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Psychological spiral under the double burden of chronic diseases: An ego depletion model in elderly patients with heart failure and cancer

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Abstract: Elderly patients experiencing the dual burden of chronic heart failure and cancer face complex physical and psychological challenges that can accelerate psychological decline. This study aimed to examine how fatigue and emotional dysregulation contribute to ego depletion, while assessing the potential moderating or mediating role of resilience. A cross-sectional survey was conducted with 200 patients using four validated instruments: The Fatigue Severity Scale (FSS), Difficulties in Emotion Regulation Scale–16 (DERS-16), Connor–Davidson Resilience Scale–10 (CD-RISC-10), and the Self-Regulatory Fatigue Scale–Short Form (SRF-S). Results showed that both fatigue and emotional dysregulation were positively associated with self-regulatory fatigue, whereas resilience was inversely related. To our knowledge, this is the first study to apply the ego depletion model to elderly patients simultaneously managing chronic heart failure and cancer. The findings highlight self-regulatory fatigue as a critical psychological outcome in this population and suggest that strengthening resilience may represent an effective nursing intervention target to mitigate psychological exhaustion and improve overall well-being.

Keywords: psychological resilience; emotion regulation; fatigue severity; elderly patients; nursing interventions

1. Introduction

Chronic heart failure (CHF) and cancer rank among the most prevalent and debilitating conditions faced by individuals today, particularly within the aging population. As populations age, the incidence of these chronic diseases increases, leading to a dual burden that imposes substantial physical, emotional, and psychological challenges. The co-occurrence of CHF and cancer not only heightens the physiological demands on patients but also initiates complex interactions that complicate effective disease management, resulting in poorer health outcomes and a diminished quality of life for these individuals [1,2]. These psychological challenges often contribute to a downward psychological spiral, adversely impacting the mental health and overall well-being of patients navigating these interconnected health issues [3,4].

A downward spiral refers to a psychological sequence where initial negative thoughts can precipitate a cascade of negative emotions and behaviors, thereby exacerbating the individual's situation. This phenomenon is notably characterized in elderly patients who bear the dual burden of CHF and cancer, as they grapple with managing emotional responses, daily functioning, and treatment decisions while enduring persistent stress and fatigue [5]. Research shows that elderly patients often experience a cumulative effect of physical fatigue due to their chronic illnesses, which

aggravates emotional dysregulation as they cope with ongoing symptoms and treatment demands [6,7].

The psychological stressors faced by these patients are multifaceted, ranging from the necessity for rigorous emotional regulation to maintain stability to the burdens associated with long-term treatments and frequent hospitalizations [8]. Within this context, emotional regulation emerges as a critical component in effectively managing their medical conditions. The demands imposed by both heart failure and cancer may significantly deplete psychological resources, aligning with the Ego Depletion Model proposed by Clesse C et al. [9]. This model posits that self-control and emotional regulation are finite resources that can become exhausted through extensive use. Each act of self-regulation—be it emotional control, treatment decision-making, or coping with chronic symptoms—strains a patient's mental reserves, increasing vulnerability to psychological decline and burnout [10,11].

Furthermore, the fatigue these patients experience is often compounded by the ongoing need for self-regulation, whether it involves managing persistent fatigue, addressing physical limitations, or fulfilling social interactions and maintaining support networks [12]. Consequently, our study aims to develop a simplified model based on the Ego Depletion framework that encapsulates psychological exhaustion in elderly patients managing both CHF and cancer. Through this framework, we hope to clarify how fatigue and emotional dysregulation progressively deplete these patients' psychological capacity, thereby resulting in self-exhaustion [13,14].

We hypothesize several relevant research questions, such as whether increased fatigue correlates with heightened self-regulatory fatigue and whether emotional dysregulation contributes to self-regulatory fatigue among this demographic. Additionally, we aim to explore whether resilience can buffer against these challenges [15]. Identifying and measuring predictors and buffers of psychological exhaustion in this vulnerable cohort could yield essential insights and lead to developing tailored interventions to enhance mental health support strategies for elderly patients confronting this dual burden of chronic illness [16].

This dualistic perspective also sheds light on an unmet need within current healthcare frameworks. While clinical programs increasingly address the physical health concerns of patients, the psychological resource depletion associated with these conditions remains an inadequately studied phenomenon, potentially undermining the overall effectiveness of treatment [17,18]. Integrating an understanding of ego depletion and its implications for emotional and cognitive health represents a vital step toward achieving more holistic care for elderly patients facing the complexities of co-existing CHF and cancer [17,19]. By elucidating the pathways through which psychological exhaustion manifests in these patients, this research aspires to reveal critical factors that can inform clinical practices and optimize treatment outcomes.

Moreover, addressing the psychological dimensions alongside the physiological challenges inherent in managing chronic illness underscores the need for enriched, patient-centered care. By deepening our understanding of the interplay between fatigue, emotional dysregulation, and resilience within this population, we aim to develop effective support mechanisms that enhance the overall well-being and quality of life of individuals living with chronic conditions [20].

In summary, addressing the intricate psychological components intertwined with

the physiological challenges of chronic heart failure and cancer is crucial for delivering comprehensive and effective care. By investigating the factors contributing to self-exhaustion through the lens of the Ego Depletion framework, this study seeks to bridge significant gaps within the existing literature. In doing so, it aspires to contribute to the evolving discourse surrounding management strategies tailored for elderly patients coping with the dual burdens of chronic disease, ultimately aiming for improvements in their psychological and physical health outcomes [21].

2. Literature review

The necessity of exploring ego depletion within healthcare populations, particularly in elderly patients facing the dual challenges of chronic heart failure (CHF) and cancer, is underscored by the growing recognition of the psychological complexities intertwined with these conditions. This literature review delves into the core components of ego depletion theory, the interaction between fatigue and emotional dysregulation, the role of psychological resilience, and the methodologies employed in measuring these constructions. It aims to synthesize existing knowledge while identifying gaps that the current study seeks to address.

2.1. The ego depletion model

The Ego Depletion Model, initially developed by Baumeister et al. in 1998, posits that self-regulation relies on finite resources [22]. This model asserts that prolonged exertion of self-control and emotional regulation can lead to significant depletion of these resources, resulting in diminished capacity for subsequent self-regulatory activities [23,24]. Baumeister and colleagues conceptualized self-control as akin to a muscle that can become fatigued through extensive use, thus leading to increased susceptibility to impulsivity and poor decision-making [25].

Subsequent research has applied the Ego Depletion Model across various contexts, revealing its implications in chronic illness management, behavior regulation, and stress response. In populations suffering from chronic conditions such as CHF and cancer, the need for self-regulation manifests in emotional responses to symptoms and treatment, patient decision-making, and general coping mechanisms. Here, the Ego Depletion Model serves as a theoretical framework to understand how sustained emotional regulation efforts can detract from psychological well-being and contribute to a downward psychological spiral [26,27].

2.2. Fatigue as a driver of ego depletion

Chronic fatigue is a significant factor that implicates ego depletion within patient populations. Studies have shown that chronic fatigue can impair cognitive functions such as attention and motivation [28], which are essential for effective self-regulation and decision-making. In populations dealing with cancer and cardiovascular diseases, the prevalence of chronic fatigue further exacerbates existing health challenges.

The Fatigue Severity Scale (FSS) is a validated measure that gauge fatigue levels in individuals with chronic conditions. This scale has demonstrated reliability and validity in various studies, confirming that chronic fatigue profoundly influences patients' daily functioning and their ability to engage in self-care behaviors [29].

Specifically, research indicates that heightened fatigue levels correlate positively with ego depletion, presenting an urgent need to explore the extent of this relationship among elderly populations managing both CHF and cancer [30].

2.3. Emotional dysregulation and psychological deterioration

Emotional dysregulation can aggravate the cycle of ego depletion and psychological decline. The effort required to regulate emotions in response to chronic illness symptoms places additional demands on already depleted self-control resources. As captured by the Difficulties in Emotion Regulation Scale (DERS), challenges in emotional clarity, impulse control, and goal-directed behavior highlight the multifaceted nature of emotional dysregulation in chronic patient populations [31]. For elderly patients with CHF and cancer, these difficulties can lead to poor coping strategies, further entrenching psychological distress and exacerbating fatigue-related issues.

A considerable body of literature has established a link between emotional dysregulation and diminished coping abilities, thereby contributing to the deterioration of mental health in chronic illness populations [32,33]. This connection necessitates a thorough evaluation of emotional dysregulation within the context of ego depletion, especially as older adults may experience unique stressors related to their chronic conditions.

2.4. Psychological resilience as a protective factor

Psychological resilience has emerged as a crucial factor that could buffer the effects of fatigue and emotional dysregulation on ego depletion. Factors that promote resilience, such as optimism and adaptive emotional regulation, have been shown to help individuals better navigate the challenges associated with chronic illnesses [34,35]. The Connor–Davidson Resilience Scale (CD-RISC) serves as a well-established measure to assess resilience, having demonstrated its protective capabilities in oncology and elderly patient studies [36,37].

The interplay of resilience with ego depletion illustrates that resilient individuals may be better equipped to preserve their self-regulatory resources, thus mitigating the adverse effects of chronic fatigue and emotional instability. In doing so, psychological resilience may function as either a moderator or a mediator between the dynamics of fatigue, emotional dysregulation, and ego depletion outcomes, emphasizing its importance in therapeutic interventions for elderly patients managing dual chronic disease burdens [38].

2.5. Measuring ego depletion in healthcare populations

The measurement of ego depletion within clinical settings offers insightful perspectives on patients' psychological functioning. The Self-Regulatory Fatigue Scale–Short Form (SRF-S) provides an effective tool for assessing self-regulatory exhaustion, capturing cognitive, emotional, and behavioral aspects associated with ego depletion. Recent validations of the SRF-S confirm its robustness as a measure [39,40]. Such measurement tools represent essential resources for clinicians aiming to identify self-regulatory fatigue and develop targeted interventions that account for the

unique psychological experiences of patients with chronic illnesses.

The careful evaluation of ego depletion can illuminate the mechanisms through which patients cope with the demands placed on them by their conditions. By integrating reliable measures such as SRF-S or other psychometric tools, healthcare providers can develop more effective treatment plans tailored to manage the psychological impacts of dual chronic conditions [41,42].

2.6. Theoretical gap

Despite the advancement of research surrounding ego depletion in various populations, a notable gap remains concerning its application among elderly patients coping with the dual burdens of CHF and cancer. Existing literature frequently overlooks this demographic, thereby presenting a significant opportunity for research to develop predictive pathways that can underpin intervention strategies tailored to this vulnerable group [43]. Addressing these theoretical gaps is imperative to understanding the psychological dynamics at play and ultimately enhancing patient-centered care models that prioritize the interplay between physiological and psychological needs.

2.7. Hypotheses summary

Based on the existing literature and identified gaps, this study proposes the following hypotheses:

H1: Fatigue is positively associated with ego depletion. This implies that higher levels of fatigue predict greater ego depletion among elderly patients managing chronic conditions.

H2: Emotional dysregulation is positively associated with ego depletion. Emotional dysregulation resulting from chronic illness can lead to increased ego depletion.

H3: Resilience is negatively associated with ego depletion. Higher resilience levels will correlate with lower levels of ego depletion among elderly patients.

H4: Resilience moderates/mediates the impact of fatigue and dysregulation on ego depletion. Psychological resilience may buffer against the adverse effects of fatigue and emotional dysregulation.

The synthesis of research presented in this literature review illustrates the intricate relationship between ego depletion, emotional dysregulation, and resilience within the context of chronic illness management. As an emergency area of study, these elements warrant further exploration, particularly in elderly populations managing CHF and cancer. This framework not only enhances our understanding of psychological factors at play but also lays a foundation for developing interventions aimed at promoting robust psychological health among vulnerable patient groups. Future research endeavors should focus on testing the proposed hypotheses while also addressing the gaps identified, ultimately paving the way for innovative care strategies that prioritize psychological well-being alongside physical health.

3. Methods

3.1. Study design

The present study was designed as a hospital-based, cross-sectional quantitative investigation focusing on elderly patients simultaneously diagnosed with chronic heart failure and cancer. This dual-disease cohort was selected because such patients represent a unique population characterized by persistent physical strain and psychological vulnerability. The purpose of the design was to provide a snapshot of the relationship between fatigue, difficulties in emotion regulation, resilience, and self-regulatory fatigue, conceptualized here as ego depletion. By adopting a cross-sectional survey, the study aimed to capture the interrelationships of these constructs at a single point in time, while ensuring feasibility in a population whose health status often prevents longitudinal participation. Reporting of the design and procedures adhered to the STROBE guidelines for observational studies [44], thereby enhancing the rigor and transparency of the methodology.

3.2. Participants

3.2.1. Inclusion and exclusion criteria

Participants were required to be aged 60 years or older, to have a confirmed diagnosis of chronic heart failure and any form of malignant disease as verified by their medical records, and to be cognitively capable of providing informed consent and completing self-report questionnaires. Exclusion criteria were defined as the presence of severe mental illness such as schizophrenia or major cognitive impairment that could hinder comprehension, and a medical judgement that the individual was in the terminal stage of illness with a life expectancy of less than three months. These criteria were designed to balance inclusivity with ethical considerations, ensuring that the participants could meaningfully engage in the research while avoiding undue burden.

3.2.2. Sampling and sample size

A convenience sampling strategy was employed, reflecting the practical challenges of enrolling frail elderly patients with dual chronic conditions. Although probability sampling methods provide stronger external validity, convenience sampling is often considered appropriate in exploratory psycho-oncology studies, particularly when the objective is to establish theoretical linkages rather than population prevalence. Sample size determination followed the heuristic of ten to fifteen participants per independent variable in regression analyses [45]. With four primary psychometric instruments and relevant covariates, a target of 200 participants was established. This number provided adequate statistical power for correlation, regression, and mediation/moderation analyses while accommodating potential incomplete data. Ultimately, 200 participants were successfully recruited during the study period between March and July 2025.

3.3. Measures

To capture the multidimensional psychological profile of participants, four validated self-report instruments were administered. Each instrument was selected

based on its psychometric strength, prior application in chronic illness populations, and theoretical alignment with the ego depletion framework.

3.3.1. Fatigue severity scale (FSS)

Fatigue was assessed using the Fatigue Severity Scale (FSS), developed by Krupp et al. [46]. The FSS is a nine-item questionnaire specifically designed to measure the impact of fatigue on daily functioning, distinguishing it from depressive symptomatology and other psychological constructs. Items are scored on a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). A mean score is calculated, with values of 5 or above generally interpreted as indicating severe fatigue. The instrument has consistently demonstrated high internal consistency, with Cronbach's alpha values above 0.85 across diverse patient populations, including individuals with multiple sclerosis, systemic lupus erythematosus, cardiovascular disease, and cancer [47,48]. In the present study, the FSS was used as a continuous variable, capturing the extent to which fatigue disrupted motivation, activity, and social participation among elderly patients facing the compounded challenges of heart failure and cancer.

3.3.2. Difficulties in emotion regulation scale—16 item version (DERS-16)

Emotion regulation difficulties were measured using the DERS-16, a short form of the original 36-item scale [49], validated by Bjureberg et al. [50]. The scale consists of sixteen items rated on a five-point Likert scale from 1 (almost never) to 5 (almost always). Total scores range from 16 to 80, with higher scores reflecting greater difficulties in emotion regulation. The DERS-16 captures five domains: non-acceptance of negative emotions, difficulties engaging in goal-directed behavior when distressed, impulse control problems, limited access to effective emotion regulation strategies, and lack of emotional clarity. Previous studies have reported excellent reliability for the short form, with Cronbach's alpha coefficients ranging from 0.92 to 0.95 [51]. In the current research, the DERS-16 provided a robust index of participants' ability to manage emotional responses in the context of sustained physical and psychological stressors associated with chronic comorbidities.

3.3.3. Connor–Davidson resilience scale—10 item version (CD-RISC-10)

Resilience, conceptualized as the capacity to adapt positively in the face of adversity, was measured using the CD-RISC-10. This short version of the original 25-item scale was developed and validated by Campbell-Sills and Stein [52] through factor analytic refinement. Each item is scored from 0 (not true at all) to 4 (true nearly all the time), yielding a total score between 0 and 40. Higher scores represent greater resilience. The CD-RISC-10 has been validated across clinical and non-clinical populations, including elderly individuals and cancer patients, with Cronbach's alpha typically above 0.85 [53,54]. In the present study, resilience was tested not only as a direct correlate of self-regulatory fatigue but also as a potential mediator or moderator of the relationships between fatigue, emotional dysregulation, and ego depletion.

3.3.4. Self-regulatory fatigue scale—Short form (SRF-S)

Ego depletion, operationalized here as self-regulatory fatigue, was measured using the SRF-S, a 16-item adaptation of the original 18-item SRF scale developed by Solberg Nes et al. [55]. The instrument assesses cognitive, emotional, and behavioral

dimensions of self-regulation exhaustion. Each item is rated on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree), producing a total score ranging from 16 to 80. Higher scores indicate greater self-regulatory fatigue. The SRF-S was chosen over the longer SRF-18 to minimize participant burden, given the frailty of the target population. Its prior validation in oncology populations within China further supported its cultural appropriateness and reliability for this study.

3.4. Data collection procedure

Trained research nurses approached eligible patients during hospital visits, explained the study objectives, and invited them to participate. Written informed consent was obtained from all participants. Data were collected using paper-based questionnaires administered in a quiet environment within the hospital, either during inpatient stays or outpatient appointments. For participants with visual impairment or limited literacy, research staff helped by reading the items aloud and recording responses without influencing answers. All complete questionnaires were coded anonymously to ensure confidentiality. The average completion time was approximately 25 minutes, and no adverse events were reported during data collection.

3.5. Data analysis

Data entry and statistical analyses were performed using SPSS version 25.0. Prior to analysis, data were screened for completeness, normality, and outliers. Descriptive statistics, including means, standard deviations, frequencies, and percentages, were calculated for demographic variables and scale scores. Normality of continuous variables was assessed using the Kolmogorov–Smirnov test.

Bivariate relationships between fatigue, emotion regulation, resilience, and self-regulatory fatigue were examined using Pearson correlation coefficients. To test the primary hypotheses, multiple linear regression models were constructed, with self-regulatory fatigue (SRF-S total score) as the dependent variable and fatigue (FSS) and emotion dysregulation (DERS-16) as independent variables. Resilience (CD-RISC-10) was included as a covariate to assess its protective role.

To explore the potential mediating or moderating role of resilience, the PROCESS macro for SPSS. Hayes [56] was employed. Model 4 was specified for mediation analysis, whereas Model 1 was used for moderation analysis. Indirect effects were tested using bootstrapping with 5000 resamples, generating bias-corrected 95% confidence intervals. Statistical significance was set at $p < 0.05$ for two-tailed tests.

4. Results and discussion

4.1. Participant characteristics

A total of 200 elderly patients with coexisting chronic heart failure and cancer were included in the analysis. **Table 1** shows participant characteristics. The mean age of participants was 72.3 years ($SD = 5.9$). Males accounted for 60% of the cohort, while females represented 40%. Most participants were married, with smaller proportions, widowed or single. In terms of education, nearly half had attained

secondary education, while primary level and higher education were less frequent. Cancer types were diverse, with lung, breast, and gastrointestinal malignancies most common, while one-third fell into the “other” category. With respect to heart failure severity, nearly half of the participants were in NYHA class II, about 40% were in class III, and 15% were in class IV.

Table 1. Participant characteristics of elderly patients with heart failure and cancer ($N = 200$).

Variable	<i>n</i> (%) or mean $\pm$ SD
Age (years)	72.3 $\pm$ 5.9
Sex	120 (60.0%) Male; 80 (40.0%) Female
Marital status	136 (68.0%) Married; 50 (25.0%) Widowed; 14 (7.0%) Single/Other
Education level	70 (35.0%) Primary or below; 90 (45.0%) Secondary; 40 (20.0%) Higher
Cancer type	50 (25.0%) Lung; 36 (18.0%) Breast; 48 (24.0%) Gastrointestinal; 66 (33.0%) Other
NYHA class	90 (45.0%) II; 80 (40.0%) III; 30 (15.0%) IV

4.2. Descriptive analysis of psychological variables

Table 2 displays descriptive statistics of psychological variables (FSS, DERS-16, CD-RISC-10, SRF-S). Fatigue severity scores (FSS) were high, consistent with clinically relevant fatigue. Difficulties in emotion regulation (DERS-16) were also elevated, indicating substantial problems in managing emotional responses. Psychological resilience, measured by CD-RISC-10, was moderate to low, while self-regulatory fatigue (SRF-S) scores were high, suggesting marked psychological exhaustion. Overall, these results suggest that patients in this cohort experience high levels of fatigue and emotional dysregulation, accompanied by low resilience and significant ego depletion.

Table 2. Descriptive statistics of psychological measures (FSS, DERS-16, CD-RISC-10, SRF-S).

Scale	Mean $\pm$ SD
FSS (Fatigue)	5.08 $\pm$ 1.16
DERS-16 (Emotion dysregulation)	43.5 $\pm$ 10.0
CD-RISC-10 (Resilience)	21.8 $\pm$ 6.5
SRF-S (Self-regulatory fatigue)	49.7 $\pm$ 12.8

4.3. Correlations

Pearson correlations revealed significant associations among the main study variables as shown in **Table 3**. Fatigue severity showed a strong positive correlation with self-regulatory fatigue ($r = 0.76$, $p < 0.001$). Emotion dysregulation was even more strongly correlated with self-regulatory fatigue ($r = 0.83$, $p < 0.001$). In contrast, resilience was negatively correlated with self-regulatory fatigue ($r = -0.64$, $p < 0.001$). These findings provide clear support for hypotheses H1–H3, indicating that fatigue and emotion dysregulation are risk factors for ego depletion, whereas resilience functions as a protective factor.

Table 3. Pearson correlations among main study variables.

Variable	FSS	DERS16	CDRISC10	SRFS
FSS	1.00	0.45	−0.29	0.76
DERS16	0.45	1.00	−0.34	0.83
CDRISC10	−0.29	−0.34	1.00	−0.64
SRFS	0.76	0.83	−0.64	1.00

Note: $p < 0.001$ for all correlations.

4.4. Regression analysis

A multiple linear regression was conducted to examine the combined effects of fatigue, emotion dysregulation, and resilience on self-regulatory fatigue. The model was statistically significant, $F(3,196) = 1990.63$, $p < 0.001$, and explained 96.8% of the variance in SRF-S scores ($R^2 = 0.968$, Adjusted $R^2 = 0.968$).

Fatigue severity was a significant positive predictor ($B = 4.65$, $SE = 0.16$, $\beta = 0.42$, $p < 0.001$), and emotion dysregulation was also a significant positive predictor ($B = 0.67$, $SE = 0.02$, $\beta = 0.53$, $p < 0.001$). In contrast, resilience was a significant negative predictor ($B = -0.66$, $SE = 0.03$, $\beta = -0.34$, $p < 0.001$). These findings support the proposed hypotheses, with fatigue and dysregulation driving higher levels of ego depletion, while resilience mitigates this effect. All related data are presented in **Table 4**.

Table 4. Multiple regression analysis predicting self-regulatory fatigue.

Predictor	B (unstd)	SE	β (std)	t	p
Constant	11.31	1.25	—	9.02	<0.001
FSS mean	4.65	0.16	0.42	29.01	<0.001
DERS16_Total	0.67	0.02	0.53	35.70	<0.001
CDRISC10_Total	−0.66	0.03	−0.34	−24.49	<0.001

Model summary: $R^2 = 0.968$, Adjusted $R^2 = 0.968$, $F(3,196) = 1990.63$, $p < 0.001$.

4.5. Integrated discussion

The present findings provide strong support for the application of the ego depletion model in elderly patients with dual chronic disease burden. Fatigue and emotion dysregulation were robust positive predictors of self-regulatory fatigue, whereas resilience exerted a protective influence. These findings are consistent with the conceptualization of ego depletion as a consequence of sustained self-regulation demands.

The strong positive association between fatigue and ego depletion highlights the cumulative toll of physical exhaustion on psychological resources. Similarly, emotion dysregulation appears to tax self-control capacity, intensifying psychological depletion. In contrast, resilience operates as a buffer, allowing individuals to conserve or replenish regulatory resources, thereby mitigating exhaustion.

These results align with previous psycho-oncology and cardiology studies that identify fatigue and dysregulated affect as major contributors to psychological distress, while also echoing findings that resilience is associated with better quality of life and adaptive coping. Clinically, the results underscore the importance of multifaceted

interventions: fatigue management strategies, emotion regulation therapies, and resilience-building programs could collectively help break the spiral of psychological deterioration in patients facing dual chronic disease.

It is noteworthy that the regression model explained an unusually large proportion of variance ($R^2 = 0.968$). This high explanatory power may reflect several factors. First, the psychometric instruments employed in this study demonstrated excellent internal consistency ($\alpha > 0.85$), which reduces measurement error and strengthens associations. Second, the constructs of fatigue, emotional dysregulation, resilience, and self-regulatory fatigue are conceptually interrelated, leading to considerable shared variance. Third, the sample was drawn from a homogenous clinical group—elderly patients with comorbid heart failure and cancer—which may have intensified the statistical associations. While the strength of the model highlights the robust predictive value of fatigue and emotion regulation difficulties, caution is warranted in interpreting the magnitude of the R^2 . Future research in more diverse populations and with additional objective measures is needed to confirm the generalizability of these findings.

5. Conclusion

This study examined the psychological spiral experienced by elderly patients with the dual burden of chronic heart failure and cancer, focusing on the interplay of fatigue, emotional dysregulation, resilience, and self-regulatory fatigue. The findings confirmed that fatigue and emotion dysregulation were strong positive predictors of self-regulatory fatigue, while resilience was negatively associated, functioning as a protective factor. Collectively, these results provide robust support for the ego depletion model in explaining psychological exhaustion under dual chronic disease conditions.

The implications are twofold. First, they highlight the urgent need to integrate fatigue management and emotion regulation interventions into standard care for elderly patients facing comorbid chronic illness. Second, they suggest that resilience-enhancing strategies—such as resilience training, mindfulness, or cognitive-behavioral approaches—could serve as vital buffers against psychological deterioration.

Although limited by cross-sectional design and reliance on self-reported data, the study provides a foundation for further longitudinal and interventional research. Future studies should incorporate biological markers of fatigue and stress, as well as evaluate the effectiveness of resilience-focused interventions. However, the unusually high variance explained by the regression model ($R^2 = 0.968$) suggests possible inflation due to conceptual overlap among constructs and sample homogeneity, which should be addressed in future research. To our knowledge, this is the first study applying the ego depletion model to elderly patients simultaneously managing chronic heart failure and cancer. By doing so, healthcare professionals may better support both the psychological and physiological needs of this vulnerable population, ultimately improving quality of life and treatment outcomes.

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