

Article

# Health Education Nursing Based on BCW Theory Improve Negative Psychology, Sleep and Quality of Life in Elderly Patients After Cardiac Interventional Surgery: A Retrospective Study

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## Abstract

**Objective:** Guided by Behavior Change Wheel (BCW) theory, a rehabilitation nursing intervention program for patients after percutaneous coronary intervention (PCI) was constructed. This study aimed to explore the impact of this intervention program on the negative emotions, sleep quality, and quality of life of patients after PCI. **Methods:** Patients with coronary heart disease after PCI who visited the cardiology department in our hospital from September 2022 to February 2024 were selected as the research subjects. The patients were divided into two groups according to the order of the operation time: 57 cases in the conventional group and 56 in the BCW group. The systolic blood pressure, diastolic blood pressure, and resting heart rate (RHR) of the two groups before the administration (T1) and at the end of 3 month administration (T2) were evaluated. The Self-Rating Anxiety Scale (SAS), self-rating depression scale, Pittsburgh sleep quality index, and quality of life scale were used in measuring the anxiety, depression, sleep quality, and quality of life levels of the two groups of patients at two-time points. **Results:** A total of 113 cases were included: 57 cases in the conventional group and 56 in the BCW group. The BCW group had larger improvements in RHR and blood pressure than the conventional group ( $p < 0.05$ ). The SAS and Self-rating Depression Scale (SDS) scores of the BCW group were significantly lower than those in the conventional group ( $p < 0.05$ ). After nursing based on the BCW model was implemented, the Pittsburgh Sleep Quality Index (PSQI) scores of the patients in the BCW group were lower than those in the conventional group ( $p < 0.001$ ). After 3 months of administration, the SF-36 total score and other dimensional scores in the BCW group were higher than those in the conventional group ( $p < 0.05$ ), and no significant difference was observed between the groups before administration ( $p > 0.05$ ). **Conclusion:** Intervention programs based on BCW theory may help to reduce patients' depression and anxiety levels, potentially exerting positive effects that improve RHR and cardiac function in patients after coronary intervention and improving patients' sleep and life quality.

## Keywords

behavior change wheel; negative emotion; sleep quality; quality of life; PCI

## Introduction

Coronary heart diseases (CHDs) are the main causes of morbidity and mortality worldwide and death from cardiovascular diseases [1]. Developments in precision medicine have advanced CHD diagnosis and treatment strategies.

Percutaneous coronary intervention (PCI) has progressed in recent years, and thus many complex CHDs can be effectively treated [2]. However, these advances lead to an increasingly complex population, including patients who have acute coronary syndrome, chronic total occlusion, calcified coronary artery disease, and cardiogenic shock. However, despite improvements in device and surgical safety, complications related to PCI still occur [3]. Most patients have varying degrees of mental problems and insufficient exercise tolerance after surgery, which not only deteriorate quality of life but also impose heavy economic burden on families and countries [4].

Awareness of cardiovascular disease and its risk factors is essential to the successful prevention and control of diseases. However, young and middle-aged people have low awareness of cardiovascular disease types, cardiovascular event warning symptoms, and risk factors [5]. The Behavior Change Wheel (BCW) was first proposed by Michie *et al.* [6] in 2011. The theory was developed from a comprehensive and systematic synthesis of 19 relevant behavioral change theoretical frameworks. It aims to help intervention program designers analyze problems from the perspective of behavior comprehensively intervene from three aspects, namely, ability, opportunity, and motivation, and systematically select the best intervention function. Thus, optimal intervention programs can be designed on the basis of individuals' understanding of behavioral change and available resources [7].



This theory is widely to promote individual health behavior and mitigate bad health behavior. Mabweazara *et al.* [8] used BCW theory and mixed-methods research to design behavior change intervention programs and achieved good results, increasing the physical activity of patients with AIDS. McEvoy *et al.* [9] conducted a peer support intervention for adults at high risk of cardiovascular diseases through a literature review and semistructured interviews to change their bad eating habits and encourage changes in Mediterranean eating behavior. Clarke *et al.* [10] identified barriers and facilitators for participation in and implementation of exercise interventions from the perspectives of patients with end-stage renal disease and healthcare providers. The medical staff develops comprehensive intervention plans through training, education, modeling, and other intervention functions to improve the physical activity level of patients with end-stage renal disease. In addition, this theory has been used in designing intervention programs that improve patients' medication compliance [11] and enable them to overcome sedentary behavior [12] and quit smoking treatment [13].

To date, research on BCW theory focuses on improving the prescription of surgical prophylaxis, developing interventions for patients with end-stage renal diseases, and promoting the adherence of patients with diabetes to diet and physical activity intervention programs. The application of this theory after PCI intervention has not been explored. Patients are prone to various adverse reactions after PCI, and thus applying BCW theory is necessary to improve the rehabilitation knowledge of patients, improve their lifestyle, and promote their prognoses. This study aimed to provide a reference for the rehabilitation intervention mode of patients after PCI and provide them with effective nursing methods.

## Information and Methods

### Normal Information

A total of 120 patients with CHD after PCI who visited the cardiology department from September 2022 to February 2024 were selected as the research subjects. Seven patients who did not meet the inclusion criteria were excluded. The included patients were divided into two groups according to the order of the operation time: 57 patients admitted from September 2022 to May 2023 were included in the conventional group and 56 admitted from June 2023 to February 2024 were included in the BCW group. All the patients who participated in the study were fully informed about the study and successfully completed informed consent forms. The study was consistent with the Declaration of Helsinki [14] and approved by the ethics committee of Nanhua Hospital Affiliated to University of South China Hospital (approval no.: 2024-KY-076).

### Inclusion Criteria

- (1) Patients were confirmed to have stable CHD and successfully underwent radial arterial coronary stent implantation.
- (2) The risk of postoperative exercise rehabilitation risk was evaluated as low and middle at risk.
- (3) Patients aged 18–70 years had good understanding and communication skills.
- (4) Patients had no exercise system diseases and was able to accept rehabilitation treatment.
- (5) Patients were in line with the diagnosis standard of stability CHD in the “Diagnosis and Treatment Guide of Stability Coronary Heart disease” [15].
- (6) Patients had no craniocerebral trauma.
- (7) Patients had other body organic diseases.
- (8) Patients had no mental or intellectual developmental disorders.

### Exclusion Criteria

- (1) Patients with severe psychological disorders and mental illness in the past.
- (2) Patients with atrial fibrillation, pathological sinus knot, tachycardia, and other serious heart rate abnormalities.
- (3) Patients with malignant tumors, severe heart failure, respiratory dysfunction, and damage to liver and kidney function.
- (4) Unprecedented hypertension (static blood pressure >160/100 mmHg).
- (5) Patients who participated in other related rehabilitation treatment or researchers.

### Nursing Method

The time of administration of two groups were all 3 months.

Patients in the conventional group were given conventional drug treatment and care, the main contents of which included:

- (1) Drug therapy: Secondary prevention drugs, include antiplatelet therapy, beta blockers, sartans, pilin-type antihypertensive drugs, statin lipid-lowering drugs, and anti-myocardial ischemia drugs.
- (2) In-hospital education: The medical staff introduces the functions, usage, precautions, and side effects of drug treatments. In general, patients try to combine work and rest, develop good work and rest habits, prevent excessive emotions, and maintain optimistic and positive attitude. They also try to follow doctors' advice and eat healthily, that is, eat small meals frequently and avoid overeating. Patients should control energy intake and increase physical activity. The medical staff promotes rehabilitation knowledge and sets appropriate exercise methods and intensities according to the patients' conditions and

individual differences. Before discharge, a patient is instructed to complete a sports rehabilitation training program, and a sports rehabilitation diary is issued. The medical staff instructs patients to keep a home exercise rehabilitation diary. Special attention must be paid before, after, and during exercise rehabilitation. If symptoms, such as nausea, vomiting, chest tightness, dizziness, shortness of breath, and irregular pulse, and uncomfortable symptoms occur, exercise should be stopped immediately and follow-up visits should be made in a timely manner.

(3) Follow-up education: The researcher will conduct telephone follow-ups in the same frequency as those performed on the BCW group. The follow-up content includes medication compliance, heart rate, blood pressure control, mental status, and rehabilitation exercise status. The patient will be informed to review after 3 months.

The patients in the BCW group were given routine secondary prevention drug treatment and care, including antiplatelet therapy, antihypertensive drugs, lipid-lowering drugs, and anti-myocardial ischemia drugs. In addition, postoperative rehabilitation nursing administration based on BCW theory was implemented.

On the first day after surgery, the researcher set up an online chat group for "Postoperative Care after Interventional Therapy". The group included all the members of the research team. The purpose of this study was explained, and patients were able to scan the designated QR code to join the group. In addition, the researchers distributed sports rehabilitation knowledge manual. The team's rehabilitation nurses and researchers provided face-to-face education to patients and their families. The research site was the cardiology ward of a tertiary hospital (10–20 min/time; a total of 1 time). Considering the different educational levels of patients and their families, the medical staff used appropriate and popular language for education. The content included the pathogenesis, risk factors, and prognoses of CHD after PCI. The medical staff emphasized the safety and benefits of postoperative exercise rehabilitation, reduced patients' fear of postoperative exercise rehabilitation, encouraged patients to actively participate in postoperative exercise rehabilitation, and initially established rehabilitation beliefs.

From the second day after surgery to the day before the patient was discharged, expert lectures were organized (the cardiologist introduced the postoperative rehabilitation concept, program, precautions, and adverse health outcomes that may be caused by failure to adhere to the exercise rehabilitation plan to the patients). Second, the pathogenesis of CHD, prognosis of the interventional treatment, rehabilitation concept, rehabilitation stages, and precautions and other relevant knowledge were explained to the patients. The step was necessary because it would strengthen patients' cognition of early postoperative exercise rehabilitation, individual skill instruction (the first skill instruction consisted of walking beside the bed on the sec-

ond day after surgery for 10 min three times per day and walking indoors on the third day after surgery for 10 min four times per day). When a patient's condition was unstable, the time and frequency were adjusted according to the actual situation of the patient. Before discharge, the patients were divided into five groups to perform group skill training: joint exercise (10 min), aerobic exercise (10 min), and relaxation exercise (10 min). The methods and precautions were the main training contents.

After discharge: The medical staff reminded patients and their families to pay attention to their recovery status, conduct a review after 1 month, and share relevant recovery situations in the online chat group. The family members and patients were instructed to promptly review the results of the rehabilitation period in the chat group. This step enabled the medical staff to understand the patients' exercise dynamics and praise and encourage patients who perform well, who in turn would feel a sense of accomplishment after performing the exercise rehabilitation program. In addition, online interactions were conducted once a month to allow patients to share their exercise experiences, form peer education, and strengthen patients' beliefs.

### Observation Indicators

The Self-Rating Anxiety Scale (SAS [16,17]) contains 20 items in total. A four-level Likert scale was used, with 15 forward scores and five reverse scores. The scores of the 20 items are summed, and the total score is multiplied by 1.25. The result is the standard score. According to the Chinese norm results, the cutoff value of the SAS standard score is 50 points. A high score indicates tendency toward anxiety. (1) Scores of <50 show normal condition. (2) Scores of 50–60 indicate mild anxiety. (3) Scores of 61–70 show moderate anxiety. (4) Scores of >70 indicate severe anxiety. The Cronbach's  $\alpha$  coefficient of the scale is 0.83.

The Self-rating Depression Scale (SDS) [18] has a total of 20 questions: 10 are described with positive words and 10 with negative words. Each item is scored using a four-point Likert scale. The total score is obtained for each item, and the total score is multiplied by 1.25. The result is used as the standard score. According to the Chinese norm results, the cutoff value of the SDS standard score is 53 points. A high score indicates tendency toward depression. (1) Scores of <53 indicate normal condition. (2) Scores of 53–62 indicate mild depression. (3) Scores of 63–72 show moderate depression. (4) Scores of >73 indicate severe depression. The Cronbach's  $\alpha$  coefficient of the scale is 0.85.

Sleep quality: The Pittsburgh Sleep Quality Index (PSQI) was used in evaluating the patients' sleep quality. The scale consists of 18 items and seven components. Each component is scored from 0 points to 3 points, with a total score of 0–21. The total score of the seven components is the final score. The score is inversely proportional to sleep quality [19]. (1) Scores of 0–5 indicate quite good sleep

quality. (2) Scores of 6–10 indicate good sleep quality. (3) Scores of 11–15 show general sleep quality. (4) Scores of 16–21 indicate poor sleep quality.

Quality of Life Scale (Short Form of 36 Health Survey Questionnaire, SF-36): includes eight dimensions and 36 items. Except physical and emotional function items, which have the same answers as “yes” or “no”, the other items are divided into levels from 3 to 6. Finally, the scores of each dimension are converted into a hundred-point system, and the scores range from 0 points to 100 points. A high score indicates that patients have improved health conditions. The Cronbach’s  $\alpha$  coefficient for the total scale is 0.91 [20].

### *Measurement and Determination of Heart Rate and Blood Pressure*

Heart rate and blood pressure measurement methods: The patients were instructed to avoid performing exercise, smoking, and drinking alcohol or coffee before measurement and empty their bladders. After resting for 5 min in a quiet state, the patients sit in a comfortable position with legs uncrossed. An electronic blood pressure was used. Each measurement was performed twice each week (with an interval of 1 min), and the average value was obtained. Morning blood pressure measurements were obtained within 1 h after getting up, before antihypertensive medications were administered, and before breakfast. Evening blood pressure measurements were performed after dinner and before the patients slept.

### *Data Collection*

Before the administration, the patient was instructed to provide general information, the patients’ heart rates and blood pressure were recorded, and the patients completed the anxiety and depression self-rating, sleep quality, and life quality scales. When the patients returned to the hospital for review after 3 months of administration, the heart rate and blood pressure (the average of the total weekly measurements) were recorded, and the anxiety and depression self-rating, sleep quality, and quality of life scales were completed.

### *Statistical Analysis*

The data in this study were analyzed and processed using SPSS21.0 (version: 25.0; manufacturer: International Business Machines Corporation; origin: Armonk, State of NY, USA) statistical software. The basic information of the patients were processed using descriptive statistics, chi-square test, independent-sample  $t$ -test, and rank sum test. The Shapiro–Wilk method was used in determining whether the data had normal distribution. The values were presented as average  $\pm$  standard ( $\bar{x} \pm s$ ). A  $t$ -test was then performed, and count data were expressed in frequency and percentage

(%). An  $\chi^2$  test was finally performed. A  $p$  value of  $<0.05$  indicated statistically significant difference.

## **Results**

### *Comparison of Clinical Data*

A total of 113 cases were finally included in the analysis. In this study, the average age of the conventional group was  $57.28 \pm 6.02$  years, and the average age of the BCW group was  $55.24 \pm 8.78$  years ( $t = 1.443$ ;  $p = 0.152$ ). Other data are detailed in Table 1. The clinical data of the two groups were comparable (Table 1).

### *Comparison of Changes in the Mental State*

We counted the anxiety and depression indexes of the two groups before and after the administration for 3 months. Self-assessment was performed using SAS and SDS scales (Table 2). No significant differences in SAS and SDS scores were found between the groups before administration ( $p > 0.05$ ). After 3 months of administration, the SAS and SDS scores of the patients in the BCW group were lower than those in the conventional group ( $p < 0.05$ ).

### *Comparison of the Patients’ Clinical Parameters*

Moreover, we measured the patients’ clinical parameters: heart rate and blood pressure. The SBP, DBP, and RHR of the two groups before administration were comparable ( $p > 0.05$ ). The blood pressure and heart rate in the BCW group were significantly lower than those in the conventional group after 3 months of administration ( $p < 0.05$ ; Table 3).

### *Comparison of PSQI Scores between Two Groups of Patients*

We assessed sleep quality in both groups. As shown in Table 4, the BCW group demonstrated significantly lower PSQI scores than the conventional group after 3 months of administration ( $p < 0.001$ ). No statistical difference between two groups was found before administration ( $p > 0.05$ ).

### *Comparison of Quality of Life in both Groups of Patients*

Table 5 shows the comparison results of SF-36 scores between the BCW group and the conventional group. After 3 months of administration, the SF-36 total score and other dimensional scores in the BCW group were higher than those in the conventional group ( $p < 0.05$ ), with no significant difference between two groups before administration ( $p > 0.05$ ).

**Table 1. Comparison of general clinical data of patients.**

Index	Conventional group (n = 57)	BCW group (n = 56)	t/Z/x <sup>2</sup>	p
Age	57.28 ± 6.02	55.24 ± 8.78	1.443	0.152
Gender			2.522	0.112
Male	42	48		
Female	15	8		
BMI (kg/m <sup>2</sup> )	24.51 ± 2.61	24.79 ± 3.37	-0.494	0.622
Education level			1.511	0.680
Junior high school and below	16	13		
High school/technical secondary school	23	20		
College	10	15		
Bachelor degree and above	8	8		
Per capita monthly household income (yuan)			0.133	0.988
<2000	5	6		
2000+	15	14		
4000+	31	30		
≥6000	6	6		
How to bear medical expenses			0.992	0.803
Medical insurance for urban and rural residents	25	26		
Provincial medical insurance	12	13		
Municipal medical insurance	11	7		
Other	9	10		
Marital status			0.560	0.454
Married	47	43		
Unmarried or otherwise	10	13		
Smoking history			0.653	0.721
Never smoke	26	27		
Smoking	18	14		
Quit smoking	13	15		
Do you have daily exercise habits?			0.097	0.756
No (<3 times/week, 30 min)	34	35		
Yes (≥3 times/week, 30 min)	23	21		
Number of coronary stents implanted			0.577	0.902
1	18	16		
2	20	22		
3	12	13		
≥4	7	5		
Heart function classification			0.711	0.701
Level I	26	22		
Level II	23	27		
Level III	8	7		
Complications			0.232	0.630
No	30	32		
Yes	27	24		
Past medical history			0.607	0.895
None	7	6		
Hypertension	32	29		
Diabetes	10	13		
Other	8	8		
History of drug use				
β-Blockers	31	30	0.008	0.931
Nitrate drugs	21	19	0.105	0.746
Calcium channel blockers	28	29	0.080	0.777
Lipid regulating drugs	18	20	0.216	0.642
Antiplatelet aggregation medicine	57	56	-	1.000
Statins	52	52	0.000	1.000

BCW, Behavior Change Wheel; BMI, Body Mass Index; 1¥ ≈ 0.1405\$.



**Table 2. Comparison of changes in the mental state of the two groups of patients ( $\bar{x} \pm s$ ).**

Group	n	Before administration		After administration	
		SAS	SDS	SAS	SDS
Conventional group	57	52.74 ± 8.25	52.25 ± 7.49	51.58 ± 6.70	51.10 ± 6.39
BCW group	56	51.71 ± 8.72	50.66 ± 7.64	45.97 ± 6.95	46.11 ± 6.43
T		0.645	1.117	4.369	4.138
p		0.520	0.266	<0.001	<0.001

SAS, Self-Rating Anxiety Scale; SDS, Self-rating Depression Scale.

**Table 3. Comparison of the patient's clinical parameters between the two groups of patients ( $\bar{x} \pm s$ ).**

Time	Index	Conventional group (n = 57)	BCW group (n = 56)	t	p
Before administration	SBP (mmHg)	142.33 ± 8.43	141.03 ± 7.39	0.871	0.386
	DBP (mmHg)	85.56 ± 7.45	84.55 ± 8.19	0.686	0.494
	RHR (times/min)	72.74 ± 7.98	71.37 ± 7.73	0.927	0.356
After administration	SBP (mmHg)	140.18 ± 6.10	136.18 ± 6.34	3.418	0.001
	DBP (mmHg)	83.92 ± 5.96	80.63 ± 6.56	2.791	0.006
	RHR (times/min)	71.79 ± 6.61	67.21 ± 5.37	4.038	<0.001

Note: SBP, Systolic Blood Pressure; DBP, Diastolic Blood Pressure; RHR, Resting Heart Rate; BCW, Behavior Change Wheel.

**Table 4. Comparison of PSQI scores in the two groups ( $\bar{x} \pm s$ ).**

Group	N	Before administration	After administration
Conventional group	57	13.26 ± 1.31	11.23 ± 2.04
BCW group	56	13.09 ± 2.01	7.20 ± 1.37
t	-	0.534	12.306
p	-	0.595	<0.001

PSQI, Pittsburgh Sleep Quality Index; BCW, Behavior Change Wheel.

## Discussion

Heart intervention surgery has a good treatment effect on patients with diseases but has negative effects. For example, after surgery, patients have decreased sleep quality and are prone to negative emotions that adversely affect their recovery from a disease.

The symptoms of depression and anxiety accelerate the direct and indirect processes of the pathogenesis of cardiovascular diseases. The risk factors and myocardial infarction of lifestyle not only increase the risk of adverse vascular incidents of uncontrolled vascular incidents after surgery in patients with coronary arteries but also have a profound impact on the patients' long-term prognoses [21]. Depression and anxiety are extremely common in patients with CHD. The study of Mujtaba SF *et al.* [22] has shown that the probability of anxiety and depression after PCI is 7.5% and 10.5%, respectively.

The SAS and SDS scores of the BCW group were significantly lower than those in the conventional group after 3 months of administration. A pairwise comparison of the BCW group showed that the anxiety and depression levels

improved after 3 months of administration compared with those before administration. The analysis showed the following results: ① This study reviews the previous relevant literature starting from the perspective of patients and uses multiple intervention functions, such as education, persuasion, and modeling, to conduct individualized and targeted health education for patients. This program enhanced patients' postoperative exercise rehabilitation through postoperative exercise. Knowledge of importance. The motivation for exercise rehabilitation has been continuously strengthened. Patients' active participation in recovery has continued to increase over time, and self-efficacy gradually increases. ② Emotional support is provided by the members of the sports rehabilitation group to the patients and assessed by a professional psychological counseling physician. The aim is to address the various bad emotions shown by patients in a timely manner. In addition, the high levels of support from families and companions may help patients to relieve tension or depression.

The quality of a patient's sleep is greatly affected by the complexity of a hospital's environment [23,24]. The PSQI scores of patients in the conventional group were lower than those in the BCW group, fully demonstrating that the health education and nursing model based on BCW theory indeed helped to improve patients' sleep quality. The theoretical health education care model allowed patients to minimize the impact of external factors on their sleep as much as possible. In addition, after targeted psychological intervention, the patients' mentality was adjusted, and the patients were able to remain calm. After surgery, the patients were able to sleep and were instructed to develop regular and healthy work and rest, avoid staying up late, go to bed early, and get up early, to improve the quality of sleep.

**Table 5. Comparison of quality of life in two groups ( $\bar{x} \pm s$ ).**

Time	Item of PSQI	Conventional group (n = 57)	BCW group (n = 56)	t	p
Before administration	Physical functioning	57.05 ± 13.99	58.95 ± 15.52	-0.684	0.496
	Role physical	46.79 ± 14.26	48.03 ± 16.83	-0.423	0.673
	Bodily pain	46.92 ± 14.35	47.37 ± 13.09	-0.174	0.862
	General health	50.51 ± 16.89	53.42 ± 15.34	-0.958	0.340
	Vitality	54.36 ± 14.92	55.13 ± 13.83	-0.284	0.777
	Social function	57.69 ± 17.35	60.25 ± 17.85	-0.773	0.441
	Emotional function	52.98 ± 19.83	55.28 ± 17.83	-0.648	0.518
	Mental Health	65.95 ± 13.33	68.11 ± 14.75	-0.817	0.416
	Total score	56.39 ± 9.68	56.76 ± 11.73	-0.183	0.855
After administration	Physical functioning	62.56 ± 11.75	71.71 ± 9.88	-4.476	<0.001
	Role physical	48.71 ± 18.98	61.18 ± 20.71	-3.338	0.001
	Bodily pain	47.44 ± 12.51	53.42 ± 14.94	-2.309	0.023
	General health	53.46 ± 12.20	62.89 ± 14.36	-3.764	<0.001
	Vitality	60.13 ± 10.42	68.95 ± 12.74	-4.032	<0.001
	Social function	58.65 ± 13.19	68.12 ± 13.53	-3.767	<0.001
	Emotional function	58.12 ± 18.29	68.42 ± 20.43	-2.825	0.006
	Mental Health	66.77 ± 9.27	75.15 ± 9.85	-4.658	<0.001
	Total score	58.40 ± 6.98	66.67 ± 8.36	-5.712	<0.001

BCW, Behavior Change Wheel.

The results of this study showed that the SF-36 total score and other dimensional scores in the BCW group were significantly higher than those in the conventional group after 3 months of administration, indicating that after 3 months of rehabilitation and nursing administration based on BCW theory, the quality of life of patients after coronary intervention improved to a certain extent. This result is consistent with the results obtained by Liu *et al.* [25], who developed an intervention plan based on BCW theory for patients with acute retinal necrosis. The reasons may be as follows: ① Family members play a role that cannot be ignored in the out-of-hospital rehabilitation of patients after coronary intervention. They work with patients to learn relevant content about postoperative sports rehabilitation to deepen patients' understanding of the importance of postoperative sports rehabilitation and the harm of negative emotions. Family members urge patients to comply with doctors' instructions and implement exercise rehabilitation plans, treat negative emotions correctly, and communicate with members of rehabilitation teams promptly when problems arise. ② Patients talk to each other about their feelings and encourage one another, driving some patients who are less motivated to work hard to achieve their goals. Rehabilitation teams provide guidance for any doubts that cannot be solved in the process. ③ The nursing intervention plan based on BCW theory is patient centered, and exercise prescriptions are formulated according to the consensus of sports rehabilitation experts and patients' conditions. The medical staff utilizes heart rate monitors and other online platforms to supervise and provide feedback to patients during the implementation of an established plan and monitor patients' emotional changes to meet patients' needs for emotional support. This method effectively im-

proves patients' rehabilitation cognition and confidence, reduces anxiety and depression levels, improves exercise rehabilitation compliance, and makes the rehabilitation effect obvious, thereby improving patients' quality of life to a certain extent.

The limitation of this study is that due to time and manpower constraints, the implementation of the administration plan was limited to one hospital, and the representativeness of the research subjects may be lacking. Moreover, the total duration of the administration was short, and the impact of this administration model on the long-term prognoses of patients was not explored. The intervention program developed and implemented in this study was aimed at small-scale individual health behavior change. The identification of policy categories in BCW theory is not clear and practical enough, and the multiple policy categories it contains seem to be more suitable for large-scale public health projects. In the future, multicenter and multigroup randomized controlled trials can be carried out to increase the sample size and follow-up duration and observe the long-term prognostic effect of the intervention program on patients.

## Conclusion

Nursing intervention programs based on BCW theory can alleviate anxiety and depression in patients after coronary intervention, reduce RHR, improve cardiac function, and improve patients' sleep quality and quality of life. This study verified that the nursing administration plan based on BCW theory is easy to accept and considered effective by patients, providing a reference for clinical intervention of other chronic diseases and home-based exercise rehabilitation.

## Availability of Data and Materials

The datasets used and/or analyzed during the current study were available from the corresponding author on reasonable request.

## Author Contributions

FW designed the study; SD and LY collected and analyzed the data. All authors conducted the study and contributed to critical revision of the manuscript for important intellectual content. All authors gave final approval of the version to be published. All authors participated fully in the work, took public responsibility for appropriate portions of the content, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or completeness of any part of the work were appropriately investigated and resolved.

## Ethics Approval and Consent to Participate

This study has been approved by the ethics committee of Affiliated Nanhua Hospital, University of South China, approval No. 2024-KY-076. We obtained from all included patients after ensuring that they understood the study content.

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## Conflict of Interest

The authors declare no conflict of interest.

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