive and emotional dysregulation, and behavioral

passivity. Items are rated on a 5-point Likert scale, with total scores ranging from 19 to 95; higher scores indicate greater ego depletion.

The scale demonstrated good psychometric properties, with a Cronbach's α coefficient of 0.926 and a test-retest reliability coefficient of 0.887. In the original study, the median ego-depletion score was 51.00 (40.00, 60.00), indicating a relatively high level of ego depletion among patients with heart failure and broadly corresponding to previous findings of substantial self-regulatory fatigue in chronic disease populations. As a disease-specific instrument, the scale incorporates symptom-related, psychological, social, cognitive, and behavioral aspects of resource depletion relevant to heart failure. Future studies should further evaluate its psychometric properties and examine its convergent validity against established measures of self-regulatory fatigue, such as the SRF-S.

3.6. Ego depletion scale for patients with Type 2 Diabetes Mellitus

The Ego Depletion Scale for Patients with Type 2 Diabetes Mellitus was developed by You et al. in 2025 and validated in a sample of 460 patients with type 2 diabetes mellitus [15]. The scale comprises 22 items across six dimensions: insufficient motivation, low self-efficacy, decision-making difficulties, competing tasks, lack of support, and negative emotions. Items are rated on a 5-point Likert scale, yielding a total score ranging from 22 to 110; higher scores indicate greater ego depletion. The scale demonstrated good psychometric properties, with a Cronbach's α coefficient of 0.911 and a content validity index of 0.860.

Compared with the Chinese version of the SRF-S adapted by Wang et al., this disease-specific instrument incorporates contextual sources of depletion, such as decision-making difficulties and competing tasks, as well as regulation-related factors, including insufficient motivation and low self-efficacy [9]. It may therefore provide a more comprehensive assessment of ego depletion in patients with type 2 diabetes mellitus and facilitate the identification of factors relevant to the development of targeted interventions. Nevertheless, multicenter studies with larger and more diverse samples are needed to confirm its psychometric robustness and determine whether its underlying dimensions are applicable to other chronic disease populations.

4. Relationship between self-regulatory fatigue and self-management in chronic disease

4.1. Associations between self-regulatory fatigue and self-management behaviors

Self-regulatory fatigue is closely associated with self-management behaviors among patients with chronic diseases. Higher levels of self-regulatory fatigue may limit the resources available for maintaining self-management and make it more difficult for patients to sustain health behaviors. Zhang et al. reported that self-regulatory fatigue was associated with patients' disease management ability and lower levels of engagement in self-management [16]. Similarly, Chen et al. found that older adults with hypertension who had higher levels of self-regulatory fatigue showed poorer self-management in medication use, disease monitoring, diet, emotional management, and physical activity [17]. Similar findings were reported among patients receiving chemotherapy for breast cancer [18]. One possible explanation is that long-term disease management places continuous demands on limited self-regulatory resources. When these resources are insufficient, patients may be more likely to adopt passive coping strategies or avoid health behaviors, which may be associated with lower rehabilitation engagement and treatment adherence [19].

The relationship may also operate in the opposite direction. Ineffective self-management may place

additional demands on self-regulatory resources and thus be associated with greater self-regulatory fatigue. Patients with chronic heart failure who adopted more active symptom management strategies were reported to have lower levels of self-regulatory fatigue than those who relied on passive symptom management [20]. In addition, a study of 215 patients with systemic lupus erythematosus suggested that poor medication management may require greater self-control effort to cope with the symptom burden associated with irregular or inappropriate medication use, thereby increasing resource depletion [21]. Taken together, these findings suggest a potentially reciprocal relationship between self-regulatory fatigue and self-management.

4.2. Self-regulatory fatigue as a potential psychological mechanism

Beyond its direct association with self-management, self-regulatory fatigue may serve as a potential psychological mechanism linking individual, psychosocial, and disease-related factors with self-management behaviors. Zhou et al. found that self-regulatory fatigue partially mediated the association between health empowerment and motivation for self-management among 302 patients receiving chemotherapy for colorectal cancer [22]. Among patients with diabetes, self-regulatory fatigue was also identified as a mediator in the relationships of social support and sleep quality with health-related self-management behaviors [23,24]. Poor sleep quality may be accompanied by negative emotional states, such as anxiety and depression, which may increase psychological resource demands and impair executive control. In contrast, social support may provide an important external resource that helps patients cope with these demands and maintain self-management behaviors.

Similar relationships have been observed in other chronic disease populations. Liu et al. reported a mediating role of self-regulatory fatigue in the relationship between alexithymia and self-management ability among patients with stroke [25]. Difficulties in identifying and regulating emotions may increase psychological demands and contribute to greater self-regulatory fatigue, which may in turn be associated with poorer self-management. Evidence from patients with rheumatoid arthritis also suggests that self-regulatory fatigue may play a mediating role in the relationship between illness perception and self-management [26].

Collectively, these findings suggest that self-regulatory fatigue may represent an important process variable linking psychological and social factors with self-management. However, current evidence is predominantly based on observational and cross-sectional studies, limiting conclusions regarding temporal direction and causal mechanisms. Longitudinal and experimental studies are therefore needed to clarify the reciprocal relationships and potential pathways involving self-regulatory fatigue and self-management.

5. Potential interventions for reducing self-regulatory fatigue

Current intervention evidence specifically targeting self-regulatory fatigue in patients with chronic diseases remains limited. Therefore, the following approaches include both direct evidence and theoretically relevant evidence from related self-regulation research.

5.1. Psychological and social resource support

Psychological and social interventions may help reduce self-regulatory fatigue by strengthening internal psychological resources and external support. Empowerment interventions encourage patients to recognize their own abilities, mobilize available resources, and shift from passive disease management toward active participation in their health care. Yin et al. examined empowerment among patients with epilepsy based on a

dual system model [27]. Their findings suggested that empowerment may facilitate the mobilization of personal resources, reduce self-regulatory fatigue, and promote active engagement in self-management. Mindfulness is another potential psychological approach. It involves purposeful and nonjudgmental awareness of present experiences and may facilitate the recognition and use of psychological resources [28]. Wagner et al. found that mindfulness reduced maladaptive behavioral responses associated with self-regulatory fatigue and supported self-control, thereby reducing impulsive behavior [29]. Sun et al. also reported that mindfulness interventions were associated with improvements in self-regulatory resource depletion [30]. One possible explanation is that mindfulness may influence prefrontal functioning and strengthen the regulation of emotional and cognitive processes [31]. Taken together, empowerment and mindfulness may provide useful approaches for supporting psychological resources and self-regulation.

5.2. Physical activity and self-regulation training

Physical activity may serve as a form of self-control training and may support self-regulatory capacity by improving perceived physical and psychological energy [32]. Previous studies suggest that repeated self-control training may partly reduce the effects of prior ego depletion and improve subsequent behavioral performance [33,34]. Repeated practice may improve the efficiency of self-control and reduce the psychological resources required to perform demanding tasks. Physical activity may also increase perceived energy and promote psychological relaxation, thereby supporting self-regulation and reducing feelings of fatigue [35].

However, simply increasing exercise intensity or frequency may overlook changes in self-regulatory resources during physical activity. When activity demands continuously exceed an individual's capacity for recovery, psychological resource depletion may increase, and the long-term sustainability of the intervention may be compromised. The activity pacing model therefore emphasizes a balance between activity and rest. Appropriate adjustment of activity and recovery may help prevent excessive resource depletion [36]. Future interventions could consider patients' disease stage and functional status when designing physical activity programs. Gradually progressive exercise of low to moderate intensity or intermittent activity combined with adequate rest may be appropriate options. These approaches may allow patients to maintain health-related behaviors with lower self-regulatory demands.

5.3. Digitally supported multicomponent interventions

Digital interventions may reduce the cognitive demands involved in decision-making and the implementation of self-management behaviors. With the development of digital health technologies, these approaches have been increasingly applied to chronic disease self-management and psychosocial support. Digitally supported multicomponent interventions use internet-based platforms or other digital technologies to integrate and reinforce psychological and behavioral components [37]. Evidence from chronic disease populations provides preliminary support for this approach. Børøsund et al. reported that patients with cancer who received a digital cognitive behavioral stress management intervention showed greater improvement in self-regulatory fatigue over a 12-month follow-up period than those receiving usual care [38]. Similarly, Boström et al. found that a digitally delivered self-management program increased patients' awareness of psychosocial factors and supported active engagement with beneficial self-management strategies, accompanied by improvements in self-regulatory fatigue [39]. Common digital health approaches to chronic disease management include mobile health technologies, wearable devices, and virtual reality [40]. Overall, digitally supported interventions may

provide a flexible approach to addressing self-regulatory fatigue while supporting chronic disease self-management. Digital platforms may facilitate continued follow-up, behavioral guidance, and individualized support based on patient needs and data.

Overall, psychological support, physical activity, self-regulation training, and digitally supported interventions may have potential for reducing self-regulatory fatigue. However, direct intervention evidence in chronic disease populations remains limited, and the effectiveness of these approaches has not been consistently established. Future studies should use rigorous longitudinal and experimental designs to identify effective intervention components and evaluate their sustained effects on self-regulatory fatigue.

6. Conclusion and future directions

Self-regulatory fatigue is an important psychological experience associated with the demands of sustained self-management among patients with chronic diseases. Current evidence suggests that self-regulatory fatigue is closely associated with self-management behaviors and may represent an important process variable linking individual, psychological, social, and disease-related factors with self-management. However, the direction and underlying mechanisms of these relationships remain unclear.

Future research should focus on several areas. First, disease-specific instruments should be further developed and validated to improve the assessment of self-regulatory fatigue across chronic disease populations. Second, longitudinal studies are needed to examine changes in self-regulatory fatigue over time and clarify its temporal relationship with self-management behaviors. Third, future studies should integrate psychological, behavioral, social, and disease-related factors within appropriate theoretical frameworks to identify potential pathways associated with self-regulatory fatigue. Finally, digitally supported multicomponent interventions that incorporate psychological support and self-regulation training should be further developed and evaluated through rigorous randomized controlled trials.

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