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The impact of self-regulatory fatigue on suicidal ideation in nursing students: the mediating role of experiential avoidance and the moderating role of negative life events

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Abstract

Background Nursing students face significant academic and emotional stress, which may increase the risk of suicidal ideation. This study examines the relationships between self-regulatory fatigue, experiential avoidance, and suicidal ideation, with a focus on the mediating role of experiential avoidance and the moderating role of negative life events.

Methods We conducted a cross-sectional survey with 562 nursing students from a university in Heilongjiang, China. Data were collected using standardized scales: the General Information Questionnaire, Adolescent Suicidal Ideation Scale, Self-Regulatory Fatigue Scale, Acceptance and Action Questionnaire II, and Adolescent Self-Rating Life Events Checklist Scale.

Results The study revealed a significant total effect of self-regulatory fatigue on suicidal ideation ($\beta = 0.5610$, $p < 0.001$), accounting for 52.26% of the variance. Experiential avoidance partially mediated this relationship, with a significant indirect effect ($\beta = 0.0723$, 95% CI [0.0059, 0.1398]), representing 12.89% of the total effect. Self-regulatory fatigue strongly predicted experiential avoidance ($\beta = 0.3567$, $p < 0.001$), which in turn predicted suicidal ideation ($\beta = 0.2028$, $p < 0.01$). Negative life events moderated the first stage of the mediation pathway (self-regulatory fatigue → experiential avoidance), as evidenced by a significant interaction term ($\beta = 0.1097$, $p = 0.0063$). The moderated mediation model explained 57.92% of the variance in experiential avoidance.

Conclusion Self-regulatory fatigue is significantly associated with suicidal ideation in nursing students, both directly and through the mediating role of experiential avoidance. Negative life events amplify this association. These findings highlight the importance of enhancing emotional regulation and coping strategies within nursing education to reduce the risk of suicidal ideation.

Keywords Nursing students, Suicidal Ideation, Experiential Avoidance, Self-Regulatory Fatigue, Negative Life Events

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Background

Suicide is a significant global public health concern, with approximately 703,000 deaths by suicide each year, as reported by the World Health Organization (WHO) [1]. In China, the suicide rate remains notably high, with an estimated 250,000 deaths and 2 million suicide attempts annually [2]. These alarming statistics underscore the urgent need for effective suicide prevention interventions.

Nursing students are at a high risk of mental health issues due to the unique stressors associated with their academic and clinical training [3, 4]. The dual burden of academic demands and emotional labor, such as managing patient pain and death, significantly increases their risk of suicidal ideation [5, 6]. Research suggests that nursing students are more susceptible to suicidal thoughts than those in other disciplines [4]. For instance, a study conducted in China found that 11.9% of nursing students had seriously considered suicide as a coping mechanism for distress [7]. These findings highlight the urgent need to explore the psychological factors contributing to the heightened risk of suicidal ideation among nursing students [8].

Self-regulation, a critical psychological capacity, refers to the ability to manage thoughts, emotions, and behaviors to achieve personal goals [9]. This capacity is particularly essential in high-stress environments such as nursing, where professionals must navigate multiple competing demands. The strength model of self-regulation [10] provides a foundational framework for understanding self-regulatory processes. According to this model, self-regulation functions as a finite resource: sustained efforts to regulate emotions, thoughts, or behaviors gradually deplete cognitive and emotional reserves, leading to self-regulatory fatigue (SRF) [11]. This depletion impairs an individual's ability to cope with subsequent stressors, increasing their vulnerability to maladaptive coping strategies and negative psychological outcomes [12]. Empirical studies have demonstrated that SRF is associated with diminished resilience, impaired decision-making, and heightened emotional reactivity, all of which are known risk factors for depression and suicidality [13, 14]. Based on this theoretical framework, we hypothesize that self-regulatory fatigue is positively associated with suicidal ideation among nursing students (H1).

The role of experiential avoidance—a maladaptive coping strategy involving the avoidance of distressing thoughts, emotions, or experiences—is central to this process. Grounded in Acceptance and Commitment Therapy (ACT) theory [15], experiential avoidance reflects psychological inflexibility, where individuals prioritize short-term relief over long-term emotional processing [16]. ACT posits that avoidance perpetuates distress by preventing habituation to negative emotions, thereby amplifying their intensity and persistence [15]. For instance, individuals with high levels of experiential avoidance often exhibit heightened rumination, emotional suppression, and disengagement from goal-directed behaviors, all of which exacerbate depressive symptoms [17, 18]. Critically, the strength model of self-regulation suggests that self-regulatory fatigue compromises an individual's capacity to engage in adaptive, resource-intensive coping strategies (e.g., problem-solving, cognitive reappraisal), making avoidance behaviors, such as experiential avoidance, more likely [19, 20]. This is consistent with research showing that depleted self-regulatory resources predict an increased reliance on avoidance-oriented coping strategies in high-stress populations [21, 22]. Thus, we hypothesize that experiential avoidance mediates the relationship between self-regulatory fatigue and suicidal ideation (H2).

The moderating role of negative life events (e.g., family crises, academic failures) can be understood through the lens of the stress-vulnerability model [23] and resource conservation theory [12]. The stress-vulnerability model posits that negative life events act as environmental stressors that interact with preexisting vulnerabilities (e.g., depleted self-regulatory resources) to amplify the risk of psychopathology [24]. Concurrently, resource conservation theory emphasizes that stressors deplete emotional and cognitive resources, forcing individuals to prioritize immediate coping over long-term adaptation [25]. When nursing students face negative life events, the combined demands of external stressors and internal self-regulatory depletion create a "resource gap", intensifying reliance on low-effort strategies like experiential avoidance [26]. For example, academic pressures or interpersonal conflicts may overwhelm already depleted resources, leaving individuals unable to tolerate distress and more likely to avoid emotional experiences [27]. This cyclical process—where stressors exacerbate resource depletion, which in turn heightens avoidance—may explain why negative life events strengthen the link between SRF and experiential avoidance [28]. We therefore hypothesize that negative life events moderate this relationship, increasing the risk of suicidal ideation (H3).

This study aims to examine how self-regulatory fatigue, experiential avoidance, and negative life events are related to suicidal ideation among nursing students. By exploring these factors in tandem, we hope to gain a deeper understanding of the mental health challenges faced by nursing students and provide valuable insights for developing targeted psychological interventions, particularly those focused on improving self-regulation and reducing experiential avoidance.

This study seeks to answer the following research questions:

Is there an association between self-regulatory fatigue and suicidal ideation among nursing students?
Does experiential avoidance mediate the relationship between self-regulatory fatigue and suicidal ideation?
Do negative life events moderate the relationship between self-regulatory fatigue and experiential avoidance, thereby contributing to suicidal ideation?

Refer to Fig. 1.

Methods

Design and sample

We employed a cross-sectional design for this study. When selecting participants, we considered the convenience of recruitment and chose the convenience sampling method. It is important to emphasize that this approach provided flexibility in our selection process and reduced the dropout rate. From January to February 2024, we selected 661 nursing students from a nursing institution in China. The inclusion criteria were currently enrolled nursing students who voluntarily participated. Students from other institutions or those on leave during the investigation period were excluded.

We estimate the sample size using the overall mean formula [29], as illustrated in Fig. 2.

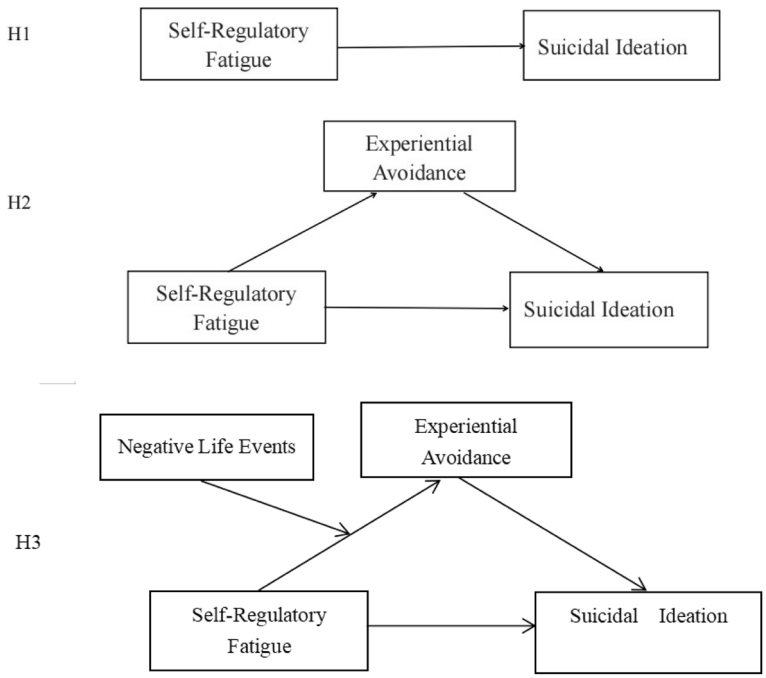


Fig. 1 Research hypothesis framework

$$n = \left(\frac{\mu_{\alpha/2} \times \sigma}{\delta} \right)^2$$

Fig. 2 Formula for sample size calculation

Where $\mu_{\alpha/2} = 1.96$, δ is the allowable error, which, after reviewing the literature [30], was determined to be $\delta = 0.5$. With a standard deviation $\sigma = 4.93$, the sample size calculated using the formula was 373 cases. Considering a 20% rate of invalid questionnaires, the final sample size was adjusted to 448 participants.

Data collection

Data were collected through an online questionnaire platform specifically designed for this study. The questionnaire was distributed to students via WeChat, China's most popular social media platform, ensuring that all nursing students had access. At the top of the questionnaire, we emphasized the survey objectives, anonymity, voluntary participation, and informed consent. It was clearly stated that by choosing to continue and submit the questionnaire, participants were considered to have agreed to participate in our study. Additionally, we provided the email address of the study team leader, allowing participants to contact the researchers if they had questions or wished to withdraw, thereby ensuring informed consent and voluntary participation.

To protect participants' privacy, we implemented several measures: (1) the questionnaire did not request personally identifiable information (e.g., name, school); (2) participation and responses would not impact their internship grades, allowing participants to choose whether or not to respond according to their preferences; and (3) all data were accessible only to the research team, ensuring confidentiality from nursing faculty.

It is important to note that each questionnaire could only be completed once to avoid duplication of responses, and it took approximately 3–5 min to complete, based on estimates from pilot testing.

To ensure the data were accurate, reliable, and complete throughout the processes of storage, transmission, and processing, we appointed two data administrators responsible for managing the questionnaires and regularly accessing the online platform data. After participants completed the electronic questionnaires, the two administrators independently reviewed and compared their entries to identify and eliminate any invalid responses. The criteria for invalid questionnaires included: (1) submission within 3 min; (2) identical scores across all items, excluding reverse items; and (3) missing responses for key items, chosen to ensure data quality. We collected 661 responses; after excluding invalid questionnaires, 562 were retained, resulting in a response rate of 85.02%.

Research instrument

General demographic questionnaire

We developed a general demographic questionnaire comprising eight items aimed at gathering essential demographic information. The questionnaire addresses the following aspects: gender, age, academic grade, place of origin, religious beliefs, average monthly family income, status as a student leader (i.e., whether the individual serves as a student cadre), and whether the participant comes from a single-parent household.

Positive and negative suicide ideation scale

The Positive and Negative Suicide Ideation Scale, developed by Osman and Gutierrez [31] and later translated and revised by Wang Xuezhi, Gong Huoliang, and colleagues [32], assesses suicidal ideations in adolescents. It comprises two dimensions: Negative suicidal ideations (8 items) and positive suicidal ideations (6 items), totaling 14 items. Respondents rate each item on a 5-point Likert scale, with negative items scored positively and positive items scored in reverse; thus, lower scores on the positive items indicate less positive thinking. Scores range from 14 to 70, with higher totals reflecting increased suicidal ideations. Example items include: "I feel I have control over my life" and "I sometimes feel there is no hope for the future." In this study, the scale demonstrated excellent reliability, with a Cronbach's alpha coefficient of 0.915. The individual dimensions had Cronbach's alpha coefficients of 0.868 and 0.969, both exceeding the acceptable threshold of 0.70. Correlation coefficients between the total score and each item ranged from 0.145 to 0.721 ($P < 0.01$). The KMO value was 0.924, and Bartlett's test of sphericity yielded a chi-square value of 4751.068 ($P < 0.001$), confirming good reliability and validity.

Self-regulatory fatigue scale

The Self-Regulatory Fatigue Scale, originally developed by NES et al. [33] and subsequently modified by Wang Ligang et al. [34], comprises 16 items across three dimensions: cognition (6 items), behavior (5 items), and emotion (5 items). A 5-point Likert scoring system is employed, where responses range from 1 (strongly disagree) to 5 (strongly agree), resulting in a total score between 16 and 80; higher scores indicate greater levels of self-regulatory fatigue. Example items include: "I feel energetic," "I can easily set goals," "I find it difficult to follow my exercise plan," and "I have an impulse to destroy something." In this study, the scale exhibited excellent reliability, with an overall Cronbach's α coefficient of 0.906. The individual dimensions demonstrated Cronbach's α values of 0.777, 0.762, and 0.841, all exceeding the acceptable threshold of 0.70. The correlation

coefficients between the total score and each item ranged from 0.444 to 0.742 ($P < 0.01$). The KMO value was 0.920, and Bartlett's test yielded a chi-square value of 4751.068 ($P < 0.001$), confirming good reliability and validity.

The acceptance and action questionnaire version II

The Acceptance and Action Questionnaire Version II, developed by Bond [35] and translated by Cao Jing et al. [36], consists of 7 items scored on a scale from 1 to 7, where 1 indicates "never" and 7 indicates "always." The total score ranges from 7 to 49, with higher scores reflecting a greater degree of experiential avoidance. Sample items include: "Painful experiences make it difficult for me to live an ideal life," "Some feelings make me afraid," "I worry that I can't control my worries and feelings," and "Painful memories have destroyed my happy life." In this study, the scale demonstrated excellent reliability, with a Cronbach's α coefficient of 0.934, exceeding the acceptable threshold of 0.70. The correlation coefficients between the total score and each item ranged from 0.518 to 0.792 ($P < 0.01$). The KMO value was 0.925, and Bartlett's test produced a chi-square value of 8286.315 ($P < 0.001$), indicating good reliability and validity.

Adolescent self-rating life events checklist

The Adolescent Self-Rating Life Events Checklist (ASLEC), developed by Liu Xianchen et al. [37], was used to assess negative life events in nursing students. The scale contains 26 items. A 6-point scoring system is employed, where 0 indicates that the event did not occur, and if it did, the severity of the impact on the individual is rated as follows: 1 = no impact, 2 = mild, 3 = moderate, 4 = severe, 5 = extremely severe. The total score is obtained by summing the individual item scores, with a higher score indicating a greater frequency and intensity of life events. Sample items include: "Being misunderstood or blamed by others," "Experiencing discrimination or being ignored," "Failing an exam or having unsatisfactory academic performance," "Having conflicts with classmates or friends," and "Experiencing significant changes in lifestyle habits, such as eating and resting patterns." In this study, the Cronbach's α coefficient of the scale was 0.937, which is above 0.70, and the correlation coefficients between the total score and individual items ranged from 0.250 to 0.723 ($P < 0.01$). The KMO value was 0.948, and Bartlett's test of sphericity yielded an approximate chi-square value of 9477.136 ($P < 0.001$), indicating good reliability and and validity.

Data analysis

Data were analyzed using SPSS 24.0 software. Descriptive statistics for demographic data were presented as frequencies and percentages. The scores for self-regulatory fatigue, psychological flexibility, and suicidal ideation were reported as means and standard deviations. Pearson correlation analysis was conducted to examine the relationships between variables. Mediation effects were tested using the PROCESS macro (Model 4). Gender, age, academic year, place of origin, religious beliefs, average monthly household income, student leadership status, and whether the student was from a single-parent family were included as control variables. All tests were performed using 5,000 bootstrap resamples to determine 95% confidence intervals (CI). If the 95% CI did not include 0, the mediation effect was considered significant. The moderating effect of negative life events on the first part of the mediation path was analyzed using Model 7. Parameter estimates were obtained using bootstrap sampling (5,000 resamples), with a 95% confidence interval excluding 0 indicating significant parameters. The significance level was set at $\alpha = 0.05$.

Ethical considerations

The project received ethical approval from the Second Affiliated Hospital of Harbin Medical University (No. KY2024-013). Participants were informed that they could withdraw from the study at any time, and the survey was conducted anonymously. Additionally, students were made aware of the benefits of participation, such as the opportunity to share their valuable opinions with relevant stakeholders, as well as the risks, including the time commitment required for the survey.

Results

Common method bias

This study used a questionnaire survey, which could introduce common method bias. To assess this, we applied Harman's single-factor method and conducted exploratory factor analysis without rotation. The results showed that the first factor accounted for 33.96% of the variance, which is below the 40% threshold, indicating no significant common method bias in this study.

Demographic characteristics of nursing students

The sample was predominantly female (86.1%) with an average age of 18.65 years (± 1.079). Most participants were first-year students (64.4%), followed by sophomores (29.0%) and juniors (6.6%). Regarding household income, 39.9% earned less than 3,000 yuan, 33.3% earned between 3,001–5,000 yuan, 18.0% earned 5,001–8,000 yuan, and 8.9% earned over 8,000 yuan. The majority were from rural areas (67.4%), while 32.6% were from urban areas. In terms of leadership roles, 22.1% were student leaders, and 77.9% were not. Most (99.1%) reported no religious beliefs, with only 0.9% identifying as religious.

Table 1 General characteristics of nursing students ($n=562$)

Project	Classification	Number of cases	Constituent ratio(%)
Gender			
	male	78	13.9
	female	484	86.1
Age	18.65 ± 1.079		
Academic grade			
	Freshman	362	64.4
	sophomore	163	29.0
	Junior	37	6.6
Average monthly family income (yuan)			
	< 3000	224	39.9
	3001–5000	187	33.3
	5001–8000	101	18.0
	> 8001	50	8.9
Place of origin			
	countryside	379	67.4
	city	183	32.6
Student Leader Status			
	yes	124	22.1
	no	438	77.9
Religious Belief			
	yes	5	0.9
	no	557	99.1
Single-Parent Household			
	yes	111	19.8
	no	451	80.2

Additionally, 19.8% came from single-parent families, and 80.2% did not. For more details, see Table 1.

Descriptive statistics of demographic variables

The suicidal ideation score was (25.15 ± 9.446), with a total scale score of 70. This indicates that nursing students' suicidal ideation is at a moderately low level. The self-regulatory fatigue score was (36.41 ± 11.936), with a total scale score of 80, also indicating a moderately low level of self-regulatory fatigue among nursing students. The experiential avoidance score was (13.96 ± 5.838), with a total scale score of 35, suggesting that nursing students' level of experiential avoidance is moderate.Finally, the total score for negative life events was 36.49 ± 12.592, with a maximum possible score of 130, indicating that nursing students experienced a relatively low frequency of negative life events. These results are presented in Table 2.

Correlation analysis of self-regulatory fatigue, suicidal ideation, experiential avoidance, and negative life events among nursing students

Self-regulatory fatigue was found to be significantly positively correlated with suicidal ideation ($r=0.715$, $P<0.01$). Additionally, experiential avoidance was positively correlated with both suicidal ideation ($r=0.586$, $P<0.01$) and self-regulatory fatigue ($r=0.731$, $P<0.01$). Negative life events also showed significant positive correlations with self-regulatory fatigue ($r=0.558$, $P<0.01$) and experiential avoidance ($r=0.547$, $P<0.01$). The detailed correlations are presented in Table 3.

Mediating role of experiential avoidance

To examine the mediating role of experiential avoidance in the relationship between self-regulatory fatigue and suicidal ideation, we conducted a mediation analysis using Model 4 of the PROCESS macro in SPSS with 5,000 bias-corrected bootstrap resamples. The results are presented in Tables 4 and 5. The key findings and statistical details are as follows.

Total effect

Self-regulatory fatigue exhibited a strong total association with suicidal ideation (β = 0.5610, $p<0.001$, 95% CI [0.5146, 0.6073]), explaining 52.26% of the variance in

Table 2 Description of each variable ($n=562$)

	N	Min	Max	Mean	Standard Deviation	Item Average	Skewness	Kurtosis
Self-Regulation Fatigue(Total)	16	16	80	36.41	11.936	2.28	0.065	−0.547
Cognitive Dimension	6	6	30	14.65	4.845	2.44	−0.069	−0.428
Emotional dimension	5	5	25	11.68	4.225	2.34	0.168	−0.301
Behavioral dimension	5	5	25	10.08	4.343	2.02	0.470	−0.665
Experiential Avoidance(Total)	7	7	35	13.96	5.838	1.99	0.535	−0.137
Suicidal Ideation(Total)	14	14	69	25.15	9.446	1.80	0.986	0.849
Positive Suicidal Ideation	6	6	30	13.79	5.414	2.30	0.395	−0.161
Negative Suicidal Ideation	8	8	40	11.36	5.902	1.42	2.060	4.249
Negative Life Events(Total)	26	25	86	36.49	12.592	1.40	1.607	2.317

Table 3 Correlation analysis of self-regulatory fatigue, suicidal ideation, experiential avoidance, and negative life events ($n = 562$)

Variable	Self-Regulatory Fatigue	Experiential Avoidance	Suicidal Ideation	Negative Life Events
Self-Regulatory Fatigue	1	0.731**	0.715**	0.558**
Experiential Avoidance	0.731**	1	0.586**	0.547**
Suicidal Ideation	0.715**	0.586**	1	0.518**
Negative Life Events	0.558**	0.547**	0.518**	1

$P < 0.01$ (two-tailed). All correlations are significant at the 0.01 level

Table 4 Mediation effect of experiential avoidance

Regression Equation		Fitting Index			Coefficient Significance		Confidence Interval	
Outcome	Predictive variable	R	R^2	F	β	t-Value	Lower Limit	Upper Limit
Suicidal Ideation	Self-Regulatory Fatigue	0.7229	0.5226	67.1287	0.5610	23.7871 ***	0.5146	0.6073
Experiential Avoidance	Self-Regulatory Fatigue	0.7406	0.5485	74.5159	0.3567	25.1640 ***	0.3288	0.3845
Suicidal Ideation	Experiential Avoidance	0.7278	0.5296	62.0463	0.2028	2.8822 **	0.0646	0.3409
	Self-Regulatory Fatigue				0.4886	14.2338***	0.4212	0.5561

Standardized coefficients*** $p < 0.001$,** $p < 0.01$

Table 5 Bootstrap 95% confidence intervals for effects of self-regulatory fatigue on suicidal ideation

Effect	Effect Value	Standard Error	Lower Limit	Upper Limit	Ratio to Total Effect
Total Effect	0.5610	0.0236	0.5146	0.6073	-
Direct Effect	0.4886	0.0343	0.4212	0.5561	87.09%
Indirect Effect	0.0723	0.0336	0.0059	0.1398	12.89%

suicidal ideation ($R^2 = 0.5226$, F = 67.1287, $p < 0.001$). This large effect size (Cohen's $f^2 = 1.10$) aligns with hypotheses positing a direct link between self-regulatory depletion and suicidal thoughts.

Direct effect

After accounting for experiential avoidance, the direct effect remained significant (β = 0.4886, $p < 0.001$, 95% CI [0.4212, 0.5561]), indicating that 87.09% of the total effect (Ratio to Total Effect = 87.09%) persisted independent of the mediator. This suggests additional pathways beyond experiential avoidance contribute to suicidal ideation.

Mediation pathway

Self-Regulatory Fatigue → Experiential Avoidance: A robust positive association was observed (β = 0.3567, $p < 0.001$, 95% CI [0.3288, 0.3845]), with self-regulatory fatigue explaining 54.85% of the variance in experiential avoidance ($R^2 = 0.5485$, F = 74.5159, $p < 0.001$).

Experiential Avoidance → Suicidal Ideation: Experiential avoidance independently predicted suicidal ideation (β = 0.2028, $p < 0.01$, 95% CI [0.0646, 0.3409]), contributing 12.89% to the total effect. The indirect effect (β = 0.0723, 95% CI [0.0059, 0.1398]) was statistically significant, as the bootstrap CI did not include zero.

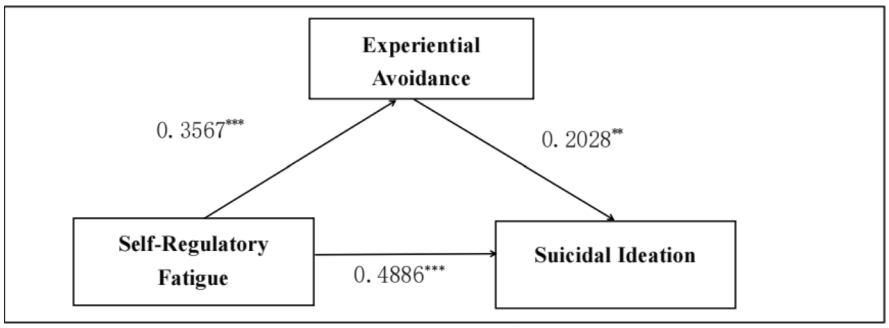
These findings suggest that experiential avoidance partially mediates the relationship between self-regulatory fatigue and suicidal ideation among nursing students. The mediation path is illustrated in Fig. 3.

Moderation analysis

All variables were standardized prior to analysis. Negative life events were tested as a moderator in the established mediation model using Model 7 of the PROCESS macro, with demographic variables controlled. Results are shown in Table 6.

In the first stage of the mediation pathway (self-regulatory fatigue → experiential avoidance), negative life events significantly moderated this relationship. The interaction term between self-regulatory fatigue and negative life events was statistically significant (β = 0.1097, $p = 0.0063$), with a 95% confidence interval

(CI) of [0.0312, 0.1882], indicating that the strength of the association between self-regulatory fatigue and experiential avoidance varied depending on the level of negative life events. The moderation model explained 57.92% of the variance in experiential avoidance ($R^2 = 0.5792$, $F = 68.8097$, $p < 0.001$), with the interaction term contributing a small but meaningful incremental effect ($\Delta R^2 = 0.0058$, $f^2 = 0.0123$, reflecting a modest effect size according to Cohen's benchmarks).



***0.001Significant level; **Significant at 0.01 level

Fig. 3 Mediation path map of self-regulatory fatigue, experiential avoidance, and suicidal ideation

Table 6 Moderating effect of negative life events on the relationship between self-regulatory fatigue and experiential avoidance

Regression Equation		Effect Value & Significance			95% Confidence Interval		R	R2	F
Outcome Variable	Predictor Variable	β	t	P	LLCI	ULCI			
Experiential Avoidance	Self-Regulatory Fatigue	0.6554	18.2333	0.000	0.5848	0.726	0.7610	0.5792	68.8097***
	Negative Life Events	0.1256	3.0319	0.0025	0.0442	0.207			
	Negative Life Events × Self-Regulatory Fatigue	0.1097	2.7443	0.0063	0.0312	0.1882			

*** $p < 0.001$

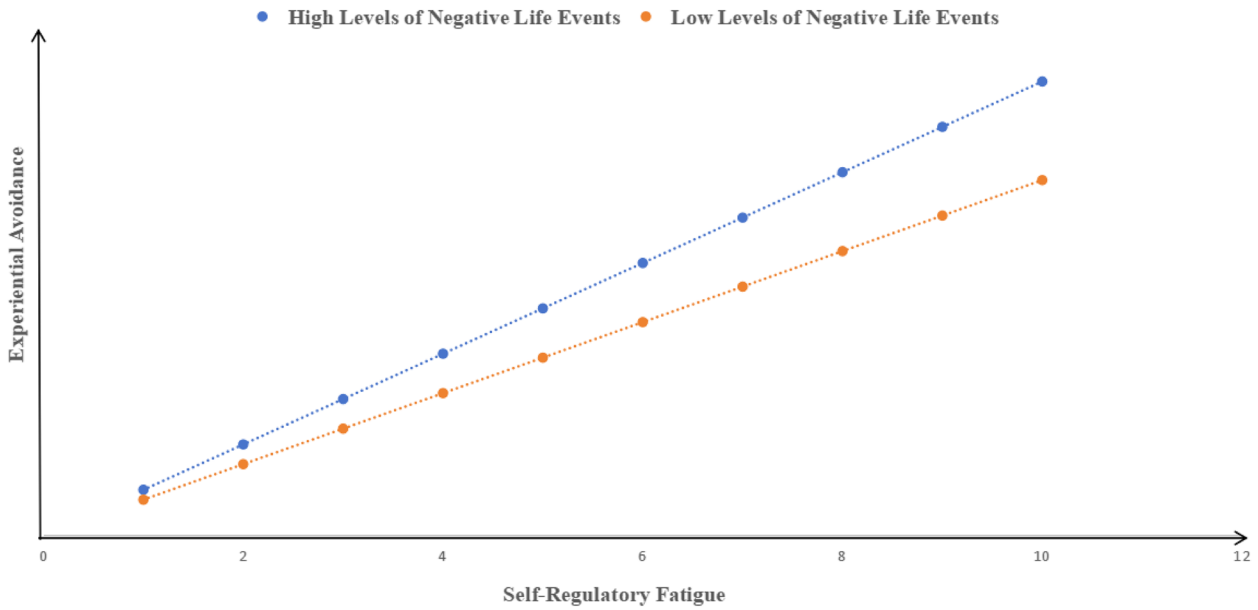


Fig. 4 Moderation path map of the relationship between self-regulatory fatigue and experiential avoidance by negative life events

Simple slope analysis (Fig. 4) revealed that at low levels of negative life events (M − 1 SD), self-regulatory fatigue remained positively associated with experiential avoidance, though the effect was weaker (β = 0.272, t = 14.412, $p < 0.001$; 95% CI [0.235, 0.309]). At high levels of negative life events (M + 1 SD), this association strengthened substantially (β = 0.374, t = 11.072, $p < 0.001$; 95% CI [0.307, 0.441]). This suggests that individuals exposed to higher negative life events experienced a 37.4% increase in experiential avoidance per unit increase in self-regulatory fatigue, compared to a 27.2% increase for those with fewer negative life events. The widening gap between slopes underscores the exacerbating role of negative life events.

The findings align with the hypothesis that negative life events exacerbate the impact of self-regulatory fatigue on experiential avoidance.

Discussion

This study aimed to examine the relationships between self-regulatory fatigue, experiential avoidance, and suicidal ideation among nursing students, focusing on the mediating role of experiential avoidance and the moderating role of negative life events. The findings provide crucial insights into the psychological mechanisms that may contribute to the heightened risk of suicidal ideation in high-stress populations, such as nursing students.

Association between self-regulatory fatigue and suicidal ideation

The strong direct association between self-regulatory fatigue and suicidal ideation (87% of the total effect) supports our hypothesis that resource depletion plays a central role in suicidal vulnerability. This finding aligns with Ego-Depletion Theory [10], suggesting that nursing students experiencing chronic self-regulatory demands may lack the cognitive resources necessary to reframe negative thoughts. This depletion creates a "cognitive vacuum", within which suicidal ideation may emerge as a perceived escape route. Notably, our observed effect size (Cohen's $f^2 = 1.10$) substantially exceeds commonly reported effect sizes for psychological predictors of suicidality [38], suggesting that self-regulatory fatigue may be a critical target for intervention in this population.

The persistence of a significant direct effect even after accounting for experiential avoidance suggests that additional mechanisms may be at play, warranting further exploration. Potential candidates include social disconnectedness or deficits in future orientation [39, 40], both of which are theoretically linked to regulatory exhaustion.

The mediating role of experiential avoidance

The partial mediation (12.89% of the total effect) supports our hypothesis that experiential avoidance functions as an amplifying pathway between regulatory fatigue and suicidality. This "vicious cycle" mechanism unfolds in two key stages:

> Stage 1: Depleted self-regulatory capacity (β = 0.36) leads to a greater reliance on avoidance strategies to manage distress, consistent with the "least effort" principle of exhausted cognition [41].
> Stage 2: Avoidance paradoxically contributes to increased suicidal risk (β = 0.20), potentially by suppressing emotions without effective resolution, creating a buildup of psychological pressure that demands release [42].

The relatively modest mediation effect has two important implications:

> Clinical: Targeting avoidance alone may yield limited benefits, given the strength of the direct pathway.
> Theoretical: The Dual-Process Model [43] may better explain these findings—regulatory fatigue impairs reflective processing (direct path) while also increasing impulsive avoidance (indirect path).

This pattern is consistent with recent network analyses showing that suicidal ideation arises as a convergence point of multiple maladaptive pathways [44]. These findings highlight the need for comprehensive interventions that address both regulatory capacity and coping flexibility.

Moderating role of negative life events

This study strongly supports our hypothesis that negative life events intensify the relationship between self-regulatory fatigue and experiential avoidance. The moderated mediation analysis revealed a significant interaction effect (β = 0.1097, $p = 0.0063$), indicating that individuals facing frequent stressors (e.g., family crises, academic pressures) are more likely to adopt avoidance behaviors when emotionally depleted. This finding aligns with resource depletion theory: coping with multiple stressors drains psychological resources, leaving individuals less able to regulate emotions and more inclined to use avoidance as a "last-resort" strategy [11, 25].

The simple slope analysis further clarifies this dynamic. At low stress levels, self-regulatory fatigue still predicted avoidance (β = 0.272, $p < 0.001$), but this relationship nearly doubled in strength for those experiencing high negative life events (β = 0.374, $p < 0.001$). Practically, this means that every unit increase in self-regulatory fatigue

results in a 37% increase in avoidance behaviors among highly stressed individuals, compared to 27% in those with lower stress levels—representing a critical divergence with important clinical implications. For example, nursing students balancing academic and clinical demands may increasingly rely on avoidance as stress accumulates, thereby perpetuating cycles of burnout [45].

While the moderation effect explained limited variance ($\Delta R^2 = 0.0058$), its real-world significance is amplified in high-stress contexts. Even small increases in avoidance behaviors can escalate mental health risks over time [46]. This underscores the stress-vulnerability model: chronic stressors reduce resilience, making maladaptive coping strategies more appealing despite their long-term harm [24]. Interventions aimed at reducing stress (e.g., mindfulness training) or replenishing resources (e.g., peer support networks) could help disrupt this cycle, particularly among healthcare trainees [47].

In summary, negative life events do not merely correlate with self-regulatory fatigue and avoidance—they actively amplify the pathway between them. This highlights the need to address external stressors in interventions designed to improve coping strategies among high-risk populations.

Implications for practice

The findings from this study have important implications for the mental health of nursing students:

Managing Self-Regulatory Fatigue: Interventions aimed at reducing self-regulatory fatigue are crucial. Institutions should focus on creating environments that promote emotional regulation, offering resources like mindfulness training and counseling services. These measures may help students manage stress more effectively and reduce the impact of emotional exhaustion [48].

Addressing Experiential Avoidance: Since experiential avoidance mediates the relationship between self-regulatory fatigue and suicidal ideation, interventions that encourage students to process, rather than avoid, their emotions may be beneficial. Techniques like Acceptance and Commitment Therapy (ACT) could help students develop psychological flexibility and adaptively cope with distressing emotions [49].

Supporting Students Through Life Stressors: Given the moderating role of negative life events, targeted support should be provided to students experiencing significant life stressors. This could include building robust social support networks, providing counseling, and offering community-building activities to buffer the effects of external stressors [50].

Limitations and future directions

First, the cross-sectional design limits the ability to make causal inferences. Since data were collected at a single point in time, it is not possible to determine the directionality or causality of the observed relationships between self-regulatory fatigue, experiential avoidance, and suicidal ideation. Future research should employ longitudinal or experimental designs to better establish causal relationships and track changes over time. Such studies could help clarify whether self-regulatory fatigue leads to increased experiential avoidance, which in turn contributes to suicidal ideation, or if these variables interact in a different sequence. Second, the sample was limited to nursing students from one university, and future studies should aim to include more diverse populations. Finally, while socio-demographic variables were controlled, other potential risk factors for suicidal ideation were not examined and should be explored in future research.

Conclusion

This study highlights significant associations between self-regulatory fatigue, experiential avoidance, and suicidal ideation among nursing students. It emphasizes the mediating role of experiential avoidance and the moderating effect of negative life events, underscoring the importance of addressing emotional regulation and coping strategies in this population. Interventions aimed at reducing self-regulatory fatigue, enhancing emotional regulation, and supporting students through life stressors can improve nursing students' mental health and well-being. Future research should explore these relationships using more robust study designs and diverse samples.

Abbreviations

SRF	Self-Regulatory Fatigue
ACT	Acceptance and Commitment Therapy
WHO	World Health Organization
H1	Hypothesis 1
H2	Hypothesis 2
H3	Hypothesis 3
ASLEC	Adolescent Self-Rating Life Events Checklist
Cronbach's α	Cronbach's Alpha
KMO	Kaiser–Meyer–Olkin
SPSS	Statistical Package for the Social Sciences
CI	Confidence Interval
β	Beta coefficient
P	Probability value
t	T-statistic
ΔR^2	Change in R-squared

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Authors' contributions
JX: Investigation, data management, resources, writing. PD: Fund acquisition, methodology, investigation, methodology, resources, software, supervision, writing. YS: Investigation, data management, writing. FW: Investigation, Writing, Methods. ZY: Data management, investigation, methodology, resources, software, validation, supervision.CD: Investigation, resources, writing. HX: Writing and polishing. LH: Chart making.

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Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
This study is based on a study approved by the ethics committee of the Second Affiliated Hospital of Harbin Medical University, with the ethics code KY2024-013. Participants will understand the purpose and methods of this study before it begins. Informed consent was obtained from the participants prior to the start of the study. Participants were also informed that the researchers were committed to answering their questions and that their information would be kept confidential. Additionally, participants were made aware that their participation in the study was voluntary.

Consent for publication
Agreed to release: "Not applicable".

Competing interests
The authors declare no competing interests.

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