

# Influence of Negative Attentional Bias on Self-Management and Health-Promoting Behaviors in Orthopedic Patients with Chronic Refractory Wounds: A Structural Equation Modeling Approach

Su-Feng Yin, Fei-Fei Bian, Hai-Xia Li

Department of Orthopedics, The Affiliated Taizhou People's Hospital of Nanjing Medical University, Taizhou, Jiangsu, 225300, People's Republic of China

Correspondence: Hai-Xia Li, Department of Orthopedics, The Affiliated Taizhou People's Hospital of Nanjing Medical University, Taizhou, Jiangsu, 225300, People's Republic of China, Tel +86 0523-86820566, Email haixialihx@163.com

**Objective:** This study aimed to investigate the status of negative information attentional bias, self-management, and health-promoting behaviors among patients with chronic refractory wounds receiving orthopedic care. Additionally, the study sought to construct a structural equation model (SEM) to evaluate the influence of negative attentional bias on self-management and health-promoting behaviors, with the intent of informing the clinical implementation of evidence-based health behavior education programs.

**Methods:** A total of 226 patients with chronic refractory wounds under orthopedic treatment at a single institution between January 2020 and December 2022 were enrolled in this study. Data were collected using a general information questionnaire, the Negative Cognitive Processing Bias Questionnaire, the Chronic Disease Self-Management Scale (CDSMS), and the Health-Promoting Lifestyle Profile II (HPLP-II). Pearson's correlation analysis was conducted to assess associations among negative attentional bias, self-management, and health-promoting behaviors. SEM using Amos 21.0 was conducted to examine potential mediating effects.

**Results:** Health-promoting behaviors demonstrated a positive correlation with self-management and a negative correlation with negative attentional bias. Furthermore, self-management was negatively correlated with negative attentional bias (all  $p < 0.05$ ). SEM indicated that negative attentional bias partially mediated the relationship between self-management and health-promoting behaviors, accounting for 31.65% of the total effect.

**Conclusion:** Negative attentional bias mediates the association between self-management and health-promoting behaviors among patients with chronic refractory wounds receiving orthopedic care. These findings suggest that enhancing self-management may improve engagement in health-promoting behaviors by reducing the influence of negative attentional bias.

**Keywords:** health-promoting behaviors, chronic refractory wounds, orthopedics, negative information attentional bias, structural equation modeling

## Introduction

Chronic wounds are clinically defined as wounds that fail to heal or demonstrate no tendency toward healing after more than one month of treatment.<sup>1</sup> It is estimated that approximately 1%–2% of the global population experiences persistent wounds, with the incidence of chronic refractory wounds showing a yearly increase.<sup>2</sup> Chronic refractory wounds in orthopedic settings are characterized by a high risk of infection and recurring bacterial biofilm formation.<sup>3</sup> In the absence of timely and appropriate intervention, these wounds may result in significant patient distress, including pain and anxiety, prolonged hospitalization, increased healthcare costs, and in severe cases, life-threatening complications. These wounds represent substantial challenges to clinical practice, placing additional strain on healthcare resources and institutions.

Currently, wound debridement and flap transplantation remain the primary therapeutic approaches.<sup>4</sup> However, the effectiveness of these interventions in managing chronic refractory wounds remains limited, with adverse impacts on both physical health and psychological well-being. Therefore, the promotion of health-supportive behaviors among individuals with chronic refractory wounds has become a growing area of focus. Health-promoting behaviors encompass a range of actions undertaken to achieve positive health outcomes. These behaviors play a vital role in preventing disease-related complications, reducing pathogenicity, maintaining functional independence, and enhancing quality of life. They are recognized as key determinants of recovery and long-term health maintenance.<sup>5</sup> As early as 2003, the World Health Organization emphasized that sustained and effective self-management significantly improves health outcomes in individuals with chronic conditions.<sup>6</sup> Individuals affected by chronic refractory wounds frequently experience prolonged psychological stress and may exhibit negative emotional reactions such as fear, anxiety, depression, and sleep disturbances, which are often associated with various forms of attentional bias.<sup>7</sup> Attention bias refers to the cognitive tendency to selectively focus on and process specific types of information in response to external stimuli—often prioritizing negative content.<sup>8</sup>

To date, limited empirical evidence exists regarding the mechanisms through which negative information attentional bias may influence these behaviors in patients with chronic refractory wounds receiving orthopedic care. Based on the hypothesis that “self-management influences health-promoting behaviors by regulating negative information attentional bias,” the present study employs a structural equation model (SEM) to investigate the underlying associations among these variables. The aim is to elucidate the mediating role of negative attentional bias and to establish a theoretical foundation for the development of targeted and effective interventions for this population.

## Subjects and Methods

### Study Participants

A total of 226 patients with chronic refractory wounds who received treatment in the department of orthopedics at a medical facility between January 2020 and December 2022 were recruited using a convenience sampling method. This study was approved by the ethics committee of the Affiliated Taizhou People’s Hospital of Nanjing Medical University.

Inclusion criteria were as follows: ① Patients presenting with non-healing or poorly healing wounds following fracture surgery, postoperative wound infections, or open fractures accompanied by tissue defects; ② Age > 18 years; ③ Wounds persisting without signs of healing after more than one month despite treatment; ④ Availability of complete clinical data; ⑤ Voluntary participation with informed consent.

Exclusion criteria included: ① Obvious complications, including gangrene, sepsis, and severe systemic inflammatory response;<sup>9</sup> ② Severe neurovascular injury or active bleeding; ③ Inability to comprehend or complete the questionnaire; ④ Withdrawal from the study or loss to follow-up; ⑤ Presence of severe organ dysfunction or malignancy.

Sample size was calculated using the formula:  $N = Z^2 \times [P \times (1-P)] / E^2$ , where  $Z = 1.96$  (standard normal deviate),  $P = 0.5$  (estimated proportion), and  $E = 10\%$  (margin of error). The calculation yielded a minimum required sample size of  $N = 96$ . To account for possible data loss and to ensure data reliability, a 10% adjustment was applied, resulting in a target sample size of 106 participants. Ultimately, 226 participants met the eligibility criteria and were included in the analysis.

## Methods

### Survey Instruments

(1) General data questionnaire: A self-designed questionnaire was used to collect demographic and clinical data, including variables such as sex, age, and wound type.

(2) Negative cognitive processing bias questionnaire: This instrument, developed by Yan et al in 2017, assesses items across four dimensions: negative rumination bias, negative interpretation bias, negative memory bias, and negative attentional bias.<sup>10</sup> It consists of 24 items rated on a 4-point Likert scale, yielding a total score ranging from 24 to 96. Higher scores indicate a greater tendency toward negative cognitive processing. The scale demonstrates strong internal consistency, with a reported Cronbach’s  $\alpha$  coefficient of 0.893.

(3) Chronic Disease Self-Management Study Measures (CDSMS): originally developed by Stanford University, this scale evaluates self-management behaviors in individuals with chronic conditions. It contains 15 items across 3 dimensions: cognitive symptom management, physical activity, and communication with healthcare providers. The physical activity dimension is scored on a 5-point Likert scale based on weekly exercise duration: 0 points (no exercise), 1 point (< 30 minutes), 2 points (30–59 minutes), 3 points (1–3 hours), and 4 points (> 3 hours). The cognitive symptom management and communication dimensions are scored using a 6-point Likert scale, ranging from 0 (never) to 5 (always). The total possible score ranges from 0 to 69, with higher scores indicating better self-management.<sup>11</sup> Reported Cronbach's  $\alpha$  coefficients range from 0.83 to 0.92 indicating good reliability.

(4) Health-Promoting Lifestyle Profile II (HPLP-II): Developed by Walker et al, this instrument assesses health-promoting behaviors through 52 items across 6 dimensions: health responsibility, self-actualization, interpersonal relationships, nutrition, physical activity, and stress management.<sup>12</sup> Each item is rated on a 4-point Likert scale, with a total score ranging from 52 to 208. Higher scores reflect more favorable health-promoting behaviors. The scale has demonstrated good internal consistency, with Cronbach's  $\alpha$  coefficient ranging from 0.80 to 0.91.

### Survey Procedures

This cross-sectional study utilized both online and offline questionnaires to collect data from patients with chronic refractory wounds undergoing orthopedic treatment. For participants unable to independently complete the questionnaires, trained medical staff provided assistance by reading each item aloud and recording the participant's responses. Investigators were instructed to clarify any content-related queries without influencing their responses. Offline data collection was conducted through paper-based questionnaires distributed during outpatient follow-up visits. Online responses were collected via digital platforms such as WeChat, QQ, and email. A total of 240 questionnaires were distributed. Following data screening, responses exhibiting uniform answer patterns or involving more than 10% missing data were excluded. Finally, 226 valid questionnaires were retained for analysis.

### Statistical Analysis

Data entry and statistical analysis were performed using SPSS version 25.0. Categorical variables following a normal distribution are presented as  $n$  (%), and continuous variables are presented as mean  $\pm$  standard deviation ( $\bar{x} \pm s$ ). Pearson's correlation analysis was used to examine relationships among variables. SEM was performed using Amos version 21.0. A two-sided  $p$ -value of less than 0.05 was considered statistically significant.

## Results

### Clinical and Demographic Characteristics of Patients with Chronic Refractory Wounds Receiving Orthopedic Care

A total of 226 patients with chronic refractory wounds receiving orthopedic care were included in the analysis. Among them, 148 were male (65.49%) and the mean age was  $62.34 \pm 8.36$  years. The distribution of wound types was as follows: traumatic wounds (72 cases, 31.86%), infectious wounds (32 cases, 14.16%), pressure injuries (28 cases, 12.39%), non-healing postoperative wounds (41 cases, 18.14%), and other types (53 cases, 23.45%). The average wound duration was  $86.62 \pm 10.25$  days, and the average wound depth was  $2.35 \pm 0.35$  cm. Regarding marital status, 167 patients (73.89%) were married, and 24 patients (10.62%) had no children. In terms of educational attainment, 127 patients (56.19%) had a junior high school education or below. Employment status indicated that 85 patients (37.61%) were currently employed. Monthly family income exceeded RMB 5,000 for 152 patients (67.26%). Additionally, 115 patients (50.88%) lived in urban areas.

### Scores for Negative Information Attentional Bias, Self-Management, and Health-Promoting Behaviors

Among the 226 patients, the mean score for negative information attentional bias was  $66.57 \pm 9.54$ . The mean score for self-management was  $36.65 \pm 4.57$ , and the mean score for health-promoting behaviors was  $132.13 \pm 16.87$ . Detailed descriptive statistics are presented in [Table 1](#).

**Table 1** Scores of Negative Information Attentional Bias, Self-Management, and Health-Promoting Behaviors in Patients with Chronic Refractory Wounds Receiving Orthopedic Care (Points)

Item	No. of Items	Total Score Range	Total Score ( $\bar{x} \pm s$ )	Average Per Item ( $\bar{x} \pm s$ )
Total Negative Information Attentional Bias	24	24~96	66.57 $\pm$ 9.54	2.77 $\pm$ 0.40
Negative Rumination Bias	8	8~32	22.94 $\pm$ 2.36	2.87 $\pm$ 0.30
Negative Interpretation Bias	4	4~16	10.64 $\pm$ 1.45	2.66 $\pm$ 0.36
Negative Memory Bias	10	10~40	27.34 $\pm$ 3.42	2.73 $\pm$ 0.34
Negative Attentional Bias	2	2~8	5.62 $\pm$ 0.55	2.82 $\pm$ 0.28
Total Self-Management	15	0~69	36.65 $\pm$ 4.57	2.44 $\pm$ 0.30
Cognitive Symptom Management	6	0~30	20.84 $\pm$ 3.42	3.47 $\pm$ 0.57
Physical Exercise	6	0~24	4.28 $\pm$ 0.25	0.71 $\pm$ 0.04
Communication With Physicians	3	0~15	11.53 $\pm$ 2.12	3.84 $\pm$ 0.71
Total Health-Promoting Behaviors	52	52~208	132.13 $\pm$ 16.87	2.54 $\pm$ 0.32
Health Responsibility	9	9~36	22.35 $\pm$ 3.45	2.48 $\pm$ 0.38
Self-Actualization	9	9~36	19.24 $\pm$ 2.23	2.14 $\pm$ 0.25
Interpersonal Relationships	9	9~36	19.15 $\pm$ 2.18	2.13 $\pm$ 0.24
Nutrition	9	9~36	33.39 $\pm$ 4.36	3.71 $\pm$ 0.48
Stress Management	8	8~32	20.37 $\pm$ 3.25	2.55 $\pm$ 0.41
Physical Exercise	8	8~32	17.63 $\pm$ 2.19	2.20 $\pm$ 0.27

## Correlation Analysis of Health-Promoting Behaviors with Self-Management and Negative Information Attentional Bias

Correlation analysis indicated that the total score for health-promoting behaviors, along with scores for its six sub-dimensions, was positively correlated with the total self-management score and its three subdimensions ( $r = 0.112$  to  $0.772$ ,  $p < 0.05$ ). In contrast, the total score for health-promoting behaviors and each of its six subdimensions was negatively correlated with the total score for negative information attentional bias and its four subdimensions ( $r = -0.787$  to  $-0.111$ ,  $p < 0.05$ ). Additionally, the self-management and its three subdimensions exhibited significant negative correlations with negative information attentional bias and its four subdimensions ( $r = -0.634$  to  $-0.114$ ,  $p < 0.05$ ). Detailed correlation coefficients are presented in [Table 2](#).

## Structural Equation Modeling of the Mediating Role of Negative Information Attentional Bias

Structural equation modeling (SEM) was employed to investigate the mediating role of negative information attentional bias in the relationship between self-management and health-promoting behaviors. In the hypothesized model, health-promoting behaviors were set as the dependent variable, self-management as the independent variable, and negative information attentional bias as the mediating variable. The dimensions of each scale served as observed variables. Model parameters were estimated using the maximum likelihood (ML) method. Two modification paths (e3 to e9 and e7 to e14) were introduced to improve model fit. The final model demonstrated acceptable goodness-of-fit indices: Chi-square/df ( $\chi^2/df$ ) = 1.582, Root Mean Square Error of Approximation (RMSEA) = 0.046, Normed Fit Index (NFI) = 0.925, Incremental Fit Index (IFI) = 0.930, Comparative Fit Index (CFI) = 0.935, Goodness of Fit Index (GFI) = 0.928, Relative Fit Index (RFI) = 0.936, and Adjusted Goodness of Fit Index (AGFI) = 0.916. All indices met standard thresholds, indicating a well-fitting model. The final path diagram is shown in [Figure 1](#).

**Table 2** Correlation Analysis of Health-Promoting Behaviors with Self-Management and Negative Information Attentional Bias in Patients with Chronic Refractory Wounds Receiving Orthopedic Care (r-Value,  $p < 0.05$ )

Variable	Total Negative Information Attentional Bias	Negative Rumination Bias	Negative Interpretation Bias	Negative Memory Bias	Negative Attentional Bias	Total Self-Management	Cognitive Symptom Management	Physical Exercise	Communication with Physicians	Total Health-Promoting Behaviors	Health Responsibility	Self-Actualization	Interpersonal Relationships	Nutrition	Stress Management
Negative Rumination Bias	0.512**	I													
Negative Interpretation Bias	0.3647**	0.317**	I												
Negative Memory Bias	0.581**	0.516**	0.116*	I											
Negative Attentional Bias	0.346**	0.113*	0.405**	0.536**	I										
Total Self-Management	-0.625**	-0.524**	-0.116*	-0.425**	-0.502**	I									
Cognitive Symptom Management	-0.402**	-0.431**	-0.414**	-0.347**	-0.536**	0.582**	I								
Physical Exercise	-0.116*	-0.114*	-0.279**	-0.485**	-0.125*	0.642**	0.104*	I							
Communication With Physicians	-0.634**	-0.428**	-0.314**	-0.536**	-0.425**	0.247**	0.365**	0.116*	I						
Total Health-Promoting Behaviors	-0.787**	-0.352**	-0.582**	-0.421**	-0.118*	0.772**	0.482**	0.436**	0.462**	I					
Health Responsibility	-0.438**	-0.635**	-0.517**	-0.258**	-0.462**	0.582**	0.116*	0.428**	0.236**	0.685**	I				
Self-Actualization	-0.589**	-0.424**	-0.114*	-0.752**	-0.432**	0.572**	0.105*	0.122*	0.418**	0.436**	0.117*	I			
Interpersonal Relationships	-0.314**	-0.525**	-0.416**	-0.332**	-0.411**	0.364**	0.287**	0.474**	0.469**	0.119*	0.241**	0.692**	I		
Nutrition	-0.408**	-0.102*	-0.111*	-0.524**	-0.368*	0.482**	0.687**	0.715**	0.547**	0.566**	0.124*	0.519**	0.625**	I	
Stress Management	-0.362**	-0.122*	-0.116*	-0.404**	-0.347**	0.112*	0.364**	0.524**	0.317**	0.428**	0.534**	0.500**	0.426**	0.501**	I
Physical Exercise	-0.587**	-0.366**	-0.417**	-0.313**	-0.436**	0.402**	0.554**	0.414**	0.113*	0.417**	0.426**	0.517**	0.325**	0.362**	0.524**

Note: \* indicates  $p < 0.05$ ; \*\* indicates  $p < 0.01$ .

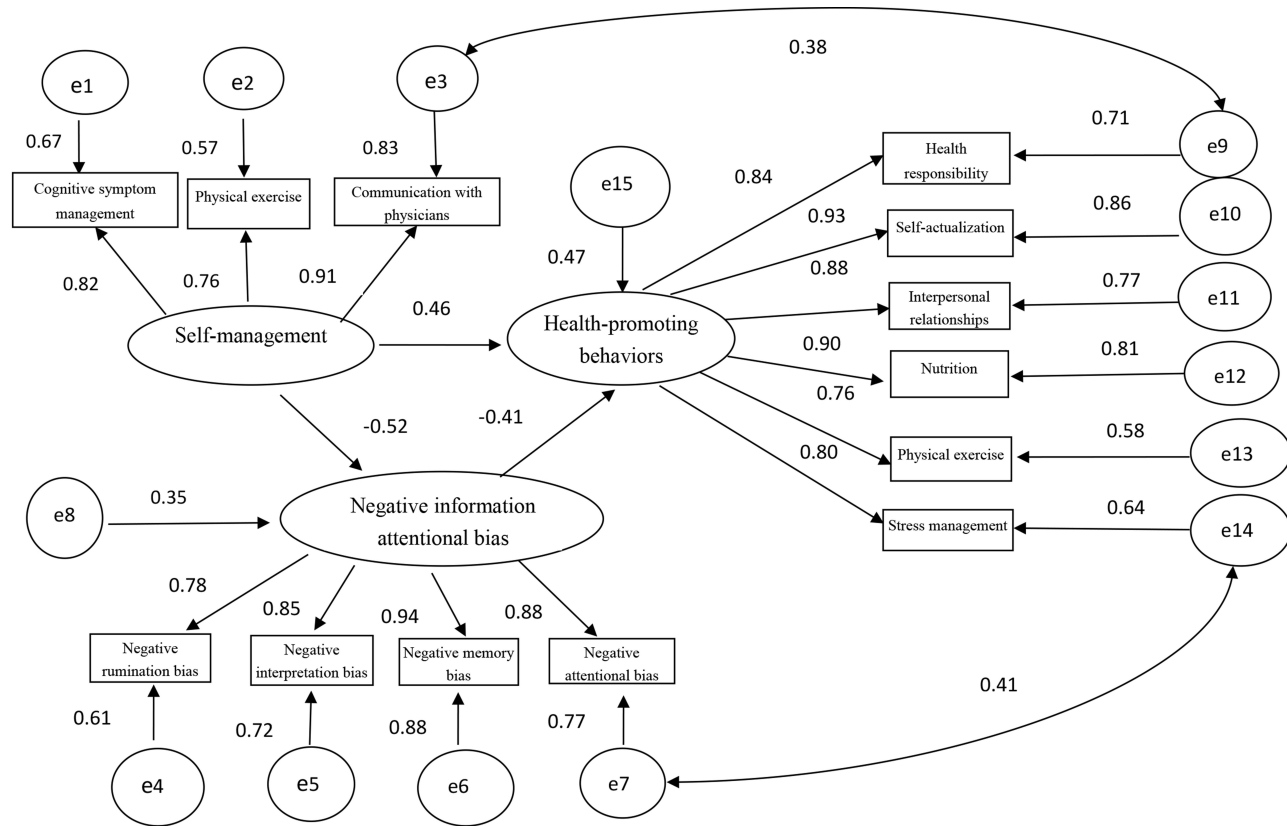


Figure 1 Mediating Effect Model.

### Effect Relationship

The mediating effect of negative information attentional bias on the association between self-management and health-promoting behaviors was assessed using the bias-corrected bootstrap method with resampling and calculation of a 95% confidence interval (CI). The results indicated that the 95% CI for the indirect effect was (0.212, 0.495), which did not include zero, thereby confirming the presence of a statistically significant mediating effect. The indirect effect of negative information attentional bias was calculated as  $0.52 \times 0.41 = 0.213$ . This indirect effect accounted for 31.65% of the total effect, derived from the formula:  $[0.213 / (0.213 + 0.46)] \times 100\% = 31.65\%$ . These findings demonstrate that negative information attentional bias serves as a partial mediator in the relationship between self-management and health-promoting behaviors. Detailed effect estimates are presented in Table 3.

Table 3 Path Coefficients of the Mediating Effect Model

Path	Effect Value	Proportion of Mediating Effect	p-value
Self-Management → Health-Promoting Behaviors	0.46	-	<0.05
Self-Management → Negative Information Attentional Bias	-0.52	-	<0.05
Negative Information Attentional Bias → Health-Promoting Behaviors	-0.41	-	<0.05
Self-Management → Negative Information Attentional Bias → Health-Promoting Behaviors	0.213	31.65%	<0.05

## Discussion

### Analysis of Health-Promoting Behaviors, Self-Management, and Negative Information Attentional Bias in Patients with Chronic Refractory Wounds Receiving Orthopedic Care

Health-promoting behaviors refer to proactive and positive actions undertaken by individuals to enhance and maintain their health status, aiming to enhance quality of life. These behaviors include managing negative emotions, maintaining a balanced diet, physical activity, and utilizing healthcare services appropriately.<sup>13</sup> In the present study, the mean health-promoting behavior score was  $132.13 \pm 16.87$ , which falls within a moderate range compared to the scale's midpoint of 130. In the context of chronic disease management, the promotion of health-related behaviors is considered a critical component of clinical treatment. However, the prolonged treatment course required for chronic refractory wounds, requiring repeated debridement and frequent dressing changes, can diminish patient motivation and adherence. Additionally, persistent symptoms including pain and exudate, may contribute to heightened environmental sensitivity, social withdrawal, and reduced engagement with health-promoting behaviors. These factors may delay recovery, increase the risk of wound recurrence, and impose additional burden on patients and their families.<sup>14</sup>

The mean self-management score among participants was  $36.65 \pm 4.57$ , slightly above the scale's midpoint score of 34.5, indicating a moderate level of self-management capability. Improvements in living standards and increased public health awareness have contributed to greater patient engagement in self-care. With widespread access to digital technologies and health-related content on social media platforms, individuals are actively using online resources to acquire disease-related knowledge and communicate with healthcare professionals. This approach facilitates timely problem-solving and informed decision-making. Nonetheless, the chronic nature of the condition can lead to role loss, diminished confidence, and negative emotions. These psychological responses, if unaddressed, may contribute to psychological disorders that impact their self-management capabilities.

Attention bias, originally conceptualized by MacLeod et al, refers to the tendency to allocate disproportionate attention to specific stimuli, often favoring negative over neutral or positive information.<sup>15,16</sup> In the present study, the mean score for negative information attentional bias was  $66.57 \pm 9.54$ , which is slightly above the scale's midpoint score of 60, suggesting a moderate-to-high level of attentional bias among participants. In clinical practice, common treatments such as debridement and dressing changes are often ineffective for chronic refractory wounds. This is primarily due to factors such as infection, poor blood supply, and necrotic tissue burden. Additionally, low local concentrations of growth factors impair cellular repair mechanisms by disrupting receptor-ligand interactions essential for tissue regeneration.<sup>1</sup> As a result, individuals with chronic wounds are often repeatedly exposed to adverse stimuli such as pain and fatigue, which may lead to preferential cognitive processing of negative information.<sup>17</sup> This attentional bias can reinforce emotional distress and further compromise health behaviors and recovery trajectories.

### Correlation Analysis of Health-Promoting Behaviors with Self-Management and Negative Information Attentional Bias

Results from Pearson's correlation analysis demonstrated significant associations between health-promoting behaviors, self-management, and negative information attentional bias in patients with chronic refractory wounds undergoing orthopedic treatment. Specifically, self-management was positively correlated with health-promoting behaviors, indicating that patients with higher self-management capabilities were more likely to engage in proactive and beneficial health behaviors. This finding is consistent with prior research by Hao et al.<sup>18</sup> It is supported by existing literature, which suggests that improved self-management can reduce the occurrence of related complications and improve health-promoting lifestyle behaviors.<sup>19,20</sup>

In routine clinical and daily contexts, individuals with stronger self-management abilities are more likely to adhere to prescribed treatment plans, perform regular wound care activities, and actively acquire health-related knowledge.<sup>21</sup> These individuals are more likely to function as autonomous managers of their health behaviors. Accordingly, healthcare professionals are encouraged to implement empowerment-based and educational methods tailored to the specific needs

and characteristics of patients with chronic refractory wounds undergoing orthopedic treatment.<sup>22</sup> This may assist in reducing maladaptive self-perceptions, fostering a sense of responsibility for self-care, and improving confidence in managing one's condition, thus reducing excessive dependence on family or healthcare providers and encouraging patient engagement in recommended health behaviors. Barcena et al<sup>23</sup> also suggested that improving patients' knowledge levels can reduce their excessive reliance on family members or healthcare providers and promote the adoption of relevant health behaviors.

Conversely, negative information attentional bias was found to be negatively correlated with health-promoting behaviors, indicating that higher levels of negative information attentional bias are associated with reduced engagement in health-promoting activities.<sup>24</sup> Persistent negative cognitive processing may limit psychological resilience and manifest as symptoms resembling post-traumatic stress disorder.<sup>25</sup> Previous research has identified that prolonged negative information attentional bias as a contributing factor to the maintenance of negative affective states, such as anxiety and depression, thereby increasing susceptibility to psychological distress.<sup>8</sup> Furthermore, individuals exhibiting heightened negative attentional bias often overestimate threats and underestimate coping resources, which may predispose them to stress-related disorders and impede the adoption of adaptive health behaviors.<sup>26</sup> Given these findings, it is recommended that healthcare professionals routinely assess for the presence and severity of attentional bias during clinical evaluation. Early identification may provide a valuable entry point for designing interventions aimed at mitigating psychological distress. Addressing attentional bias can support patients in strengthening their belief in recovery, improving adherence to treatment, and ultimately enhancing their overall quality of life.

## Mediating Effect of Self-Management and Negative Information Attentional Bias on Health Promotion Behaviors

The SEM results from this study indicate that self-management exerts both a direct and indirect positive influence on health-promoting behaviors. The indirect effect is mediated by negative information attentional bias, supporting the hypothesized pathway. Self-management is defined as an individual's ability to utilize internal resources to adopt health-supportive behaviors, control symptoms, prevent complications, and sustain optimal health outcomes.<sup>27</sup>

The relationship between self-management and attentional bias appears to be closely tied to emotional regulation and psychological adaptability. Negative information attentional bias often arises in response to the psychological burden imposed by persistent disease symptoms. Therefore, individuals with stronger self-management capabilities are typically more effective in regulating emotions, managing stress, and mitigating the influence of attentional bias. Moreover, those with higher levels of self-management are more likely to actively engage in problem-solving behaviors, including seeking assistance from family members or healthcare professionals when challenges exceed personal coping capacity. This is particularly evident in the domains of diet and exercise, both of which can contribute to the reduction of negative attentional bias. By adopting more adaptive coping strategies and reducing the salience of negative stimuli, individuals are better positioned to engage in proactive health behaviors. This cognitive shift may foster a stronger sense of responsibility for self-care and enhance adherence to therapeutic regimens, ultimately contributing to improved quality of life.

## Limitations

This study was constrained by practical conditions, which may have led to a preference for recruiting individuals who were more easily accessible. Such sampling tendencies may influence the sample composition and introduce potential bias. Future research should aim to include a more diverse and representative sample. Longitudinal studies could be conducted to assess causal relationships and track changes over time. Additionally, multi-center collaborations and larger sample sizes would enhance the generalizability of findings.

## Conclusion

This study demonstrates that patients with chronic, hard-to-heal orthopedic wounds exhibit moderate levels of health-promoting behaviors, self-management abilities, and negative attention bias. These findings highlight the importance of

addressing these factors in clinical practice. Negative attention bias plays a mediating role between self-management and health-promoting behaviors, indicating that self-management may partially influence health-promoting behaviors by modulating attention bias. Therefore, future clinical interventions should prioritize the development and enhancement of patients' self-management skills. The results of this study provide valuable evidence for healthcare professionals to design targeted interventions aiming at improving rehabilitation outcomes and quality of life for patients with chronic, hard-to-heal wounds.

## Abbreviations

SEM, structural equation modeling; CDSMS, Chronic Disease Self Management Study; HPLP-II, Health-Promoting Lifestyle Profile II; ML, maximum likelihood.

## Data Sharing Statement

All data generated or analysed during this study are included in this article. Further enquiries can be directed to the corresponding author.

## Ethics Approval and Consent to Participate

The study was conducted in accordance with the Declaration of Helsinki (as was revised in 2013). The study was approved by Ethics Committee of the Affiliated Taizhou People's Hospital of Nanjing Medical University (No. KY202004101). Written informed consent was obtained from all participants.

## Clinical Trial Registration

<http://www.chictr.org.cn>, identifier: ChiCTR2000035217, 2020-08-04.

## Acknowledgments

We are particularly grateful to all the people who have given us help on our article.

## Funding

No external funding received to conduct this study.

## Disclosure

The authors declare that they have no competing interests in this work.

## References

1. Wilkinson HN, Hardman MJ. Wound healing: cellular mechanisms and pathological outcomes. *Open Biol.* 2020;10(9):200223. doi:10.1098/rsob.200223
2. Li S, Mohamedi AH, Senkowsky J, Nair A, Tang L. Imaging in chronic wound diagnostics. *Adv Wound Care.* 2020;9(5):245–263. doi:10.1089/wound.2019.0967
3. Zhang HL, Gao WH, Liu XL, et al. Therapeutic efficacy of platelet-rich plasma combined with negative pressure wound therapy in refractory orthopedic wounds. *J Xixiang Med Univ.* 2018;35(1):45–49. doi:10.7683/xyxyxb.2018.01.011
4. Powers JG, Higham C, Broussard K, Phillips TJ. Wound healing and treating wounds: chronic wound care and management. *J Am Acad Dermatol.* 2016;74(4):607–626. doi:10.1016/j.jaad.2015.08.070
5. Andersen LL. Health promotion and chronic disease prevention at the workplace. *Annu Rev Public Health.* 2024;45(1):337–357. doi:10.1146/annurev-publhealth-060222-035619
6. Tang T, Gu ZJ, Xie WP, et al. Research progress on self-management in patients with multimorbidity. *Chin J Mod Nurs.* 2020;26(16):2101–2105. doi:10.3760/cma.j.cn115682-20191111-04111
7. Yan R, Strandlund K, Ci H, Huang Y, Zhang Y, Zhang Y. Analysis of factors influencing anxiety and depression among hospitalized patients with chronic wounds. *Adv Skin Wound Care.* 2021;34(12):638–644. doi:10.1097/01.ASW.0000797948.13759.ba
8. Farr Z, Broomfield NM, Coventry KR. A systematic review of attentional bias in problem gambling. *J Gambl Stud.* 2024;40(2):493–519. doi:10.1007/s10899-023-10260-9
9. Xiong Y, Mi B, Yan C, et al. Guideline for the diagnosis and treatment of chronic refractory wounds in orthopedic trauma patients (version 2023). *Chin J Trauma.* 2023;39(6):481–493. doi:10.3760/cma.j.cn501098-20230306-00118
10. Yan XF, Zhang R, Feng ZZ. Development and validation of the negative cognitive processing bias questionnaire. *J Third Mil Med Univ.* 2017;39(23):2329–2334. doi:10.16016/j.1000-5404.201707160

11. Guan J, Zhang Y, You S, et al. Application of protection motivation theory in epidemic prevention in patients with respiratory diseases under the COVID-19 pandemic: a cross-sectional study. *Clin Respir J*. 2023;17(10):1058–1066. doi:10.1111/crj.13693
12. Rathnayake N, Alwis G, Lenora J, Lekamwasam S. Applicability of health promoting lifestyle profile-II for postmenopausal women in Sri Lanka; a validation study. *Health Qual Life Outcomes*. 2020;18(1):122. doi:10.1186/s12955-020-01371-7
13. Nagamitsu S, Kanie A, Sakashita K, et al. Adolescent health promotion interventions using well-care visits and a smartphone cognitive behavioral therapy app: randomized controlled trial. *JMIR mHealth uHealth*. 2022;10(5):e34154. doi:10.2196/34154
14. Wang R, Guo Y, Li B, Zheng J, Tang Z, Shu M. application effect of silver-containing dressings in the repair of chronic refractory wounds. *Evid Based Complement Alternat Med*. 2022;2022:3616923. doi:10.1155/2022/3616923
15. Pandzic I, Notebaert L, Basanovic J, MacLeod C. Examining the role of trait anxiety and attentional bias to negative information in intrusion vulnerability following an emotionally negative event. *J Behav Ther Exp Psychiatry*. 2023;81:101894. doi:10.1016/j.jbtep.2023.101894
16. Le Pelley ME, Mitchell CJ, Beesley T, George DN, Wills AJ. Attention and associative learning in humans: an integrative review. *Psychol Bull*. 2016;142(10):1111–1140. doi:10.1037/bul0000064
17. Kim J, Stechmiller J, Weaver M, et al. The association of wound factors and symptoms of fatigue and pain with wound healing in chronic venous leg ulcers. *Int Wound J*. 2023;20(4):1098–1111. doi:10.1111/iwj.13966
18. Hao RN, Yang QF, Bai S, et al. Mediating effect of social support between self-management ability and health-promoting lifestyle in elderly tumor patients with PICC catheterization. *Chin J Mod Nurs*. 2022;28(15):1982–1987. doi:10.3760/cma.j.cn115682-20211224-05809
19. Cadel L, DeLuca C, Hitzig SL, et al. Self-management of pain and depression in adults with spinal cord injury: a scoping review. *J Spinal Cord Med*. 2020;43(3):280–297. doi:10.1080/10790268.2018.1523776
20. Aden S, Lauridsen MM, Grønkjær LL. Self-management interventions to patients with cirrhosis: a scoping review. *Hepatol Commun*. 2024;8(11):e0576. doi:10.1097/HC9.0000000000000576
21. Bolton Saghdaoui L, Lampridou S, Racaru S, Davies AH, Wells M. Healthcare interventions to aid patient self-management of lower limb wounds: a systematic scoping review. *Int Wound J*. 2023;20(4):1304–1315. doi:10.1111/iwj.13969
22. Stepanian N, Larsen MH, Mendelsohn JB, Mariussen KL, Heggdal K. Empowerment interventions designed for persons living with chronic disease - a systematic review and meta-analysis of the components and efficacy of format on patient-reported outcomes. *BMC Health Serv Res*. 2023;23(1):911. doi:10.1186/s12913-023-09895-6
23. Barcena ARC, Catalan CA, et al. Factors associated with utilization of primary preventive services of Tamang Serbisyo para sa Kalusugan ng Pamilya (TSeKaP) among Philhealth indigent members in Manila. *acta medica philippina*. 2018;52(3):245–252. DOI:10.47895/amp.v52i3.400
24. Li Y, Zhu D. The impact of perceived social support on children's problem behaviors: the parallel mediating roles of attentional bias. *BMC Psychol*. 2025;13(1):870. doi:10.1186/s40359-025-03225-7
25. Zhang X, Lu J, Ding Z, et al. Psychological resilience and post-traumatic stress disorder as chain mediators between personality traits and cognitive functioning in patients with breast cancer. *BMC Psychiatry*. 2024;24(1):750. doi:10.1186/s12888-024-06219-8
26. De Houwer J, Koster EHW. Attentional biases in anxiety and depression: current status and clinical considerations. *World Psychiatry*. 2023;22(3):473–474. doi:10.1002/wps.21117
27. van Dongen SI, de Nooijer K, Cramm JM, et al. Self-management of patients with advanced cancer: a systematic review of experiences and attitudes. *Palliat Med*. 2020;34(2):160–178. doi:10.1177/0269216319883976

## Risk Management and Healthcare Policy

### Publish your work in this journal

Risk Management and Healthcare Policy is an international, peer-reviewed, open access journal focusing on all aspects of public health, policy, and preventative measures to promote good health and improve morbidity and mortality in the population. The journal welcomes submitted papers covering original research, basic science, clinical & epidemiological studies, reviews and evaluations, guidelines, expert opinion and commentary, case reports and extended reports. The manuscript management system is completely online and includes a very quick and fair peer-review system, which is all easy to use. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <https://www.dovepress.com/risk-management-and-healthcare-policy-journal>

**Dovepress**  
Taylor & Francis Group