포괄적 심장재활을 위한 마음챙김기반 상담프로그램의 개발 및
예비적 효과성: 사전연구

정지영1, 김민정2, 윤솔빈3, 김효진3, 윤진아3, 이미경4, 신상희1, 전용관5,6,7, 한성림8, 이정은8, 이찬주9, 이종영10, 정익모11, 김종남12
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Development and Preliminary Efficacy of a Mindfulness-Based Counseling Program as Part of Comprehensive Cardiac Rehabilitation: A Pilot Study

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Key messages
본 연구의 목적은 심장질환 환자들을 위한 포괄적 심장재활 중재의 일부로 심리상담 프로그램을 개발하고 효과성을 확인하는 것이다. 이를 위해 6회기로 구성된 마음챙김 기반 상담 프로그램을 개발하였다. 마음챙김 기반 상담 프로그램은 코로나 시기에 맞추어 2회의 대면 상담 및 교육과 4회의 온라인 상담 및 교육으로 구성되었다. 프로그램의 구체적인 내용은 마음챙김 먹기 명상, 바디스캔, 마음챙김 호흡법, 마음챙김 걷기 등이다. 서울 소재 대학병원에서 치료 중인 13명의 심장질환 환자 중 7명에게 포괄적 심장재활 프로그램을 실시하였고 6명에게는 운동재활 프로그램을 실시하였다. 그 결과, 포괄적 심장재활군에서 불안이 유의하게 감소하고 건강관련 삶의 질 중 정신적 건강과 전반적 건강이 유의하게 증가하였다. 운동재활군에서는 우울이 유의하게 감소하였고 건강관련 삶의 질 중 정신적 건강이 유의하게 상승하였다. 본 연구를 통한 포괄적 심장재활의 필요성과 심리중재의 효과성을 확인할 수 있었고 이후 대규모 연구가 필요함을 제안하고자 한다.

중심말자: 포괄적 심장재활, 마음챙김, 효과성, 예비연구

Abstract
Background: While psychological intervention is recognized as a core component of cardiac rehabilitation (CR), its application in CR remains limited. This study aimed to develop a psychological counseling program (the Mindfulness-Based Counseling Program [MBCP]) as a component of comprehensive CR for the patients with cardiovascular disease and to explore its preliminary efficacy.

Methods: We developed a psychological counseling program (MBCP) as part of comprehensive CR. The MBCP consisted of six-week psychological counseling and mindfulness practice. Through this program, we aimed to promote health maintenance behaviors and stress management. Thirteen subjects with either acute myocardial infarction or congestive heart failure with reduced EF (≤40%) participated, randomly assigned to either comprehensive CR including MBCP (n=7) or exercise-based CR (n=6). Psychological-status assessments included life satisfaction (DSQ), health-related quality of life (HRQoL), depression (PHQ-9),...
Introduction

Cardiovascular diseases (CVDs) remain one of the leading causes of death and disability worldwide [1]. Cardiac rehabilitation (CR) services are integral components of the continuum of care for patients with CVDs [2]. CR is an evidence-based intervention that uses patient education, health behavior modification, and exercise training to improve secondary prevention outcomes in patients with CVDs [3]. According to Thomas et al. [3], CR services empower patients to meet their goals of increased physical activity, improved dietary habits, optimal adherence to prescribed medications, smoking cessation, and optimal psychosocial well-being and stress management, thereby helping them to reduce their risk of future CVD events.

Although CR has traditionally focused on exercise, recent European guidelines emphasize the need for diet and psychological counseling, in addition to exercise [4]. According to Anderson et al. [5], comprehensive CR includes behavioral changes in lifestyle, modification of risk factors, and psychological components related to psychosocial well-being. Grace SL et al. reviewed that CR is comprised of five core components, namely nutritional counseling, risk factor modification, psychosocial management, patient education, and exercise training [6,7]. Other findings showed that comprehensive CR of all core components significantly reduces morbidity and cardiovascular mortality [8]. Therefore, psychological intervention or counseling is an important component of comprehensive CR.

The increasing need for psychological interventions in CR has led to a variety of studies. Psychological maladjustments such as stress [9], anxiety [10], and depression [11] have been identified as significant psychosocial risk factors of cardiovascular disease, and psychological interventions for CVD have focused on these factors. For example, Blumenthal et al. [11] insisted that depression is an important independent predictor of death after undergoing a coronary artery bypass graft (CABG) and should be carefully monitored and treated if necessary. The impact of stress on CVDs and suggested underlying pathophysiology were recently reviewed by Kivimäki and Steptoe [9].

After reviewing the standard and integrated care programs for patients with cardiac disease, Huffman et al. [12] concluded that traditional collaborative care models are feasible and effective for improving mood symptoms, anxiety, mental health-related quality of life (HRQoL), and function in patients with CVD and psychiatric conditions. In addition, coping skills and stress management, mindfulness-based programs (i.e., mindfulness-based stress reduction [MBSR] and mindfulness-based cognitive therapy [MBCT]), and positive psychological interventions are useful in patients with CVD but without psychiatric conditions. Huffman et al. [13] reported that patients with depression showed significantly greater improvement in depression, mental HRQoL, anxiety, and cognitive symptoms of depression as a result of psychoeducation, and planning pleasurable activities, among others. Mohammadi et al. [14] implemented an
optimism training intervention in patients with heart disease and found out that the intervention group showed greater improvements in optimism, life satisfaction, hope, and anxiety. Williams et al. [15] conducted an eight weeks group stress reduction program. The "mindful meditation" in daily life situation was applied to the intervention group. After completing the program, the intervention group showed significant decrease in effects of daily hassles, psychological stress and medical symptoms compared to the control group.

In this study, we investigated the preliminary efficacy of MBSR as a psychological intervention for CR. The definition of mindfulness is "the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the experience moment by moment" [16]. The MBSR, developed by Jon Kabat-Zinn [17], is a structured group intervention program for patients with chronic medical conditions. According to Grossman et al. [18], MBSR is a program that alleviates suffering associated with physical, psychosomatic, and psychiatric disorders and may help a broad range of individuals cope with their clinical and non-clinical problems. Nijjar et al. [19] indicated that MBSR is a safe and well-received secondary prevention strategy for cardiac patients. They suggested a conceptual model of MBSR in cardiac patients, which explained that MBSR improves emotional regulation and psychosocial function, leading to a reduced CV risk-factor burden and finally, a reduced risk of recurrent CV events and mortality.

Based on the above literature review, we hypothesized that the CCR program including psychological intervention can improve the quality of life, depression, anxiety, and perceived stress, as well as reduce medical events in patients with CVD. Therefore, in this study, we developed a Mindfulness-Based Counseling Program (MBCP) for cardiac patients as part of the CCR and explore the preliminary efficacy of the program.

1. Development of a psychological intervention program

The content of a Mindfulness-Based Counseling Program (MBCP) was constructed based on the findings of previous studies. Prior research on psychological interventions in CR has shown that heart disease is influenced by several psychological factors and that evidence-based psychotherapy programs are significantly beneficial in the prevention and management of heart disease. Sommaruga et al. [20] found that depression, anxiety, stress, social factors, and personality were related to the development and outcome of heart disease. Based on recent epidemiological data, Rozanski [21] classified five major behavioral risk factors for coronary artery disease (CAD). These included health-related behaviors (physical inactivity, poor diet, obesity, smoking, poor sleep, and lack of rest), negative emotions (depression, anxiety, anger, and hostility), and chronic stress, including situational stress (work, marriage, social stress, and medical illness), social isolation, and poor social support. Parswani et al. [22] emphasized that stress can have unwanted physical and emotional effects and release hormones that increase blood pressure and promote arterial clotting. In a systematic review, Welton et al. [23] identified six components of therapeutic interventions for heart disease: usual care, education, behavior, cognition, relaxation, and support. The Korean Cardiac Rehabilitation Clinical Practice Guidelines [24] also emphasized that depression can reduce adherence to treatment plans, such as medication, lifestyle modification, and participation in CR in patients with heart disease, thereby reducing secondary prevention effects [25,26] and increasing healthcare costs [27]. These findings suggest that psychological counseling in CR should include the maintenance of healthy behaviors, stress management, and reduction of depression, anxiety, anger, and social isolation. Therefore, the MBCP developed in this study is a psychological counseling program that utilizes the therapeutic elements of mindfulness to help manage stress and facilitate relaxation.

As mentioned above, MBSR is a mindfulness-based stress reduction program created by Kabat-Zinn [16,17,28] to make mindfulness meditation easier to practice. Additionally, it has been reported to be effective for stress problems in the general population, mental disorders such as anxiety and depression, and general medical disorders [29]. In this study, we used the Korean adaptation of Kabat-Zinn’s MBSR program [17], named the Korean Mindfulness-Based Stress Reduction (K-MBSR) by Chang et al. [30].
The original K-MBSR consisted of eight sessions, including formal meditations such as body scan, seated meditation, and mindfulness hatha yoga, and informal meditations such as walking and eating meditation. In systematic review, home-based CR program duration varied from 6 weeks to 6 months [31]. According to Devi et al. [32], a total of 95 patients diagnosed with stable angina went through website-based, individualized behavior goals assessment during six weeks. Important changes in weight, self-efficacy, emotional QOL score, and angina symptoms were observed. Since the comprehensive CR program in this study consisted of three interventions (exercise, diet, and psychological counseling), the duration of the MBCP program was determined to be six sessions to ensure efficient progression of the entire program. Two of the six sessions were performed in person, and four were performed over the phone to overcome the low participation rates due to COVID-19 and the burden of time, transportation, and cost, which are traditional limitations of CR. All sessions were held once a week for approximately 30 minutes per session. The MBCP provides education on how to use mindfulness during negative emotions or stressful situations using the core contents of the MBSR (raisin eating, body scans, hatha yoga, breathing, walking, and sitting meditation) and individual counseling for psychologically vulnerable groups. Subjects underwent screening through one of the following criteria: 1) a score of 5 or higher on the Depression Inventory (PHQ-9); or 2) a score of 5 or higher on the Anxiety Inventory (GAD-7); or 3) a score of 10 or higher on each of the Negative Affect and Social Inhibition on the Type D Personality Scale. If subjects met one of these criteria, they were considered psychologically vulnerable, therefore we wanted to look more closely at their stress or emotional difficulties in counseling. Vulnerable group counseling focused on emotional problems (depression, anxiety, anger, etc.), stress, self-efficacy, and sleep management. We developed online mindfulness training videos and audios and provided them for daily home practice. Two clinical psychologists and a Ph.D. in psychology were involved in the MBCP development. The content validity of the program has been verified by a counseling psychologist. The process of developing the MBCP is illustrated in Fig. 1.

The content of each MBCP session is shown in Table 1. The first session consisted of a phone counseling to discuss the motivation for participating in this study, confirm current health condition and stress levels, and provide the baseline psychological status. Since the first session was performed by phone counseling, online mindfulness links for the mindful raisin eating practice was sent via text before the first session. We taught them about the main practice of mindful raisin eating—to pay attention to the raisin, touch it with one’s own hands, put it in one’s own mouth, chew, taste, and swallow it—and encouraged them to practice at home three to four times a week. Many subjects showed resistance to writing, so they were encouraged to use the reflective journal freely and share their experience of mindfulness as much as possible through phone counseling.

The second session was conducted face-to-face at a hospital CR center in Seoul, Korea. Since the second session was the first time the therapist and subjects met, we wanted to build a rapport by asking about their daily lives and health management. We also prepared yoga mats, practiced body scans together, and taught them how to use mindfulness and what to look out for. A body scan is
Table 1. General structure and contents of MBCP program

<table>
<thead>
<tr>
<th>Session</th>
<th>Topics</th>
<th>Core components</th>
<th>Assignments</th>
</tr>
</thead>
</table>
| 1 (P)   | Orientation | • 3 core questions to check how you are doing  
- How is your general health status?  
- How are your daily routines? (exercise, diet)  
- Do you feel stressed? How do you deal with your stress?  
• Identify what the patient would like to get help in counseling  
• General information about mindfulness  
- What is mindfulness  
- Effects of mindfulness on health and stress  
- How to practice mindfulness in daily life | • Mindful raisin eating practice  
• Mindfulness diary |
| 2 (I)   | Body scan practice | • 20 minutes of body scan practice  
• Share the experience of body scan  
- How was your experience during the body scan?  
- What were the barriers of practicing body scan?  
- Tips of overcoming the barriers | • Body scan and mindful raisin eating practice  
• Mindfulness diary |
| 3 (P)   | Psychological counseling and hatha yoga | • 3 core questions to check how you are doing  
• Hatha yoga  
- Instructions  
- Tips about how to do it on daily basis | • Hatha yoga and body scan practice  
• Mindfulness diary |
| 4 (I)   | Mindful breathing practice | • 20 minutes of mindful breathing practice  
• Share the experience of mindful breathing  
- How was your experience during the mindful breathing?  
- What were the barriers of practicing mindful breathing?  
- Tips of overcoming the barriers | • Mindful breathing and hatha yoga practice  
• Mindfulness diary |
| 5 (P)   | Psychological counseling and mindful sitting meditation | • 3 core questions to check how you are doing  
• Mindful sitting meditation  
- Instructions  
- Tips about how to do it on daily basis | • Mindful sitting meditation and mindful breathing practice  
• Mindfulness diary |
| 6 (P)   | Mindful walking and program closure | • 3 core questions to check how you are doing  
• Mindful walking  
- Instructions  
- Tips about how to do it on daily basis  
• Program closure  
• Share experiences about the MBCP program (counseling, mindfulness)  
• Make your own mindfulness plan | • Select and practice a meditation that suits best |

P: phone counseling (online video+phone counseling), I: in-person training.

an exercise that involves paying attention to each part of the body in turn and returning it gently in the following order: ankles, calves, knees, hips, buttocks, and right toes. Lying down for body scan was recommended.

The third session was about daily well-being and health-promoting behaviors. We encouraged the online practice of hatha yoga in daily basis. Hatha yoga was mainly about the practice of moving the body, being mindful of breath, and moment-to-moment awareness of what is happening while in different types of postures, whether we are slowly stretching or strengthening.

The fourth session was conducted face-to-face and focused on barriers to health maintenance and stress management. Mindful breathing was also practiced, focusing on shifting away from negative thoughts by paying attention to the breath and noticing the changing patterns of bodily sensations in the lower abdomen while breathing in and out.

In the fifth session, we discussed about difficulties of following the exercise, diet instructions, and managing stress. Online mindful sitting meditation practice was encouraged. It was mainly about sitting on a chair or cushion in an upright, relaxed, and comfortable position and noticing thoughts, sounds, feelings, breathing, and bodily sensations.

Finally, in the sixth session of mindful walking, we taught them to notice and focus their attention on different sensations in the body—such as the feeling of a single foot touching the ground, the feeling of the left leg, and the feeling of the left foot—while walking intentionally. At the end of the sixth session, we explained that after the program, subjects would continue to practice mindfulness in a way that worked best for them. In this study, we emphasized that mindfulness can help people relax and achieve emotional stability, especially when experiencing increased stress, depression, or anxiety. In sessions two through six, we provided tips on the challenges of practicing mindfulness.

2. Home-based CR exercise program

The exercise group participated only in home-based CR exercise program. The aim of the home-based CR exercise program was to increase the participants’ moderate-intensity exercise to 150
min or more per week, with resistance exercise utilizing their body weight at least twice a week. The details of the program are presented in Table 2. The development and application of the program are described in original article [33].

**Materials and Methods**

**1. Subjects**

Thirteen patients (age: 19~75; M/F: 10/3) with either acute myocardial infarction (MI) or heart failure with reduced LV ejection fraction (≤40%) were enrolled in this study through the cardiology clinics of Severance Hospital (Seoul, Republic of Korea) during September 2021 and April 2022. Subjects with acute MI have at least one of the following worsening prognostic factors: diabetes, history of myocardial infarction, history of heart failure, history of ischemic stroke, peripheral arterial disease, Killip class 2≤, left main or multi-vessel coronary artery disease, and left ventricular ejection fraction of ≤40%. Exclusion criteria include 1) difficulty in exercise 2) active infection 3) malignancy.

The subjects were randomly allocated into one of the two CR groups: 1) exercise-based CR (n=6) and 2) comprehensive CR (n=7). Exercise-based CR program contains individual physical training and general education for secondary prevention of CVDs. On the other hand, comprehensive CR program is a 6 week intervention and contains individual psychological intervention (MBCP) and diet/nutritional counseling added on exercise-based CR. All subjects were provided with psycho-educational materials related to stress management.

The demographic characteristics of the subjects are presented in Table 3. This study was approved by the Institutional Review Board (IRB) of Severance Hospital (IRB approval number:4-2021-0576), and informed consent was obtained from all subjects.

**2. Measurements**

1) Health-related quality of life scale

The SF-12, which was extracted from the SF-36 developed by Ware and Sherbourne [34] translated and validated by Koh et al. [35], was used based on a study by Ware et al. [36]. The health-related quality of life scale is primarily categorized into Physical Component Summary (PCS) and Mental Component Summary (MCS). The Physical Component Summary comprises four domains: physical functioning, role limitations due to physical health, bodily pain, and overall general health. The Mental Component Summary consists of four domains: mental health, limitations in emotional roles, social functioning, and vitality. Each item was aggregated per category, and the combined scores were transformed to achieve a maximum score of 100 points. The score ranges from 0 to 100, with higher scores indicating better health status and higher quality of life. In this study, the overall Cronbach’s α for the items was .85, the Physical Component Summary (PCS) had a value of .67, and the Mental Component Summary (MCS) had a value of .82.

<table>
<thead>
<tr>
<th>Table 2. Home-based cardiac rehabilitation program for 6 weeks</th>
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<tbody>
<tr>
<td><strong>Exercise goals</strong></td>
</tr>
<tr>
<td>1. At least 150 min of moderate to vigorous aerobic exercise</td>
</tr>
<tr>
<td>2. 1~3 sets of calisthenics (10 repetitions of 8 exercise)</td>
</tr>
<tr>
<td><strong>Intervention strategies</strong></td>
</tr>
<tr>
<td>1. Face-to-face exercise education sessions (1st and 3rd week of</td>
</tr>
<tr>
<td>intervention)</td>
</tr>
</tbody>
</table>
2) Domain satisfaction

We used the life domain satisfaction scale (Domain Satisfaction) developed by Boehm et al. [37]. It consists of eight domains, each with a single item: marital or loved relationships, leisure time activities, standard of living, job, health, family life, sex life, and feelings about oneself. Based on the question, “All things considered, how satisfied or dissatisfied are you with the following areas of your life?”, each item is rated on a 7-point Likert scale ranging from “very dissatisfied” (1 point) to “very satisfied” (7 points). The satisfaction scores for each domain were calculated by averaging the responses, with higher scores indicating higher satisfaction levels. In the study of Boehm et al., [37] Cronbach’s α was .84. and in this study, Cronbach’s α was .80.

3) The Type D scale—14 items

We used the Korean version of the Type D Personality Scale—14 which was developed by Denollet [38] and adapted for Korean by Lim HE et al. [39]. Type D Personality consists of two subfactors: Negative Affectivity (NA) with seven items and Social Inhibition (SI) with seven items, for a total of 14 items. Negative Affectivity assesses the tendency to experience negative emotions depending on time and situation. Social inhibition measures the tendency to suppress the expression of emotions and behaviors in social interactions to avoid criticism from others. Each item is rated on a 5-point Likert scale ranging from “Not at all” (0 points) to “Very much” (4 points). If the score was 10 or higher in both domains, the individual was classified as having a Type D Personality. At the time of development, the internal reliability of Denollet’s study [38] for the NA and SI subscale was .88 and .86, respectively. The Korean version of the Type D scale was validated by Lim et al. [39], showing that Cronbach’s α was .86 for NA and .80 for SI. In this study, Cronbach’s α for NA was .94, SI was .90, and total was .95.

4) Patient Health Questionnaire—9 items

The PHQ-9 (Patient Health Questionnaire—9), which was developed and validated by Kroenke et al. [40] in accordance with the diagnostic criteria for Major Depressive Disorder in DSM-IV, was
translated into Korean and used by Choi et al. [41]. It is a self-report questionnaire consisting of nine items (pleasure, despair, sleep, fatigue, appetite, self-esteem, concentration, anxiety, and suicidal thoughts) that assesses how often discomfort has been experienced in the past two weeks. Each item was rated on a 3-point Likert scale ranging from 'not at all' (0 points) to 'nearly every day' (3 points). A total score ranges from 0 to 27 points with a higher score indicating a higher level of depression (clinical depression: ≥10 points). A validity study on the cutoff score of the Korean version of the PHQ-9 for screening of depressive disorders [42] suggested that a cutoff score of 5 is appropriate when using the PHQ-9 for screening purposes. Cronbach’s α were .86 at the time of development in Kroenke et al.’s study [40], .85 in Choi et al.’s study [41], and .70 in this study.

5) Generalized Anxiety Disorder−7 items

The Generalized Anxiety Disorder−7 (GAD-7) scale, developed by Spitzer et al. [43], was translated into Korean by Seo and Park [44] and validated. This self-report questionnaire consists of seven items designed to measure anxiety symptoms over the past two weeks. The questionnaire aims to screen for and assess the severity of generalized anxiety disorders. It consists of seven items rated on a 4-point Likert scale ranging from ‘not at all’ (0 points) to ‘nearly every day’ (3 points). A total score of 5≤ of 21 indicated mild anxiety, 10≤ indicated moderate anxiety, and 15≤ indicated severe anxiety. In the study of Seo and Park [44], Cronbach’s α was .915. In this study, Cronbach’s α was .84.

6) Perceived Stress Scale

The Perceived Stress Scale (PSS), initially developed and validated by Cohen [45] in 1983 and later revised into 10 items in 1988, was utilized in its Korean version validated by Lee et al. [46]. The scale consists of questions about the participants’ perceived stress experiences over the past month. Items 4, 5, 6, 7, and 8 are negative questions and were back scored. Each item was rated on a 5-point Likert scale ranging from “Not at all” (0 points) to “Very often” (4 points), with higher scores indicating a higher level of perceived stress. In the study by Lee et al. [46], Cronbach’s α was .82, and in this study, it was .78.

7) Program participation rate and satisfaction survey

Attendance rates of all 4 phone counseling sessions, all 2 in-person training sessions, and mindfulness practice rate at home were collected to explore the applicability of the MBCP. Program satisfaction survey was conducted to assess the satisfaction of the subjects after the MBCP. The survey was consisted of six items: satisfaction with face-to-face education, duration and intensity of in-person sessions, phone counseling, frequency of phone counseling, utilization of mindfulness diary, and utilization of online mindfulness materials (video and audio). The survey was rated on a 5-point Likert scale ranging from “very Dissatisfied” (1 point) to “very Satisfied” (5 points).

3. Data analysis

In this study, we used SPSS (version 22.0; IBM Corp., Armonk, NY, USA) for Windows for all statistical analyses. All data are expressed as mean±SD. Changes between baseline and endpoint in each group were assessed by Wilcoxon signed-rank test.

Results

1. Changes in psychological status of comprehensive CR group

Changes in psychological status of comprehensive CR group are presented in Table 4. The results showed that there was a statistically significant reduction in anxiety and statistically significant increase in Mental component summary (MCS) and general health (a subfactor of health-related quality of life). Additionally, although not statistically significant, there were improvements in the domain satisfaction levels of standard of living and family life, as well as a tendency for reduced negative affectivity in Type D personality traits and perceived stress. These findings support that the MBCP could lower the anxiety and tension and also enhance the quality of life. Furthermore, there was a significant increase in satisfaction with standard of living and family life an a significant decrease in negative emotion of Type-D and stress.
2. Changes in psychological status of exercise-based CR group

Changes in psychological status of exercise-based CR group are presented in Table 5. Effects of exercise-based CR (without MBCP and dietary counseling) on psychological status were assessed using Wilcoxon signed-rank tests. The results showed a significant decrease in depression and an increase in the MCS scores. These outcomes highlight the potential impact of exercise not only on physical activity but also on psychological status such as depression and mental aspects of HRQoL.

3. MBCP participation and satisfaction

All subjects of comprehensive CR group showed high attendance rate to MBCP sessions (Table 6). Attendance rate of all four phone counseling sessions was 100% (n=7). Subjects who attended to all two in-person training sessions was 85.7% (n=6), only one subject forgot and missed one session. Five subjects practiced mindfulness at home, utilizing online materials and contents of what they have learned in in-person training sessions.

Seven subjects who participated in MBCP were highly satisfied with the program. The results showed that overall satisfaction with phone counseling and in-person training was very high (5 out of 5 points). Satisfaction with the length of time and frequency of in-person training session was 4.71 points. Subjects showed high satisfaction with online mindful materials (5 out 5 points), but satisfaction with utilizing mindfulness diary was relatively low (4.14 out of 5 points) (Table 6).

Discussion

This study aimed to develop and explore the preliminary effects of a psychological counseling program as a component of comprehensive CR for patients with CVD. Since this was a pilot study, the results will be used to modify, supplement, and refine MBCP for the main study.

First, the MBCP developed in this study was based on mindfulness, which emphasizes awareness and acceptance: the efficacy of mindfulness has already been verified in many studies [17,18]. There were
Table 5. Changes in psychological status of exercise-based CR group (n=6)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Baseline M (SD)</th>
<th>6 weeks M (SD)</th>
<th>z</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Domain satisfaction</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital/love relationships</td>
<td>5.3 (1.6)</td>
<td>4.8 (1.2)</td>
<td>-1.09</td>
<td>0.28</td>
</tr>
<tr>
<td>Leisure</td>
<td>4.2 (1.2)</td>
<td>4.3 (1.8)</td>
<td>-28</td>
<td>0.78</td>
</tr>
<tr>
<td>Standard of living</td>
<td>3.8 (1.7)</td>
<td>4.2 (1.0)</td>
<td>-45</td>
<td>0.19</td>
</tr>
<tr>
<td>Job</td>
<td>5.5 (1.5)</td>
<td>4.8 (1.6)</td>
<td>-1.34</td>
<td>0.18</td>
</tr>
<tr>
<td>Health</td>
<td>4.3 (1.0)</td>
<td>4.0 (1.7)</td>
<td>-82</td>
<td>0.41</td>
</tr>
<tr>
<td>Family life</td>
<td>5.0 (1.4)</td>
<td>4.8 (1.3)</td>
<td>-58</td>
<td>0.56</td>
</tr>
<tr>
<td>Sex life</td>
<td>4.7 (1.6)</td>
<td>3.8 (1.3)</td>
<td>-97</td>
<td>0.33</td>
</tr>
<tr>
<td>Self</td>
<td>4.7 (1.4)</td>
<td>4.2 (1.2)</td>
<td>-97</td>
<td>0.33</td>
</tr>
<tr>
<td>Total</td>
<td>4.7 (1.0)</td>
<td>4.4 (1.1)</td>
<td>-1.63</td>
<td>0.10</td>
</tr>
<tr>
<td><strong>HRQoL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>General health</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General health</td>
<td>53.3 (10.3)</td>
<td>66.7 (16.3)</td>
<td>-1.63</td>
<td>0.10</td>
</tr>
<tr>
<td>Physical functioning</td>
<td>75.1 (13.9)</td>
<td>69.6 (16.3)</td>
<td>-71</td>
<td>0.48</td>
</tr>
<tr>
<td>Role-physical</td>
<td>70.8 (24.6)</td>
<td>79.2 (24.6)</td>
<td>-56</td>
<td>0.58</td>
</tr>
<tr>
<td>Bodily pain</td>
<td>86.7 (10.3)</td>
<td>86.7 (16.3)</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Total</td>
<td>71.7 (10.8)</td>
<td>75.0 (13.8)</td>
<td>-42</td>
<td>0.67</td>
</tr>
<tr>
<td><strong>Mental health</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mental health</td>
<td>83.4 (14.8)</td>
<td>80.6 (8.6)</td>
<td>-56</td>
<td>0.58</td>
</tr>
<tr>
<td>Vitality</td>
<td>58.5 (31.1)</td>
<td>53.0 (16.3)</td>
<td>-71</td>
<td>0.48</td>
</tr>
<tr>
<td>Social functioning</td>
<td>76.7 (23.4)</td>
<td>86.7 (10.3)</td>
<td>-1.13</td>
<td>0.26</td>
</tr>
<tr>
<td>Total</td>
<td>63.6 (12.3)</td>
<td>76.0 (10.1)</td>
<td>-2.23</td>
<td>0.03a</td>
</tr>
<tr>
<td><strong>PHQ-9</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative affectivity</td>
<td>7.3 (3.8)</td>
<td>4.7 (2.5)</td>
<td>-2.03</td>
<td>0.04a</td>
</tr>
<tr>
<td>Social inhibition</td>
<td>1.3 (1.5)</td>
<td>0.8 (1.0)</td>
<td>-76</td>
<td>0.45</td>
</tr>
<tr>
<td>Type-D</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative affectivity</td>
<td>6.0 (3.6)</td>
<td>5.3 (5.2)</td>
<td>-73</td>
<td>0.47</td>
</tr>
<tr>
<td>Social inhibition</td>
<td>7.8 (5.5)</td>
<td>7.8 (7.6)</td>
<td>-27</td>
<td>0.79</td>
</tr>
<tr>
<td>PSS</td>
<td>16.0 (4.1)</td>
<td>17.5 (2.7)</td>
<td>-96</td>
<td>0.34</td>
</tr>
</tbody>
</table>

a)p<.05.

Table 6. MBCP participation and satisfaction survey

<table>
<thead>
<tr>
<th></th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attended all 4 phone counseling sessions</td>
<td>7 (100%)</td>
</tr>
<tr>
<td>Attended all 2 in-person training sessions</td>
<td>6 (85.7%)</td>
</tr>
<tr>
<td>Practiced mindfulness at home</td>
<td>5 (71.4%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Mean (maximum 5 points)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall satisfaction with phone counseling</td>
<td>5</td>
</tr>
<tr>
<td>Satisfied with the length of time and frequency of phone counseling</td>
<td>5</td>
</tr>
<tr>
<td>Overall satisfaction with in-person training</td>
<td>5</td>
</tr>
<tr>
<td>Satisfied with length of time and frequency of in-person training</td>
<td>4.71</td>
</tr>
<tr>
<td>Satisfied with utilizing mindfulness reflection journal</td>
<td>4.14</td>
</tr>
<tr>
<td>Satisfied with online mindful resources (video and audio)</td>
<td>5</td>
</tr>
</tbody>
</table>

Some positive findings in this study; specifically, there was a significant decrease in anxiety in the comprehensive CR group and a significant increase in the mental component summary and general health among health-related quality of life. Mindfulness is effective in reducing anxiety because it induces relaxation responses, and it is believed that this change has had an impact on the overall mental condition and physical health. In contrast, in the exercise CR group, depression was significantly reduced, and the mental component summary of health-related quality of life was significantly improved. This finding suggests that increased physical activity through exercise has a positive effect on depression and overall mental health. However, these findings were based on a small sample size and should be confirmed in larger studies.

This study had several important implications. First, we developed a psychological counseling program (MBCP) as a component of comprehensive CR for the first trial in Korea. This is very significant because it implies we can apply this program in the medical field from now.

Second, although this was a pilot study, it is important that we identified the efficacy of MBCP as a component of comprehensive CR. In the comprehensive CR group, the results suggested considerable positive effects, with significant effects on reducing anxiety and improving the general
health and mental aspects of HRQoL. In addition, despite of borderline significance, life domain satisfaction showed improvements in standard of living and family life, and at the same time, negative affectivity in Type D personalities and perceived stress tended to decrease (p<.10). Future studies will need to explore these tendencies in a larger sample.

Third, we explored applicability of MBCP through participation and satisfaction rate. The results showed high attendance rates of phone counseling (100%) and in-person training sessions (85.7%). In addition, five subjects (71.4%) practiced mindfulness at home. These results suggest that patients can utilize the contents of MBCP at home, and phone counseling and online mindfulness materials may be helpful in stress management if patients are interested in and accustomed to mindfulness. Satisfaction survey showed very high satisfaction (five out of five points) with in-person training, and high satisfaction with phone counseling and mindfulness training materials. In particular, both the in-person training time and phone consultation frequency were highly satisfactory, confirming the positive results of the accessibility and convenience of this psychological counseling program. Online training materials, consisted of videos and recordings, were also easy to implement independently at home on a daily basis.

Additionally, we conducted interviews with subjects to gain more in-depth data on their experiences of program participation and identified areas that needed to be modified in the program: we received mostly positive feedback. Our interviews focused on program engagement (in-person or over the phone), the program content (phone counseling and mindfulness practice), what they found helpful in their daily lives, and their experience of combining medical treatment and psychotherapy. In terms of engagement, the subjects reported many positive experiences after in-person counseling, such as a sense of closeness and trust with the therapist and peace of mind. They also appreciated the convenience of receiving support during the COVID-19. Some found that while the text messages helped them stay on track with their health-promoting behavior and mindfulness, it was somewhat complicated and frustrating to receive separate messages from each of the three teams (exercise, diet, and psychological counseling). Regarding the program content, subjects liked the phone counseling because they thought they received regular care from experts and reported that mindfulness was easy to perform, but it was difficult to practice actively because it was unfamiliar and awkward. In terms of how the program helped them in their daily lives, there were many positive experiences, such as improved health, psychological comfort, and a change in their attitude toward life (they felt more relaxed and not as impatient as they used to be). In addition, regarding the experience of combining medical treatment with a psychological counseling program, subjects indicated that they would have benefited more from the program if they had been participating in the program during the hospital admission period when they experienced severe psychological distress due to poor health, as they would have been more motivated to seek psychological counseling or stress management.

These findings provide a positive outlook for developing a psychological counseling program for further studies. We plan to modify the counseling program based on the results of satisfaction surveys and interviews. For example, in the initial phone call, we wanted to focus on the subjects’ primary concern, such as healthcare, to build a rapport and encourage active participation in counseling. Furthermore, to overcome awkwardness to mindfulness and increase utilization, we recommended patient-customized mindfulness tips. However, we decided to reduce the emphasis on mindfulness diary because the patients were relatively less satisfied with writing diaries. Finally, the program should start as close to the time of study entry as possible so that patients can receive help quickly when they need psychological intervention.

The limitations of this study and suggestions for future research are as follows: First of all, due to the small sample size (13 subjects), parametric statistics could not be used. Therefore results may be sample-specific and may not be generalizable. It is necessary to conduct a study with a larger sample size to generalize the results of this study.

Second, because this study focused on developing a program and exploring its feasibility and acceptability prior to a larger study, we were
unable to analyze which psychological variables influenced medical outcomes or exercise and dietary variables. Finally, owing to time constraints, we were unable to conduct a follow-up study to examine the long-term effectiveness of the program.

These findings support continued research exploring a larger sample size using more powerful statistical methods. Further studies are needed to analyze the characteristics and differences in exercise and dietary behaviors according to the levels of depression, anxiety, and Type D personality traits, as well as the effects of depression, anxiety, and Type D personality traits on major medical outcomes (e.g., death, myocardial infarction). In addition, examining which mindfulness practices were most commonly practiced among participants in this study may help develop the most effective mindfulness and stress management programs for people with heart disease in Korea. Continued research should explore whether improvements in anxiety, health-related quality of life, and reductions in stress and negative emotions following a comprehensive CR program are sustained not only immediately after the end of the program but also over a longer period of time, perhaps a year or more. The significance of this study is that it included psychological and nutritional counseling as well as exercise in the development of a comprehensive CR. The difference is that exercise focuses on promoting physical activity and health behaviors, while psychological counseling focuses on stress management and quality of life. It was expected that the comprehensive cardiac rehabilitation group would also improve depression, but this study showed that only the exercise group was effective. Larger studies are needed to further clarify the differences between the two approaches.

Acknowledgements

The results of this study were presented at the 2023 World Congress of Cognitive Behavioral Therapy in Seoul (poster number: 1094).

Conflicts of interest

The authors declared no conflict of interest.