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Research Paper

Effects of pre-operative education tailored to information-seeking styles on pre-operative anxiety and depression among patients undergoing percutaneous coronary intervention: A randomized controlled trial

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ABSTRACT

Objective: This study aimed to evaluate the impact of pre-operative education tailored to percutaneous coronary intervention (PCI) patients' information-seeking styles on pre-operative anxiety and depression.

Methods: A single-blind randomized control trial was conducted. A total of 114 participants were recruited from the cardiology department in a tertiary hospital in Kunming, Southwest China from April to September 2020 and randomly allocated to the intervention group ($n = 57$) or control group ($n = 57$). All patients received oral pre-operative education as well as printed pre-operative education manuals and divided into monitors or blunders by the Chinese Version of the Monitoring Subscale of the Miller Behavioral Style Scale (C-MMBSS). The intervention group received pre-operative education tailored to information-seeking styles, while the control group received routine education. Anxiety and depression were measured at baseline and 1 h before the operation. Satisfaction with pre-operative education and length of stay were assessed at discharge.

Results: A total of 104 participants completed the study (52 participants in each group). Pre-operative education tailored to information-seeking styles was beneficial for reducing pre-operative anxiety ($P < 0.01$), reducing pre-operative depression ($P < 0.01$), and improving satisfaction with pre-operative education ($P < 0.01$) compared with routine education. There was no significant difference in length of stay between the intervention and control groups ($P = 0.209$). Conversely, pre-operative anxiety of patients was increased ($P = 0.017$) after pre-operative education in the control group.

Conclusion: This study confirmed that pre-operative education tailored to information-seeking styles effectively reduces pre-operative anxiety and depression and improves satisfaction with preoperative education.

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What is known?

- Individuals were categorized into monitoring or blunting information-seeking styles with respect to medical information.
- Patients fare better psychologically, behaviorally, and physiologically when the information they received is tailored to their information-seeking styles.

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- Health education tailored to information-seeking styles has been advocated extensively, but the effectiveness of it among patients undergoing percutaneous coronary intervention (PCI) remains uncertain.

What is new?

- Pre-operative education tailored to information-seeking styles improved pre-operative anxiety, depression, and satisfaction with pre-operative education.
- Pre-operative education should be tailored to information-seeking styles.

1. Introduction

Due to the high morbidity and mortality rates associated with coronary artery disease [1–4] and the developments in cardiovascular intervention, the number of patients receiving percutaneous coronary intervention (PCI) treatment has increased. It has been reported that the average number of patients undergoing PCI per year is 800,000 in Europe and 1 million in the USA [4]. More than 820,000 PCI procedures were performed in China in 2017 [5]. As a common treatment for coronary artery disease, PCI benefits patients by decreasing mortality rates and long-term myocardial infarctions, thereby causing less pain and improving quality of life [6–8]. Although PCI has been applied worldwide due to its advantages, this heart-related intervention is invasive and can cause severe psychophysiological arousal among patients. Some PCI patients may develop psychological issues such as pre-operative anxiety and depression; PCI patients have higher levels of these symptoms than individuals in the general population [4,9]. Pre-operative anxiety and depression are associated with decreased immunity, elevated inflammation levels, and increased cardiovascular morbidity and mortality rates [4,10–12]. As such, methods to reduce the levels of pre-operative anxiety and depression in patients receiving PCI are necessary to improve their clinical outcomes.

As a way to prepare patients for their surgery both physically and psychologically, pre-operative education has been found to decrease patients' pre-operative anxiety and depression [13]. However, a study found that pre-operative education did not reduce patients' anxiety levels, which makes the practice of pre-operative education for patients undergoing PCI complicated and challenging [14]. Some studies have explored the reasons for the conflicting results, and evidence suggests that individualized health education is key to the success of pre-operative education and positive patient outcomes, which suggests that pre-operative education for patients undergoing PCI should be individualized and should take into account the patients background, preferences and personality [14,15]. As one aspect of personalities, information-seeking styles play an important role in patient education [16]. The Cognitive-Social Health Information (C-SHIP) model emphasized the involvement of cognitive and affective factors in the face of health threats and demonstrated that individuals were categorized into two main information-seeking styles with respect to medical information: monitoring information-seeking styles, also known as monitors and blunting information-seeking styles, also known as blunters [17]. Monitors seek out threat-relevant information and need more psychological support, while blunters avoid this information. For monitors, a large amount of information combined with psychological support can reduce their tension and anxiety, reduce pain, and improve their satisfaction with information provision and care. Conversely, among blunters, a minimal amount of

information can lower their stress and arousal levels, make them feel more relaxed, and facilitate their reinterpretation [18–21]. Miller [17,19,20,22] also indicated that patients fare better psychologically, behaviorally, and physiologically when the information they receive is tailored to their information-seeking styles, thus suggesting pre-operative health education for patients undergoing PCI should be aligned with information-seeking styles [14].

However, the effect of pre-operative health education tailored to patients' information-seeking styles remains unclear among patients receiving PCI. Therefore, we conducted a randomized controlled trial to determine whether pre-operative health education tailored to patients' information-seeking styles can relieve pre-operative psychological issues such as anxiety and depression among PCI patients.

2. Methods

2.1. Study design and participants

We conducted a prospective, single-blinded clinical randomized controlled trial (Chinese Clinical Trial Registry Center [<http://www.chictr.org.cn>] registration number: ChiCTR2000031261) among patients scheduled for the PCI procedure. This study report follows Consolidated Standards of Reporting Trials (CONSORT).

Participants were recruited from the cardiology department in a tertiary hospital in Kunming, Southwest China from April to September 2020. A convenience sampling method was used to select the participants. The inclusion criteria were as follows: 1) voluntary participation; 2) the first elective PCI; 3) age 18 to 80; 4) normal communication ability; and 5) medical stability. Patients participating in other studies, patients with other major comorbidities and patients with cognitive confusion were excluded.

The formula for Comparing Two Means was used to calculate the sample size [23]. Before the formal study, we conducted a pilot study involving 40 PCI patients who met the inclusion criteria to assess the effect of pre-operative education in a tailored approach on anxiety and depression before the operation and calculated the sample size. According to the pilot study, a sample size of 94 was required to detect significant differences in this study (type I error = 0.05, type II error = 0.10). The final estimated sample size was 114 for two groups, accounting for a potential attrition rate of 20%.

2.2. Ethical statement

This trial was approved by the ethics committee of the First Affiliated Hospital of Kunming Medical University on 31 July 2019 (2019 ethical approval number 26). The recruiter contacted the participants about the study's purpose, significance, and procedure and explained voluntary participation and the unaffected withdrawal principle. Before starting the trial, the participants signed written informed consent. Participants' personal data were only used for academic purposes and will not be disclosed to anyone other than the relevant researchers.

2.3. Randomization and masking

The randomization sequences were generated by a data administrator proficient in statistics but not involved in other research processes. The block randomization method with a block size of 4 was used to randomize participants in a 1:1 ratio to the tailored education group (intervention) or conventional education groups (control). Each randomization sequence was then sequentially sealed in separate opaque envelopes. Groups of participants

were finally determined by opening the envelopes. The allocation was concealed until the initiation of the intervention.

The outcome assessors and statistical analysts were blinded. The results were measured by outcome assessors blinded to the study hypothesis and group allocation information. The statistical analysts were only responsible for data analysis. All the participants completed the same questionnaire and used different types of pre-operative health education manuals with similar appearances. In addition, the trial supervisors (F. Ma, A. Hanum, Q. Zhuo) supervised the implementation of randomization and blinding throughout the process.

2.4. Interventions

The intervention program was developed based on a literature review, qualitative research, and expert review, with cognitive-social health information processing (C–SHIP) theory leading the intervention [17]. According to the literature review, the pre-operative health education manual was developed to guide education [24–27]. Besides, a qualitative interview to explore the needs of patients undergoing PCI on pre-operative education was conducted [14]. According to the literature review and qualitative research, three topics of pre-operative education were made as follow. 1) What is my disease? 2) How can it be treated? 3) What should I do? The three types of pre-operative health education manuals contain the same topics and items. The contents of these three topics involve items about disease definition, etiology, inducement, symptoms and signs, treatment methods, operation process, operation risk, pre-operative cooperation, post-operative cooperation and medication precautions, and the manuals use cartoon patterns, colors, and plain language to improve readability [14].

Finally, eight experts (two were doctors specialized in cardiology and psychiatry, respectively, with senior professional titles and more than 15 years of working experience; six were nurses specialized in cardiology care with senior professional titles and more than 20 years of working experience) were invited to revise the manuals. The experts' suggestions include modifying words and deleting some contents. For example, three experts suggested changing "what is coronary heart disease" to "what is my disease". Two experts suggested deleting the description of complications. In general, no major changes were made.

Four cardiology nurses provided pre-operative education based on the manuals. Two of them were responsible for the pre-operative education in the intervention group, and the other two nurses were responsible for education in the control group. All nurses had bachelor's degrees and worked in the cardiology department for over five years. One nursing student with a master's degree measured patients' information-seeking styles, and another measured the outcome. Before the intervention, the four nurses and two nursing students received a half-day training by the project leader (F. Ma), who held a Ph.D. degree and over ten years of clinical experience in coronary heart disease. The training contents included health education skills, how to use pre-operative health education manuals, and measurement methods.

2.4.1. The intervention group

When admitted to the hospital, the measurer assisted the participants to complete the Chinese Version of the Monitoring Subscale of the Miller Behavioral Style Scale (C-MMBSS) [28]. The data manager analyzed and saved participants' C-MMBSS scores. Participants in the intervention group were divided into monitors or blunters based on their scores. Different types of information-seeking styles received corresponding pre-operative health education.

Once the eligible participants signed the informed consent form for PCI surgery, the attending physician notified the data manager. Then, the data manager assigned a nurse to implement health education for monitors patients and blunters patients one day before the operation respectively. The main form of preoperative health education is that nurses explain the contents of the pre-operative health education manual to patients one at a time. The difference is that the content of each item in the monitors manual includes detailed information, in the blunters manual includes minimal and simple information. For example, disease definition was explained in detail using plain language and combing with five pictures. Disease definition in the blunters manual is a simplification of the usual definition. Manuals were subsequently provided to the patients. The duration of pre-operative health education in monitors and blunters was approximately 15 min and 5 min, respectively.

2.4.2. The control group

To prevent patients from knowing the grouping situation, the information-seeking styles of patients in the control group were measured when admitted to the hospital like the intervention group. The control group received routine pre-operative health education that was not tailored to information-seeking styles, for example the disease definition in the control group is a conventional definition, without plain language and concise content. Data manager assigned two nurses in the control group to implement pre-operative education one day before the operation with routine pre-operative education manual. The routine pre-operative education manual items are less complicated than the monitor pre-operative education manual and not as simple as the blunter pre-operative education manual. Therefore, the nurse explained the contents of the routine pre-operative manual to patients one by one. Manuals were subsequently provided to the patients. The duration of pre-operative health education in the control group was approximately 10 min. Furthermore, the whole process of the intervention was supervised by the project leader (F. Ma).

2.5. Measures

Baseline characteristics, including demographic information (such as age, gender, nationality, marital status, and level of education) and clinical variables (such as admission diagnosis and PCI type), were assessed using a self-designed baseline characteristic collection questionnaire.

Information-seeking styles were evaluated using the C-MMBSS [28]. The C-MMBSS was translated and validated by our research team from the Miller behavioral style scale (MBSS) and has been verified to have good psychometric properties. This tool can identify individuals' information-seeking styles in threatening medical situations in Chinese contexts [20,28]. The C-MMBSS consists of four hypothetical threat-evoking scenarios (1. visiting a dentist; 2. kidnapped by a terrorist organization; 3. in danger of unemployment; 4. on an airplane with technical problems). Each hypothetical threat-evoking scenario includes three or four monitoring statements (e.g., "I would want the dentist to tell me when I would feel pain"), comprising 13 monitoring statement items. The items are rated on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). The total scores on the C-MMBSS scale range from 13 to 65; individuals who scored at least 51 points were considered monitors, while those who scored below 51 points were considered blunters [28].

Anxiety was assessed with the State-Trait Anxiety Inventory [29,30], a widely used 20-item tool to measure state or transitory anxiety. All items are self-rated on a 4-point scale ranging from 1 ("almost never") to 4 ("almost always"). Ten negative items were

reverse scored (from 4 to 1), and ten positive items were forward scored (from 1 to 4). Higher scores indicate a higher level of anxiety.

Depression was measured with the Self-rating Depression Scale [30,31]. The scale contains 20 items, including 10 positive items and 10 negative items. Participants rated their feelings about each item during the past week using a 4-point Likert scale. In the 10 positive scoring items, “none, or a little of the time” is counted as 1 point, while “most, or all of the time” is counted as 4 points. The scores of the negative items were the opposite. The raw score for the total scale ranges from 20 to 80. The cutoff index score is 50, converted by dividing the raw sum score by 80 and multiplying it by 100. Higher scores indicate greater severity of depression.

Patients' satisfaction with pre-operative education was measured using a self-designed one-item scale ranging from 0 (very dissatisfied) to 100 (very satisfied). Patients were graded according to their satisfaction with pre-operative health education. In addition, the length of stay was determined based on the admission and discharge times.

2.6. Data collection

Patients scheduled for PCI were introduced to the recruiter after the physician developed an initial treatment plan. Then the recruiter invited eligible patients to participate. A measurer blinded to the study hypotheses and patient grouping assessed the patients' anxiety and depression at admission and 1 h before the operation, assessed the patients' satisfaction with pre-operative education at discharge, and recorded the length of stay. Furthermore, participants' information-seeking styles were also evaluated at baseline. In addition, to prevent participants from filling in the scale incorrectly or randomly, the measurer read all the measurement scales verbatim to the participants and checked their responses accordingly.

2.7. Statistical analysis

SPSS version 20.0 was used for the statistical analysis of data. The continuous variables were expressed as the mean and standard deviation, and the categorical variables were expressed as frequency and percentage. Baseline differences between groups were compared using independent-sample *t*-tests or chi-square test, and between-group comparisons using Mann–Whitney test. Within-group comparisons were conducted using paired samples *t*-tests for normally distributed continuous data and the paired samples Wilcoxon test for nonnormally distributed continuous data. A 2-sided *P*-value < 0.05 indicated statistical significance.

3. Results

Of the 285 potential patients assessed for eligibility, 114 were eligible and randomized. During the research process, 5 participants (4.4%) refused the data collection, 1 participant (0.9%) withdrew due to transfer, 2 participants (1.8%) canceled the operation, 1 participant (0.9%) refused intervention, and 1 participant's (0.9%) condition deteriorated. The total drop-out rate was 8.8%. One hundred four eligible participants completed the study and were included in the analysis (Fig. 1).

At baseline, most of the participants were male 74 (71.2%) and married 102 (98.1%). The mean age of the participants was 58 years (ranging from 27 to 79 years). Most participants were of Han nationality 86 (82.7%). Regarding information-seeking styles, 45 participants were considered to be monitors, and 59 were found to be blunterners. Furthermore, 23 participants were monitors, and 29 were blunterners in the intervention group; as for the control group, 22 participants were monitors, and 30 were blunterners (Table 1). Overall,

the two groups had no difference in baseline characteristics ($P > 0.05$).

Table 2 shows no significant between-group difference in anxiety score at admission ($P = 0.633$). The intervention group had lower anxiety scores than the control group 1 h before the operation ($P = 0.002$). According to within-group analysis, a decrease in anxiety scores in the intervention group ($P < 0.01$) and an increase in anxiety scores in the control group ($P = 0.017$) was observed.

As shown in Table 2, there was no statistically significant difference in depression level between the two groups at admission ($P = 0.638$). The depression scores in the intervention group were significantly lower than in the control group 1 h before the operation ($P = 0.005$). Within-group analysis revealed a reduction in depression scores in the intervention group ($P < 0.001$) but no significant change in depression scores in the control group ($P = 0.470$).

The results demonstrated that the mean satisfaction score in the intervention group was 94.4 ± 6.8 and the control group was 85.2 ± 9.8 . However, the intervention group showed a significantly higher satisfaction score than the control group at discharge ($P < 0.001$).

The mean length of stay in the intervention group was 8.2 ± 3.2 days, while that of the control group was 7.8 ± 3.3 days. There was no significant difference in the length of stay between the two groups ($P = 0.209$).

4. Discussion

We conducted this randomized controlled trial to investigate the effect of pre-operative education tailored to information-seeking styles among PCI patients. The findings of this study revealed that conventional pre-operative education increased the pre-operative anxiety level of patients. Consistent with our results, Deyirmenjian et al. reported that patients in the experimental group receiving pre-operative education with reinforcement of information, including cardiac surgery unit equipment, functional training, possible complications, pain management, and so on, had a higher pre-operative anxiety level [32]. This finding can be explained by the fact that patients could not bear such a large amount of pre-operative information, which might increase their anxiety. A study supporting this view showed that some patients who received more disease-related information experienced more anxiety [33], which suggests that pre-operative health education might increase patients' burden physiologically and psychologically [19]. Our study provided evidence that pre-operative education tailored to information-seeking styles can decrease pre-operative anxiety compared with conventional education. We found that more information could help monitors cope with anxiety, while declining to receive information with the aim of self-distraction could help blunterners cope with anxiety [34]. Kruzik et al. [35], also pointed out that the effect of pre-operative education tailored to information-seeking styles on pre-operative anxiety is better than that of conventional pre-operative education. Hence, pre-operative health education could play a positive role in improving the physiological and psychological outcomes of patients only when the education matches the information-seeking styles of patients.

Few studies have reported the efficacy of pre-operative education on depression. Shuldham [36] carried out pre-operative health education among patients before coronary artery bypass grafting and found that patients' depression levels did not improve significantly. Nevertheless, Liu et al. [37] reported that pre-operative education intervention with detailed information can lower depression levels among gastrectomy patients at 1 h before surgery and 24 h after surgery. These findings indicate that different information given in the education process can lead to different

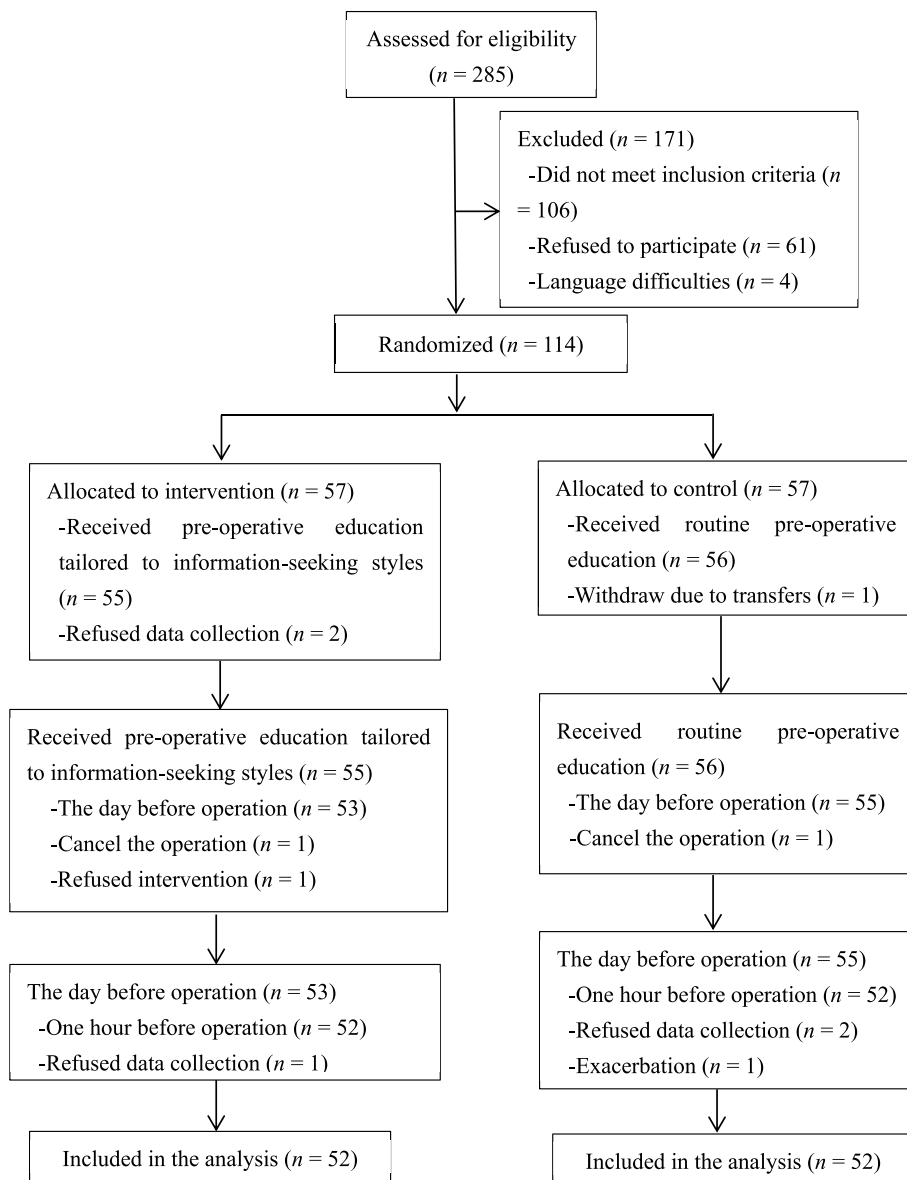


Fig. 1. Flowchart of the study.

outcomes. Our study revealed that pre-operative education without considering information-seeking styles could not lower depression levels at 1 h before surgery. Furthermore, our study also found that the intervention group, which received pre-operative education tailored to information-seeking styles, showed significant improvement in pre-operative depression levels. Consistent with our results, a previous systematic review indicated that patient-centered information tailored to information-seeking styles plays an important role in decreasing the depression levels of cancer patients [38]. Our results further highlight the need to provide pre-operative education tailored to information-seeking styles.

As expected, the patients in the intervention group receiving pre-operative education tailored to information-seeking styles reported higher satisfaction with the pre-operative education, similar to the findings of Husson and Miller et al. [19,38]. The level of satisfaction with pre-operative education is correlated with better health outcomes, whereas information-seeking styles are related to information satisfaction [39,40]. When faced with threat-relevant

information, monitors scan for and amplify this information, whereas blunters distract themselves from voluminous information. Furthermore, monitors tend to feel dissatisfied with information received, while blunters are satisfied when they do not receive voluminous information [19,39,40]. Therefore, we suggest that satisfaction with pre-operative education can be improved when voluminous information is given to monitors and when less information is provided to blunters.

In the present study, the average length of stay was approximately 10 days, which is consistent with the results of Zheng et al. [41]. Although previous study has demonstrated that pre-operative health education could reduce the length of stay in total knee arthroplasty patients [42], our findings suggest that neither method of pre-operative education is effective at reducing the length of stay. In our study, the length of stay was affected by disease severity, age, economy, and other factors rather than pre-operative health education intervention. This finding is also in accordance with the study of Ronco et al., in which the length of stay was affected by post-operative treatment and related costs

Table 1
Baseline characteristics of the participants.

Variables	Intervention group(n = 52)	Control group(n = 52)	t/χ ²	P
Age	58.3 ± 11.3	57.9 ± 12.8	0.163	0.871
Gender				
Male	38 (73.1)	36 (69.2)	0.187	0.665
Female	14 (26.9)	16 (30.8)		
Ethnic group				
Han	40 (76.9)	46 (88.5)	2.419	0.120
Minority	12 (23.1)	6 (11.5)		
Marital status				
Unmarried	1 (1.9)	1(1.9)	< 0.001	1.000
Married	51 (98.1)	51 (98.1)		
Level of education				
Primary school and below	22 (42.3)	24 (46.2)	6.551	0.088
Junior high school	9 (17.3)	14 (26.9)		
Senior high school	10 (19.2)	2 (3.8)		
College or above	11 (21.2)	12 (23.1)		
Information-seeking styles				
Monitoring	23 (44.2)	22 (42.3)	0.039	0.843
Blunting	29 (55.8)	30 (57.7)		
Admission diagnosis/symptom				
Chest distress	15 (28.8)	15 (28.8)	3.284	0.350
Chest pain	15 (28.8)	22 (42.3)		
Coronary heart disease	16 (30.8)	9 (17.3)		
Acute coronary syndrome	6 (11.5)	6 (11.5)		
PCI operation type				
CA	25 (48.1)	20 (38.5)	1.201	0.548
CA, PCI	16 (30.8)	17 (32.7)		
CA, PTCA, PCI	11 (21.2)	15 (28.8)		

Note: Data are n (%) or Mean ± SD. PCI = Percutaneous Coronary Intervention. CA = Coronary Angiography. PTCA = Percutaneous Transluminal Coronary Angioplasty.

Table 2
Comparison of anxiety and depression within and between groups.

Variables	Intervention group(n = 52)	Control group(n = 52)	Z	P
Anxiety				
Baseline	22.6 ± 2.8	22.6 ± 3.2	-0.477	0.633
One hour before operation	21.5 ± 2.1	23.1 ± 3.1	-3.159	0.002
Z	-4.458	-2.389		
P	< 0.001	0.017		
Depression				
Baseline	23.0 ± 2.1	22.9 ± 2.3	-0.471	0.638
One hour before operation	21.9 ± 2.1	23.1 ± 2.5	-2.814	0.005
Z	-5.096	-0.722		
P	< 0.001	0.470		

[27]. Furthermore, it is difficult to reduce the length of stay only by health education, as another study reported that the length of stay might be related to the patient's factors, hospital factors, social factors, and other factors [26,27,37,43].

5. Limitations

Some limitations should be mentioned. First, the participants were recruited from a single general tertiary hospital in Southwest China; therefore, the results are not generalizable to all patients undergoing PCI in different cities. Second, due to the small sample size, the findings should be interpreted cautiously. A large-sample multicenter study is warranted. Third, anxiety, depression, satisfaction with education, and length of stay were measured only before the operation. The post-operative effects of the tailored pre-operative education program were ignored. Therefore, future studies should evaluate the post-operative effects.

6. Conclusion

This study provides evidence that pre-operative education tailored to patients' information-seeking styles effectively reduces

pre-operative anxiety and depression and improves satisfaction with pre-operative education compared with conventional pre-operative education. Therefore, pre-operative education should be tailored to information-seeking styles. Our study adds to the literature on the effectiveness of pre-operative education tailored to information-seeking styles and may promote its application in other settings.

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Data availability statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

CRedit authorship contribution statement

Qiqi Zhuo: Writing-original draft, Data curation. **Fang Ma:** Conceptualization, Writing-review & editing. **Changsheng Cui:**

Formal analysis. **Yangjuan Bai**: Data curation. **Qjulan Hu**: Conceptualization. **Ardani Latifah Hanum**: Writing-review & editing. **Wei Wei**: Formal analysis. **Hongmin Liang**: Data curation, supervision.

Declaration of competing interest

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijnss.2023.03.015>.

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