

ORIGINAL RESEARCH

# The Mediating Role of Self-efficacy in Acute Myocardial Infarction Patients between Post-PCI Fatigue and Post-traumatic Stress Disorder

Yuanyuan Yang, MM; Yingli Tian, MM; Jian Liao, MM; Shuzhen Li, MM; Wei Xu, MM; Jing Liu, MM

## ABSTRACT

**Objective** • This study aims to investigate the prevalence of post-traumatic stress disorder (PTSD) in patients with acute myocardial infarction (AMI) after percutaneous coronary intervention (PCI). Additionally, the study will analyze the correlation between self-efficacy and PTSD in patients with acute myocardial infarction who have undergone PCI.

**Methods** • This study focused on 268 AMI patients admitted to our hospital between April 2019 and March 2022. We utilized the Posttraumatic Stress Disorder Scale-Civilian Version (PCL-C) to conduct a questionnaire survey and analyzed the correlation between self-efficacy, postoperative fatigue, and PTSD using Pearson. Additionally, we established a structural equation model (SEM) using Amos 21.0 software and conducted a mediation effect test.

**Results** • (1) The PTSD score of 268 AMI patients in this study after PCI was  $(36.62 \pm 4.62)$ , the fatigue score was

$(8.62 \pm 0.82)$ , and the self-efficacy score was  $(19.34 \pm 2.24)$ ; (2) Gender, educational level, and complications were the influencing factors of PTSD in AMI patients ( $P < .05$ ); (3) Pearson analysis showed that PTSD after PCI in AMI patients was correlated positively with fatigue and had a negative correlation with self-efficacy; fatigue It was negatively correlated with self-efficacy (both  $P < .01$ ); (4) The mediating effect of self-efficacy between fatigue and PTSD in AMI patients after PCI was established, and the mediating effect value was 29.31%.

**Conclusion** • PTSD, fatigue, and self-efficacy after PCI in AMI patients are all at moderate levels, which need clinical attention—29.31% mediating effect between fatigue and PTSD, confirming that fatigue can affect PTSD by regulating self-efficacy. (*Altern Ther Health Med*. [E-pub ahead of print.]

**Yuanyuan Yang, MM; Jian Liao, MM; Shuzhen Li, MM; Wei Xu, MM,** Department of Cardiovascular Medicine; The People's Hospital of Leshan Sichuan; Leshan; Sichuan; China. **Yingli Tian, MM,** Department of Outpatient; Cangzhou; Hebei; China. **Jing Liu, MM,** Department of Critical Care Medicine; the Second Affiliated Hospital of the Air Force Military Medical University; Xian; Shaanxi; China.

Corresponding author: Jing Liu, MM  
E-mail: [Angelyang2023@163.com](mailto:Angelyang2023@163.com)

## INTRODUCTION

Post-traumatic stress disorder (PTSD) is a condition that arises as a result of experiencing a major traumatic event. It is characterized by a range of physical and emotional symptoms, including increased alertness, avoidance behavior, repetitive experiences of symptoms, and negative cognitive and emotional changes. These symptoms can persist for an extended period and can significantly impact an individual's quality of life.<sup>1,2</sup> Acute myocardial infarction (AMI) is the

most severe manifestation of coronary artery disease, and percutaneous coronary intervention (PCI) is the primary treatment modality.<sup>3</sup> Acute myocardial infarction (AMI) is a sudden and potentially fatal event that can cause significant psychological and physiological stress for the patient. This double-stress response can profoundly impact the patient's well-being and requires prompt medical attention.<sup>4</sup> According to previous studies,<sup>5</sup> Post-Traumatic Stress Disorder (PTSD) can occur in about 10-20% of Acute Myocardial Infarction (AMI) patients. It can be worsened by Percutaneous Coronary Intervention (PCI) as a traumatic treatment. PTSD can lead to reduced compliance with treatment, increased risk of readmission, and can even affect the prognosis of AMI, potentially leading to a recurrence.

Furthermore, fatigue is closely linked to anxiety and depression.<sup>6,7</sup> Fatigue is a complex phenomenon that can affect both the mind and body. Research has shown that it is a common issue among patients with cardiovascular disease, with reported incidence rates ranging from 50% to 96%.<sup>8</sup> Self-efficacy, a measure of a patient's motivation and resilience during disease treatment or rehabilitation, has been linked to

PTSD in the literature. However, there is a lack of research on the specific mechanisms underlying this relationship.<sup>9-12</sup> This study aims to explore the relationship between fatigue and PTSD in AMI patients, specifically by examining the hypothesis that fatigue affects PTSD through its impact on self-efficacy. The researchers utilized structural equation modeling (SEM) to uncover the underlying connection between self-efficacy, fatigue, and PTSD. This research aimed to investigate the relationship between self-efficacy and fatigue on PTSD in AMI patients. Additionally, it sought to identify the mediating effect of self-efficacy to provide a theoretical foundation for developing standardized, reasonable, and scientific nursing interventions.

## METHODS

### Study design

This study used a cross-sectional design with questionnaires to analyze the data.

### Sample

The study population consisted of 268 AMI patients admitted to the People's Hospital of Leshan Sichuan between April 2019 and March 2022. The study questionnaire was administered to AMI patients within 1 to 6 months after discharge, using offline and online research methods. The subjects were informed about the purpose and significance of the study and were given the distributed materials only after obtaining their consent. In this study, online research was conducted to collect data through email, while offline research involved paper questionnaires filled out during outpatient follow-up visits. If test subjects were uncertain about the questionnaire content, the investigators provided clarification without influencing their responses, and the questionnaires were collected once completed. A total of 290 questionnaire forms were distributed, with 270 returned. After excluding questionnaires with regular responses and those with more than 10% missing items, 268 questionnaires were deemed valid, resulting in an effective rate of 92.41%. Sample inclusion criteria for this study were patients who met the diagnostic criteria for AMI, underwent PCI, were over 18 years old, had clear thinking and could cooperate in completing the questionnaire, were discharged within 1-6 months, had their first onset and stable condition at discharge, and provided informed consent and voluntary participation. Exclusion criteria included patients with mental retardation or mental illness, those who suffered other major traumatic events during treatment, those who had difficulty understanding the questionnaire, those who were discharged from the hospital on non-medical grounds and lost to follow-up, those with severe functional impairment of other organs or malignant neoplastic disease, and those with incomplete clinical information. The formula used to calculate the sample size was  $N = [\text{Max}(\text{number of entries}) \times (5 \sim 10)] \times [1 + (10\% \sim 30\%)]$ .<sup>13</sup> For this study, 17 entries from the PCL-C scale were used, resulting in a required sample size of 94~131 cases. However, 268 patients with AMI were included, which met the stability requirements of the model.

### Study measure

**General information questionnaire:** The content structure was designed by the researcher and included mainly general demographic information and disease-related information.

The General Self-Efficacy Scale (GSES) was designed by Luszczynska<sup>14</sup> and introduced by Wang Cai Kang et al.<sup>15</sup> The scale has 10 items and is rated on a 4-point Likert scale, ranging from 'not at all true' to 'completely true'. The internal consistency Cronbach's alpha for the scale is 0.87, a higher score indicates greater self-efficacy. In the research, the Cronbach's alpha for this scale was 0.858.

The Fatigue Scale 14 (FS-14) is a tool developed by Chalder et al.<sup>16</sup> to measure fatigue levels. It comprises 14 projects, divided into two dimensions: physical fatigue (8 items) and mental fatigue (6 items). A 'yes' answer is scored a 'no' answer is scored as 1, and a 'no' answer is scored 0. The total score ranges from 0 to 14, with higher scores indicating more severe fatigue. The internal consistency Cronbach's alpha coefficient for this scale is 0.77, while in this study, it was found to be 0.84.

The PCL-C (Post-Traumatic Stress Disorder Checklist-Civilian Version) was utilized in this study. Developed by the Post-Traumatic Stress Disorder Research Center in the USA<sup>17</sup> and subsequently Chineseized by Yang et al.,<sup>18</sup> the scale has a high internal consistency Cronbach's alpha coefficient of 0.88-0.94. It consists of 17 items divided into 3 dimensions: 7 items for avoidance numbness, 5 for re-experiencing symptoms, and 5 for hypervigilance symptoms. Participants rated their symptoms on a 5-point Likert scale ranging from 'none' to 'very severe', scoring 17 to 85. Higher scores indicate more severe PTSD symptoms. The Cronbach's alpha coefficient for this scale in our study was 0.85-0.92.

### Ethical considerations

Prior to conducting the study, approval was obtained from the hospital's ethics committee. Participants were informed about the study's purpose and relevant details and were required to sign an informed consent form prior to their involvement.

### Data analyses

The data was entered and analyzed using SPSS 24.0 software. Count data that conformed to normal distribution were described using  $n$  (%), and measurement data were described using  $(\bar{x} \pm s)$ , with  $t$  tests and ANOVA used for analysis. Pearson analysis of correlation was used with a test level  $\alpha = 0.05$ . The mediating effects were tested using SEM constructed with Amos 21.0 software, with differences considered statistically significant at  $P < .05$ .

## RESULTS

### PTSD and fatigue and self-efficacy scores in AMI patients after PCI

The PTSD score after PCI in 268 AMI patients was  $(36.62 \pm 4.62)$ ; the fatigue score was  $(8.62 \pm 0.82)$ ; and the self-efficacy score was  $(19.34 \pm 2.24)$ , as shown in Table 1.

**Table 1.** PTSD and fatigue and self-efficacy scores after PCI in 268 AMI patients (scores)

Projects	Number of entries	Total score range	Scores ( $\bar{x} \pm s$ )	Entry mean scores ( $\bar{x} \pm s$ )
Total PCL-C score	17	17 to 85 points	36.62 ± 4.62	2.15 ± 0.27
Avoidance of numbness symptoms	7	7 to 35 points	13.58 ± 2.22	1.94 ± 0.32
Re-experiencing symptoms	5	5 to 25 points	8.47 ± 0.74	1.69 ± 0.15
Hypervigilance symptoms	5	5 to 25 points	14.57 ± 2.28	2.91 ± 0.46
FS-14 Overall Score	14	0 to 14 points	8.62 ± 0.82	0.62 ± 0.06
Somatic fatigue	8	0 to 8 points	5.78 ± 0.64	0.72 ± 0.08
Brain fatigue	6	0 to 6 points	2.84 ± 0.32	0.47 ± 0.05
Total GSES score	10	10 to 40 points	19.34 ± 2.24	1.93 ± 0.22

**Table 2.** Analysis of factors influencing PTSD in 268 patients with AMI

Projects	Number of examples (n)	Total PTSD score	t/F value	P value
Gender				
Male	165 (61.57)	36.43 ± 4.28	11.380	.000
Female	103 (38.43)	43.18 ± 5.36		
Age (years)				
19~35	63 (23.51)	38.76 ± 4.48	2.104	.124
36~55	93 (34.70)	40.22 ± 4.69		
>55	112 (41.79)	39.27 ± 4.56		
Marital status				
With spouse	203 (75.75)	39.11 ± 4.58	1.236	.217
No spouse	65 (24.25)	39.92 ± 4.65		
Education level				
High School or above	78 (29.10)	35.28 ± 4.06	11.153	.000
High School and below	190 (70.90)	42.58 ± 5.16		
Comorbid other physical illness (kind)				
> 2	82 (30.60)	40.22 ± 5.53	0.418	.659
1~2	128 (47.76)	39.65 ± 4.67		
0	58 (21.64)	39.57 ± 4.63		
Medical burden				
No burden	102 (38.06)	38.45 ± 4.37	2.998	.052
There is a certain burden	114 (42.54)	39.24 ± 4.42		
A heavy burden	52 (19.40)	40.28 ± 4.53		
Employment				
On-the-job	186 (69.40)	38.82 ± 4.58	1.207	.228
Retired/unemployed	82 (30.60)	39.55 ± 4.52		
Complications				
None	33 (12.31)	37.22 ± 4.36	11.686	.000
General	160 (59.70)	39.35 ± 4.42		
Serious	75 (27.99)	41.65 ± 5.25		
Classification of cardiac function				
>II class	125 (46.64)	38.96 ± 4.57	1.468	.139
≤ Class II	143 (53.36)	39.84 ± 5.06		

**Analysis of factors influencing PTSD in AMI patients with different demographic characteristics**

A total of 120 cases of second-stage pressure ulcers were included in this study, and the results showed that gender, literacy, and comorbidity were factors influencing PTSD in patients with AMI ( $P < .05$ ), as shown in Table 2.

**Analysis of the correlation between PTSD and fatigue and self-efficacy in AMI patients after PCI**

There was a positive correlation between PTSD and fatigue ( $r=0.328$  to  $0.642$ ,  $P < .01$ ) and a negative correlation between PTSD and self-efficacy ( $r=-0.667$  to  $-0.528$ ,  $P < .01$ ); fatigue was negatively correlated with self-efficacy ( $r=-0.662$  to  $-0.561$ ,  $P < .01$ ), in patients with AMI after PCI. See Table 3.

**Mediated effect model of PTSD and fatigue and self-efficacy in AMI patients after PCI**

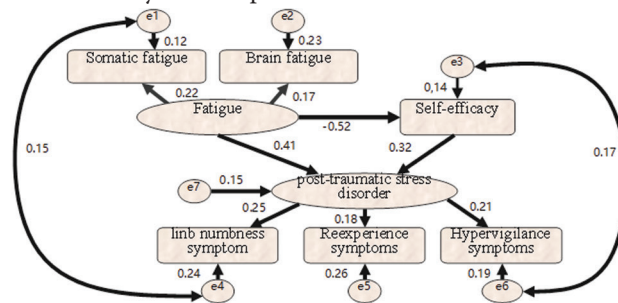
A Structural Equation Model (SEM) was utilized to investigate the relationship between self-efficacy, fatigue, and PTSD in AMI patients after PCI. The study also analyzed the mediating effect of self-efficacy between fatigue and PTSD. The hypothetical SEM was constructed with PTSD as the dependent variable, fatigue as the independent variable, and self-efficacy as the mediator variable. Each scale dimension was considered as the observed variable. The model parameters were evaluated using maximum likelihood (ML) to ensure that all fitted indicators within the model met the fit criteria (Table 4). The revised model showed that all path coefficients were statistically significant ( $P < .05$ ) (Figure 1, Table 4).

**Table 3.** Correlation analysis of PTSD with fatigue and self-efficacy after PCI in AMI patients (r-value)

Variables	Total PCL-C score	Avoidance of numbness symptoms	Re-experiencing symptoms	Hypervigilance symptoms	FS-14 Overall Score	Somatic fatigue	Brain fatigue
Avoidance of numbness symptoms	0.635 <sup>b</sup>	1					
Re-experiencing symptoms	0.527 <sup>b</sup>	0.364 <sup>b</sup>	1				
Hypervigilance symptoms	0.542 <sup>b</sup>	0.116 <sup>a</sup>	0.428 <sup>b</sup>	1			
FS-14 Overall Score	0.374 <sup>b</sup>	0.555 <sup>b</sup>	0.419 <sup>b</sup>	0.637 <sup>b</sup>	1		
Somatic fatigue	0.337 <sup>b</sup>	0.328 <sup>b</sup>	0.639 <sup>b</sup>	0.425 <sup>b</sup>	0.744 <sup>a</sup>	1	
Brain fatigue	0.462 <sup>b</sup>	0.524 <sup>b</sup>	0.642 <sup>b</sup>	0.329 <sup>b</sup>	0.723 <sup>b</sup>	0.112 <sup>a</sup>	1
Total GSES score	-0.549 <sup>b</sup>	-0.667 <sup>b</sup>	-0.627 <sup>b</sup>	-0.528 <sup>b</sup>	-0.652 <sup>b</sup>	-0.662 <sup>b</sup>	-0.561 <sup>b</sup>

<sup>a</sup> $P < .05$   
<sup>b</sup> $P < .01$

**Figure 1.** Model of mediating effects of PTSD and fatigue and self-efficacy in AMI patients after PCI



**Table 4.** Suitability indicators in SEM

Model test volume	Initial model	Modified model	Adaptation criteria
$\chi^2$ values	$\chi^2 = 64.254$	$\chi^2 = 48.254$	$P > .05$
$\chi^2 / df$ values (Cardinality freedom ratio)	5.628	1.725	$1 < \chi^2 / df < 2$ good $1 < \chi^2 / df < 5$ general
IFI values (Value-added fitness index)	0.902	0.923	$> 0.9$
CFI values (Value-added fitness index)	0.911	0.938	$> 0.9$
NFI value (Standard fitness index)	0.864	0.905	$> 0.9$
RFI value (Relative fitness index)	0.896	0.916	$> 0.9$
GFI value (Goodness-of-fit fitness index)	0.882	0.908	$> 0.9$
AGFI value (Adjusted fitness index)	0.874	0.902	$> 0.9$
RMSEA values (Adjusted fitness index)	1.125	0.036	$< 0.05$ good $< 0.08$ is reasonable

**Table 5.** Path coefficients for the mediating effects of PTSD and fatigue and self-efficacy in AMI patients after PCI

Pathways of Influence	Effect value	95% CI	Intermediary effect as a percentage	P value
Fatigue → PTSD	0.41	0.266-0.612	-	$< .05$
Fatigue → self-efficacy	-0.52	-0.704 to -0.352	-	$< .05$
Self-efficacy → PTSD	0.32	0.134 ~ -0.528	-	$< .05$
Fatigue → self-efficacy → PTSD	0.17	0.064-0.212	29.31%	$< .05$

**Effect relationships**

Analysis of the mediating effect showed that a mediating effect of post-PCI fatigue and PTSD in AMI patients was established, where the indirect effect value of self-efficacy was  $0.52 \times 0.32 = 0.17$ , with a mediating effect value of 29.31% of the total effect [ $0.17 / (0.17 + 0.41)$ ], indicating a partial mediating effect of self-efficacy in fatigue and PTSD, see Table 5.

**DISCUSSION**

**Analysis of the current situation of PTSD and fatigue and self-efficacy in AMI patients after PCI**

Post-traumatic stress disorder (PTSD), also known as delayed psychogenic reaction, is a condition that can cause severe functional impairment and have a prolonged course,

significantly affecting the psychological and social functioning of the patient. While previous reports on PTSD have mainly focused on war, violent crime, major traffic accidents, or aircraft crashes, recent research has confirmed that life-threatening medical illnesses and treatments can also be considered important stressors that trigger PTSD.<sup>19</sup> AMI, a severe acute coronary syndrome, poses a high-risk, unpredictable situation for patients, causing significant trauma. In this study, the PTSD score for 268 AMI patients was ( $36.62 \pm 4.62$ ), which was lower than the median score of 51 on the scale. However, it was higher than the PTSD score reported in the study by Dong Jianxiu et al.<sup>20</sup> The PTSD score of patients with AMI in the study by Chen Yeshe et al.<sup>21</sup> was higher than the score in this study, possibly due to differences in time and sample size. AMI has a rapid onset, high mortality rate, and expensive treatment, which can lead to negative emotional responses like fear and despair, as well as thought and psychiatric disorders. In addition, the reduced self-care ability of some patients with acute myocardial infarction (AMI) after percutaneous coronary intervention (PCI) can hinder their ability to effectively adapt, leading to increased psychological burden and varying degrees of post-traumatic stress disorder (PTSD), which can negatively impact the disease prognosis. The results of the PCL-C scale used in this study show that the lowest mean score was for re-experiencing symptoms, while the highest mean score was for high alertness symptoms, which is consistent with the findings of Zeng Kai et al.<sup>22</sup> Patients with AMI-related symptoms may continue to experience persistent and potential threats from AMI, even after receiving treatment. This may be due to the lingering effects of the traumatic event, which cannot be completely separated from the patient's experience. According to previous studies,<sup>21,23</sup> patients with AMI-related symptoms may continue to experience persistent and potential threats from PTSD even after receiving treatment. Factors such as age, gender, literacy, economic income, psychological status, negative coping, and cardiac function classification have been identified as influential in the occurrence of PTSD. The results of this study showed that gender, literacy, and comorbidity were influential factors for PTSD in patients with AMI. The reasons for this are: (1) In this study, it was observed that PTSD scores were significantly higher in women than in men. This could be attributed to the fact that women tend to be more emotionally expressive and susceptible to emotional disorders, resulting in a weaker psychological stress capacity and difficulty in displaying a calm, rational, and open mind in the face of traumatic events. Additionally, women also experience significantly higher disease-related family social stress than men. Therefore, it is recommended that clinical staff should pay special attention to the emotional changes of female patients and provide them with adequate emotional care and psychological guidance. (2) Individuals' level of education, and cognitive ability are closely related to their ability to learn about diseases. A study has shown that individuals with low literacy levels have higher PTSD scores

compared to those with high literacy levels. This could be attributed to the fact that individuals with higher literacy levels have better access to relevant resources, which enhances their understanding of disease cognition and health promotion. As a result, they acquire more knowledge about health management, making it easier for them to establish positive and effective psychological defenses. To better serve patients with low literacy levels, it is recommended that clinical staff provide robust health education, conveying useful information about the disease. Additionally, clinicians should actively mobilize various social resources to help patients establish new psychological defense mechanisms to cope with PTSD. (3) This study confirms the correlation between comorbidities and the exacerbation of PTSD symptoms, aligning with the findings of Song Qiong et al.<sup>24</sup> The study also highlights the interconnectedness of psychological and physical symptoms. The clinical staff is recommended to provide preventive measures and effective treatment to AMI patients who may develop complications. This can aid in reducing the fear associated with the disease and consequently alleviate PTSD symptoms.

The fatigue score was found to be ( $8.62 \pm 0.82$ ), which was moderately high compared to the median score of 7 on the scale. However, it was lower than the fatigue score reported in the study by Qin Fawei et al.,<sup>25</sup> but higher than the fatigue score observed in the military in the study by Hou Tianya et al.<sup>26</sup> Fatigue in patients with acute myocardial infarction (AMI) is a multifactorial phenomenon involving persistent energy loss and physical fatigue. These factors can lead to depression, reduced stamina for activities, and impaired physical function, ultimately resulting in low mood and decreased energy levels. The overall impact of these symptoms is a decrease in the patient's ability to perform daily activities and a decline in overall physical function. Fatigue in AMI patients is often overlooked as it lacks typical clinical manifestations and is masked by symptoms such as dizziness and pain. This results in nursing staff not giving sufficient attention to fatigue, leading to delayed and ineffective relief. It is crucial for clinical staff to closely monitor and address fatigue in AMI patients. The study found that the self-efficacy score was ( $19.34 \pm 2.24$ ), which is moderately low compared to the middle score of 25 on the scale. The score is also lower than the self-efficacy score of patients with chronic heart failure in the Du Peijuan et al.<sup>27</sup> study, which requires clinical attention. The lower score may be attributed to various factors such as the stressful trauma of the PCI procedure, the difficulty in treating AMI, the long duration of the disease, the high recurrence rate, the need for long-term medication, and the persistent discomfort of experiencing AMI-related symptoms.

#### **Analysis of the correlation between PTSD and fatigue and self-efficacy in AMI patients after PCI**

The results of this study showed that PTSD was correlated with fatigue and self-efficacy in AMI patients after PCI ( $P < .05$ ), and there was a positive correlation between fatigue and

PTSD ( $P < .01$ ), indicating that the more severe the fatigue in AMI patients after PCI, the stronger the PTSD.<sup>28</sup> In their study, Liu Huan et al. found that fatigue is a gradual and cumulative process closely linked to treatment outcomes, disease progression, diet, and sleep quality. Furthermore, patients with high levels of fatigue tend to have a lower self-perception of their quality of life. Research has indicated<sup>29</sup> that the prognosis for Acute Myocardial Infarction (AMI) is a lengthy process, with patients frequently experiencing symptoms related to AMI and being at risk for negative emotional reactions such as anxiety and depression. It has also been found that negative psychological factors can significantly contribute to persistent fatigue. Previous studies have indicated that anxiety and depression may serve as early indicators for PTSD. These findings confirm the close relationship between negative emotional reactions and PTSD and suggest that adverse psychological states, such as anxiety and depression, can impact PTSD by regulating hormone secretion and mobilizing inflammatory responses.<sup>30,31</sup>

Meanwhile, The study found a negative correlation between self-efficacy and PTSD ( $P < .01$ ) among AMI patients. This suggests that higher self-efficacy is associated with less severe PTSD symptoms. These findings align with a previous study by Yuan-Yuan An et al.<sup>32</sup> According to the literature,<sup>10</sup> Research suggests that having a strong sense of self-efficacy can contribute to a positive state of mind and increase confidence in disease treatment while reducing psychological stress. This is particularly important for AMI patients, as those with high self-efficacy are more likely to face the challenges and distress caused by illness with greater determination and confidence during a traumatic event. This can lead to positive adaptive behaviors, decreased PTSD symptoms, and overall improved mental health. According to the study by Wu Chao et al.,<sup>33</sup> there is a negative correlation between fatigue and self-efficacy ( $P < .01$ ) in AMI patients after PCI. This means that the more severe the fatigue, the lower the self-efficacy. Fatigue is a subjective feeling of discomfort that includes physical and mental fatigue. If persistent, it can lead to impaired body function, reduced motivation, and even a complete loss of enthusiasm for life. This negative attitude towards problems can result in low self-efficacy and an inability to coordinate various factors to deal with difficult situations.

### Mediating effects of PTSD and fatigue and self-efficacy in AMI patients after PCI

The SEM results of this study showed that fatigue can affect PTSD directly and indirectly through the mediating role of self-efficacy,<sup>10,27</sup> suggesting that self-efficacy is an important predictor of mental health and that enhancing self-efficacy can help to promote positive adaptive behavior. As an available internal resource, self-efficacy plays an important regulatory role when patients are affected by illness shocks and traumatic, stressful events. Having a high level of self-efficacy can help maintain good mental health and alleviate PTSD symptoms during illness treatment.

## CONCLUSIONS

Post-traumatic stress disorder (PTSD) in patients with acute myocardial infarction (AMI) following percutaneous coronary intervention (PCI) is linked to moderate levels of fatigue and self-efficacy, which should be given clinical attention. The mediating effect of self-efficacy between fatigue and PTSD, accounting for 29.31% of the relationship, suggests that fatigue can impact PTSD by affecting self-efficacy. Therefore, healthcare professionals should prioritize monitoring fatigue and self-efficacy levels in AMI patients after PCI and implement targeted interventions to reduce the impact of PTSD. This study is a cross-sectional study, meaning it captures data at one point. The next step would be to create a follow-up protocol based on the framework and describe the longitudinal or trajectory change pathway. This will provide a scientific basis for clinical interventions.

## CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this paper.

## DATA AVAILABILITY

The simulation experiment data used to support the findings of this study are available from the corresponding author upon request.

## REFERENCES

- Zhang Y, Ren R, Yang LH, Tang XD. Post-traumatic stress disorder and sleep disorders [J]. *Sichuan Da Xue Xue Bao Yi Xue Ban*. 2021;52(1):28-32. doi:10.12182/20210160201
- Aron CM, Harvey S, Hainline B, Hitchcock ME, Reardon CL. Post-traumatic stress disorder (PTSD) and other trauma-related mental disorders in elite athletes: a narrative review. [J]. *Br J Sports Med*. 2019;53(12):779-784. doi:10.1136/bjsports-2019-100695
- Gu YQ, Li QY, Wu J, et al. The effects of early ambulation in patients with acute myocardial infarction after emergency PCI: a systematic review [J]. *Chung Hua Hu Li Tsa Chih*. 2020;55(10):1571-1577. doi:10.3761/j.issn.0254-1769.2019.10.023
- Jacquet-Smailovic M, Brennstuhl MJ, Denis I, Kirche A, Tarquinio C, Tarquinio C. Relationship between Post-traumatic Stress Disorder and subsequent myocardial infarction: a systematic review and meta-analysis. [J]. *J Affect Disord*. 2022;297(1):525-535. doi:10.1016/j.jad.2021.10.056
- Bielas H, Meister-Langraf RE, Schmid JP, et al. Acute stress disorder and C-reactive protein in patients with acute myocardial infarction. [J]. *Eur J Prev Cardiol*. 2018;25(3):298-305. doi:10.1177/2047487317748506
- Joseph NM, Benedick A, Flanagan CD, Breslin MA, Vallier HA. Risk Factors for Posttraumatic Stress Disorder in Acute Trauma Patients. [J]. *J Orthop Trauma*. 2021;35(6):e209-e215. doi:10.1097/BOT.0000000000001990
- Liu H, Li CY, Huang H, et al. Relationship among Fatigue, Psychological Elasticity and Depression in Hematopoietic Stem Cell Transplant Patients [J]. *PLA Nurs J (Manila)*. 2020;37(11):47-50, 58. doi:10.3969/j.issn.1008-9993.2020.11.012
- Chen YY, Hong JF. The mediating role of nutritional status between fatigue and quality of life in patients with chronic heart failure [J]. *Guangxi Medicine*. 2022;44(1):64-67. doi:10.11675/j.issn.0253-4304.2022.01.13
- Fan ZG, Fu XX, Liu SH. A follow-up study on the effect of self-stigma on depression among college students with hearing impairment: the mediating role of self-efficacy and discrimination perceptions [J]. *Chin J Clin Psychol*. 2021;29(6):1266-1270. doi:10.16128/j.cnki.1005-3611.2021.06.029
- Yan X, Li H, Huang S-M, et al. Influence of self-efficacy and psychological status on the occurrence of post-traumatic stress disorder in patients with lung cancer [J]. *Hebei Med*. 2018;40(3):428-430. doi:10.3969/j.issn.1002-7386.2018.03.026
- Chinese Society of Cardiovascular Diseases, Chinese Journal of Cardiovascular Diseases Editorial Board. Guidelines for the diagnosis and treatment of acute ST-segment elevation myocardial infarction (2019) [J]. *Chinese Journal of Cardiovascular Diseases*. 2019;47(10):766-783. doi:10.3760/cma.j.issn.025373758.2019.10.003
- Chinese Society of Cardiovascular Diseases, Chinese Journal of Cardiovascular Diseases Editorial Board. Guidelines for the diagnosis and treatment of non-ST-segment elevation acute coronary syndromes (2016) [J]. *Chinese Journal of Cardiovascular Diseases*. 2017;45(5):359-376. doi:10.3760/cma.j.issn.0253-7375.2017.05.003
- Xiao S. *Clinical research design*. [M] Peking University Medical Press; 2003.
- Luszczynska A, Scholz U, Schwarzer R. The general self-efficacy scale: multicultural validation studies. [J]. *J Psychol*. 2005;139(5):439-457. doi:10.3200/JRPL.139.5.439-457
- Wang CK, Hu ZF, Yong L. A study on the reliability and validity of the General Self-Efficacy Scale [J]. *Appl Psychol*. 2001;7(1):37-40. doi:10.3969/j.issn.1006-6020.2001.01.007
- Chalder T, Berelowitz G, Pawlikowska T, et al. Development of a Fatigue Scale [J]. *J Psychosom Res*. 1993;37(2):147-153. DOI:10.1016/0022-3999(93)90081-1
- Conybeare D, Behar E, Solomon A, Newman MG, Borkovec TD. The PTSD Checklist-Civilian Version: reliability, validity, and factor structure in a nonclinical sample. [J]. *J Clin Psychol*. 2012;68(6):699-713. doi:10.1002/jclp.21845
- Yang XY, Yang HG, Liu QG, et al. The Research on the Reliability and Validity of PCL-C and Influence Factors [J]. *Chinese Journal of Health Psychology*. 2007;15(1):6-9.
- Liu X, Lin P, Wang YN. Research progress of post-traumatic stress disorder in patients with acute myocardial infarction [J]. *Modern Clinical Nursing*. 2019;18(03):53-57.
- Dong JX, Wang JH, Yang H, et al. The mediating effect of fear of disease progress between cardiac discomfort symptoms and post-traumatic stress disorder in patients with acute myocardial infarction [J]. *Chinese Journal of Behavioral Medicine and Brain Science*. 2021;30(9):806-810.
- Chen YS, Wu P, Wen M, et al. Post-traumatic stress disorder status and its influencing factors in patients with acute myocardial infarction [J]. *Zhongnan Journal of Medical Sciences*. 2021;49(1):95-99.

22. Zeng K, Chen S, Tu Y, et al. Correlation analysis of fear of disease progression and post-traumatic stress disorder symptoms in patients with acute myocardial infarction [J]. *Nurs Res*. 2020;34(3):380-383. doi:10.12102/j.issn.1009-6493.2020.03.007
23. Zhu CY. Risk factors for post-traumatic stress disorder after cardiac surgery on cardiopulmonary bypass in elderly patients [J]. *Int J Psychiatry*. 2022;49(1):90-92,104.
24. Song Q, Chen CX. Relationship between acute stress response and the range of coronary artery infarct and degree of chest pain in acute myocardial infarction [J]. *Mod Prev Med*. 2016;43(17):3248-3251.
25. Hou TY, Jing M, Cai WP, Wei D, Deng W, Deng G. The relationship between psychological control source and fatigue in soldiers: the mediating The relationship between psychological control source and fatigue in soldiers: the mediating effect of psychological resilience [J]. *Journal of Second Military Medical University*. 2021;42(11):1308-1313.
26. Qin F, Liu M, Li F, et al. The mediating role of chronic disease self-efficacy between fatigue and social support in postoperative chemotherapy patients with breast cancer [J]. *Chinese Journal of Modern Nursing*. 2022;28(5):596-601. doi:10.3760/cma.j.cn115682-20210617-02659
27. Du Peijuan KL. The mediating effect of self-efficacy between social support and fear of disease progression in patients with chronic heart failure [J]. *Mod Prev Med*. 2021;48(23):4413-4416.
28. Sun JW, Li JH, Wang YR, et al. The relationship between neuroticism personality, psychological resilience and posttraumatic stress disorder symptoms and posttraumatic growth in patients recovering from burn injury [J]. *Chinese Journal of Mental Health*. 2019;33(3):198-202. doi:10.3969/j.issn.1000-6729.2019.03.008
29. Gustad LT, Laugsand LE, Janszky I, Dalen H, Bjerkeset O. Symptoms of anxiety and depression and risk of acute myocardial infarction: the HUNT 2 study [J]. *Eur Heart J*. 2014;35(21):1394-1403. doi:10.1093/eurheartj/eh387
30. Zhang YY, Lin P, Wang YI, et al. Cross-lagged analysis of acute stress disorder, post-traumatic stress disorder, anxiety and depression in patients with acute myocardial infarction [J]. *Chinese Journal of Modern Nursing*. 2021;27(32):4415-4420. doi:10.3760/cma.j.cn115682-20210607-02488
31. Liu B, Yuan HL, Pan JY, et al. Research progress on the inflammatory mechanism of post-traumatic stress disorder [J]. *Occup Health (Lond)*. 2021;37(18):2582-2586.
32. An YY, Yuan GZ, Wu XC, et al. The influence of social support on post-earthquake adolescent post-traumatic stress disorder and post-traumatic growth. The mediating role of self-efficacy [J]. *Xinli Fazhan Yu Jiaoyu*. 2018;34(1):98-104. doi:10.16187/j.cnki.issn1001-4918.2018.01.12
33. Wu C, Lang HJ, Zhang LF, et al. The mediating effect of fatigue on general self-efficacy and stress perception among nurses in the emergency department [J]. *J Nurs (Luton)*. 2020;27(4):72-74. doi:10.16460/j.issn1008-9969.2020.04.072