

# Needs and Preferences for Remote-Delivered Mindfulness-Based Cognitive Therapy in Patients After Acute Coronary Syndrome: A Qualitative Study

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## Abstract

**Background:** Following acute coronary syndrome (ACS), up to 40% of patients report elevated depressive symptoms which is associated with a two-fold increase in mortality risk due to behavioral and biological mechanisms. Mindfulness-Based Cognitive Therapy (MBCT) delivered via synchronous group videoconferencing could help reduce depressive symptoms.

**Objective:** To guide MBCT adaptation for ACS patients for a future clinical trial, this qualitative study aimed to explore ACS patients' (1) symptoms after ACS, (2) needs for behavioral health treatment, (3) perspectives on mindfulness intervention and group videoconference delivery, and (4) willingness to self-collect dried blood spots in a research study.

**Methods:** We compared ACS patients with and without depressive symptoms to highlight particularly relevant treatment topics for patients developing depression following ACS experience. From 2/2019–11/2019, we conducted semi-structured individual telephone interviews with N = 23 patients after ACS (N = 13 with and N = 10 without elevated depressive symptoms; 63.4 (SD = 8.5) years, 87% male, 96% non-Hispanic white, 7.1 (SD = 7.5) years since ACS). In qualitative content analyses, four independent coders coded each interview.

**Results:** Participants with depressive symptoms experienced emotional, physical, social, and health behavior problems, while those without depressive symptoms made positive health behavior changes and struggled with anxiety symptoms. Both groups were interested in a behavioral health treatment for emotional and social support. Most were willing to participate in a mindfulness group via videoconferencing; some preferred in-person, but accessibility and convenience outweighed these cons. Almost all were willing to self-collect dried blood spots and some were already familiar with this technique.

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**Conclusion:** ACS patients, especially those with depressive symptoms, need help managing a multitude of quality of life concerns that can be targeted with an adapted MBCT approach. A videoconference-delivered MBCT approach is of interest. Suggestions for adapting MBCT to target the needs of ACS patients are discussed.

## Keywords

acute coronary syndrome, cardiovascular disease, depression, anxiety, health behavior, intervention

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## Introduction

Each year, one million people in the United States experience acute coronary syndrome (ACS), which encompasses myocardial infarction and unstable angina, commonly referred to as a heart attack.<sup>1</sup> Up to 40% of patients experience elevated depressive symptoms after ACS, which is associated with a two-fold increased risk of mortality through biological (e.g., inflammation) and behavioral mechanisms (e.g., physical inactivity, unhealthy diet).<sup>2-6</sup> Thus, in line with the 2021 American Heart Association (AHA) scientific statement on well-being,<sup>7</sup> depression treatment is necessary to improve quality of life and cardiovascular outcomes after ACS.<sup>8-10</sup>

Many patients after ACS are interested in non-pharmacological behavioral depression treatments.<sup>11</sup> However, the recommended treatment from the American Heart Association, cognitive-behavioral therapy (CBT),<sup>3</sup> has shown limited effects on depression and cardiac outcomes in patients after ACS and has not been widely accessible for ACS patients.<sup>12-15</sup> Combining CBT with mindfulness meditation might provide additional benefit. Mindfulness meditation involves paying attention to the present moment with an attitude of openness and curiosity.<sup>16</sup> Mindfulness-Based Cognitive Therapy (MBCT) is an 8-week group intervention that combines CBT with mindfulness meditation<sup>17</sup> and has evidence to treat depression<sup>17-20</sup> and reduce inflammation.<sup>21,22</sup> A recent meta-analysis of 17 randomized controlled trials of mindfulness interventions for patients with cardiovascular disease demonstrated moderate-large effect sizes for improvements in depression,<sup>23</sup> and the American Heart Association recently acknowledged the benefits of meditation for cardiac health and recommended meditation as an adjunct to standard cardiovascular risk-reduction techniques.<sup>24</sup> However, no research has focused on MBCT for ACS patients, who have the unique experience of having a sudden, frightening, and unexpected cardiac event and hospitalization, which can lead to greater health-related fears and emotional problems as compared to patients with stable cardiovascular disease.<sup>25,26</sup> Taken together, these findings suggest that a mindfulness approach combined with CBT for patients after ACS is warranted.

An electronic health approach is needed to promote accessibility of MBCT. Behavioral treatments are often difficult to access for ACS patients with depression symptoms due to

emotional and physical symptoms.<sup>27</sup> With the changes imposed by COVID-19, the need for e-health approaches is clear. It is feasible to deliver MBCT via e-health technologies including synchronous group videoconferencing,<sup>28-30</sup> which combines accessibility with real-time peer interaction and has comparable efficacy with in-person treatments.<sup>31,32</sup> No research has explored MBCT delivered via group videoconferencing for patients after ACS.

MBCT was developed to treat depression in the general population, and thus may not target the unique needs of ACS patients. Adaptation is needed to enhance relevance to ACS patients to promote intervention acceptability and efficacy.<sup>33,34</sup> Consistent with Phase Ia (“Define”) of the ORBIT model for behavioral intervention development,<sup>35</sup> the purpose of the current qualitative research study was to guide the MBCT adaptation process for ACS patients and remote delivery by exploring (1) ACS patients’ symptoms (probing for emotional, physical, social, and behavioral changes), (2) ACS patients’ preferences for behavioral treatment (probing for interest in a behavioral health intervention; treatment targets, content, and structure; and timing of treatment delivery after ACS); (3) perspectives on a mindfulness intervention and group videoconferencing delivery; and (4) willingness to complete a remote dried blood spot collection procedure to assess inflammation in a future research study. We compared perspectives among ACS patients with and without depressive symptoms in order to understand both the symptoms and needs of depressed patients, as well as the resiliency factors of non-depressed patients which may inform intervention targets. Resiliency factors were conceptualized as positive physical or mental health changes after ACS that may protect someone from developing depression, may be targeted through mindfulness training, and were more commonly reported in the non-depressed group as compared to the depressed group. The propositions were that participants would (1) report emotional (e.g., depression, anxiety), physical (e.g., weakness, shortness of breath), social (e.g., relationship changes), and behavioral problems (e.g., difficulty with healthy diet and exercise), and that these would be more prevalent among those with depression symptoms, (2) express an interest in a behavioral health intervention and suggest specific needs regarding treatment targets, timing of intervention delivery, and session length, (3) have positive perspectives on a mindfulness program and willingness to try

group videoconferencing delivery, and (4) share barriers (e.g., pain) and facilitators to completing dried blood spot procedures (e.g., training materials, incentives).

## Materials and Methods

### Participants

Participants were  $N = 23$  adults with a lifetime history of ACS. For comparison and context, we included ACS patients with elevated depressive symptoms ( $N = 13$ ) and without elevated depressive symptoms ( $N = 10$ ), to understand both risk and resiliency factors that may serve as intervention targets. Based on prior qualitative work, we aimed to include at least 10 participants per strata and conduct interviews until thematic saturation was reached. Eligibility criteria were the same for both groups with the exception of the depression score criterion: PHQ-9 score  $\geq 10$  in the depressed group and PHQ-9 score  $< 10$  in the non-depressed group. Other eligibility criteria included: (1) medical record-confirmed lifetime diagnosis of ACS (i.e., myocardial infarction or unstable angina), (2) age 35-85 years, (3) access to high-speed internet, (4) no active suicidal ideation or past-year psychiatric hospitalization, (5) English-speaking, and (6) able to provide informed consent.

### Procedure

All study procedures were approved by the Mass General Brigham IRB (2018001000). Participants were recruited from one hospital system to participate in semi-structured individual telephone interviews for ACS patients with depression symptoms from February-November 2019. Participants were recruited via flyers in cardiology clinics, direct provider referrals, and the hospital Research Patient Data Registry (RPDR). Patients who previously agreed to be contacted directly about research studies as part of a hospital-wide research cohort were mailed an opt-out letter from the study team. Those who were not part of this hospital program were mailed an opt-out letter from their study team and cardiologist. Patients who did not opt-out within two weeks were contacted by phone for eligibility screening, which consisted of answering questions and completing the PHQ-9. Patients who met the PHQ-9 cut-off score  $\geq 10$  were invited to participate as part of the depressed group; those who did not meet the cut-off were invited for the non-depressed group. Eligible and interested participants then completed verbal consent over the phone and were scheduled for an individual phone interview. Study recruitment letters were sent to 338 patients and 78 patients agreed to be screened ( $78/338 = 23\%$ ). Of the 78 screened, 31 were eligible ( $31/78 = 40\%$ ). Among the 31 patients who were eligible, 23 participated ( $23/31 =$  participation rate:  $74\%$ ).

The interview was a 30-45-minute semi-structured interview conducted by a licensed clinical psychologist (CML). The qualitative approach was informed by the ORBIT model for behavioral intervention development.<sup>35</sup> The ORBIT

model suggests the use of formative qualitative research to identify treatment components and targets, and appropriate treatment subjects.<sup>35</sup> As such, our interview guide was designed to explore ACS patient preferences in accordance with MBCT treatment components (e.g., mindfulness meditation practices, group format, treatment structure and dose), treatment targets (e.g., specific emotional distress symptoms), and overall treatment needs and preferences to assess appropriateness of offering MBCT to ACS patients (e.g., general interest in behavioral intervention). The first two participants completed the interview together as an in-person focus group. Due to the challenges of coordinating group schedules and transportation to the hospital, the remaining interviews were conducted individually by phone. We chose not to conduct these interviews by Zoom so as not to bias the results in favor of positive perspectives on videoconferencing. The interview asked about changes after ACS, probing for specific emotional, physical, social, behavioral problems (Aim 1); needs for a behavioral health intervention, including interest in behavioral health treatment, targeted treatment content, treatment structure (e.g., session length), and timing of treatment delivery after ACS (Aim 2); perspectives on a mindfulness intervention and videoconferencing delivery (Aim 3); and willingness to self-collect dried blood spot samples for clinical research (Aim 4). Resiliency factors were not probed for in the interview directly but were revealed upon group comparison in the results. Before discussing perspectives on a mindfulness intervention, participants were led through a short MBCT exercise (3-minute breathing space) and asked about their experience. Participants were also asked about their perspective on how mindfulness practice may help them, their willingness to participate in a mindfulness program, their thoughts about a group format with others who have had a cardiac event, and their thoughts about the typical MBCT dose (8-weekly 2-hour sessions). Participants were not asked about additional CBT components of MBCT or about varying types or durations of meditation practices (e.g., 3-minute breathing meditation vs longer meditation practice). To describe group videoconferencing, we explained that this involved participating from your own home while being able to see and hear other people in real-time, with everyone's faces on the computer screen. For the dried blood spot procedures, we explained that we plan to study inflammatory biomarkers related to cardiac disease by asking participants to prick their finger and place a few drops of blood on a piece of paper, to send back to the research team in the mail. After completion of the interview, participants received a \$30 gift card for remuneration and those in the depressed group received a list of mental health resources and assistance with referrals if needed.

### Data Analysis

All interviews were transcribed. Using a multi-step content analysis process, three independent coders (CL, SC, AW) first

reviewed all qualitative responses to identify themes and develop a preliminary coding framework. The coders conducted their coding independently on a Word document by documenting key categories of responses and illustrative quotes and met on a regular basis to iteratively compare and refine the categories and coding structure. Discrepancies were resolved with comparisons to raw data and discussion with a qualitative research expert (EP) until consensus was obtained. Then, the first author (CL) and a new coder (RL) both coded all of the original transcripts, applying the final coding framework and resolving any discrepancies through discussion. Responses were compiled separately for the depressed and non-depressed groups and results were compared between groups.

## Results

### Participant Characteristics

Sociodemographic and clinical characteristics are presented in Table 1. Across the full sample, participants were, on average, 63.4 (SD = 8.5) years old, 87% male, 96% non-

Hispanic white; 7.1 (SD = 7.5) years had passed since their ACS. There were no significant differences between the depressed and non-depressed groups on these characteristics, other than marital status ( $P = .03$ ) with fewer married participants in the depressed group, and, by design, depression score ( $P < .01$ ).

### Symptoms after ACS

In the depressed group, participants reported a multitude of emotional problems. Almost all reported struggling with depression (“I had depression prior to the heart attack. But since it, it’s like I’ve gotten into this trap, and I’m having a really hard time getting out of it”). A few participants also expressed feelings of anger, guilt, self-blame, decreased confidence, or mood swings. In regard to self-blame, one participant mentioned, “I feel angry at myself sometimes. I think about my mistakes in life, and one of them about my anger that got me into all this trouble.” Most participants also reported difficulty with anxiety, including fears of a recurrent cardiac event, anxiety about physical symptoms, and worries about health overall (“I think I’ll always be nervous if I get

**Table 1.** Participant Demographic and Clinical Characteristics.

	Full Sample	Depressed	Non-depressed	Group Comparison
Age, M (SD)	63.4 (8.5)	62.4 (10.2)	63.6 (6.0)	$t(1) = .10, P = .92$
Male gender, N (%)	20 (87)	10 (77)	10 (100)	$\chi^2(1) = 2.65, P = .10$
Race, N (%)				$\chi^2(1) = 1.44, P = .70$
White	20 (87)	11 (85)	9 (90)	
Black/African American	3 (13)	2 (15)	1 (10)	
Non-Hispanic ethnicity, N (%)	22 (100)	13 (100)	9 (100)	
Education, N (%)				$\chi^2(1) = .65, P = .42$
High school/GED or some college	13 (68)	9 (75)	4 (57)	
College or advanced degree	6 (32)	3 (25)	3 (43)	
Marital status, N (%)				$\chi^2(2) = 6.8, P = .03$
Married or living together	9 (47)	3 (25)	6 (60)	
Divorced/separated/widowed	6 (32)	5 (42)	1 (10)	
Never married	4 (21)	4 (33)	0 (0)	
Employment, N (%)				$\chi^2(2) = 3.67, P = .16$
Full or part-time employed	3 (19)	2 (20)	1 (17)	
Retired	9 (56)	4 (40)	5 (83)	
On disability	4 (25)	4 (40)	0 (0)	
Type of ACS, N (%)				$\chi^2(1) = 1.68, P = .19$
MI	21 (91)	11 (85)	10 (100)	
Unstable angina	2 (9)	2 (15)	0 (0)	
PHQ-9 score, M (SD)*	7.4 (5.9)	12.2 (2.5)	1.2 (1.3)	$t(1) = -12.67, P < .01$
Years since ACS, M (SD)	7.8 (10.5)	8.6 (12.3)	6.7 (7.9)	$t(1) = -.42, P = .68$
Medical comorbidities, N (%)				
Heart failure	13 (59)	8 (67)	5 (50)	$\chi^2(1) = .63, P = .43$
Hypertension	17 (81)	10 (83)	7 (78)	$\chi^2(1) = .10, P = .75$
Obesity/overweight	11 (55)	7 (64)	4 (44)	$\chi^2(1) = .74, P = .39$

Note. Valid percentages are reported. Data were missing for ethnicity ( $n = 1$ ), education ( $n = 4$ ), marital status ( $n = 4$ ), employment ( $n = 7$ ), years since ACS ( $n = 1$ ), heart failure ( $n = 1$ ), hypertension ( $n = 2$ ), and obesity ( $n = 3$ ).  $n = 2$  had more than one cardiac event; type of ACS is based on the most current event. Medical diagnoses are not mutually exclusive.

something like discomfort in my chest"). One participant reported that depression symptoms were more elevated shortly after the ACS but have improved over time ("In the beginning, It was kind of depressed, but not for long"). Another participant expressed frustration with medical advice, stating that, "[My doctor] said 'take it easy,' but that's another problem I have, what the hell does that mean?"

Negative physical symptoms were common in the depressed group. Half of participants reported shortness of breath, decreased energy, or feeling weak, and stated that these symptoms led to physical activity limitations such as difficulty walking, climbing stairs, or exercising. One participant stated, "I have shortness of breath. Sometimes I feel weak and not able to fully climb maybe a full set of stairs at once." Another stated, "I like to go to the gym and stuff... but lots of times, I'm short of breath and I just don't have the energy." Several participants also reported problems with healthy eating and medication side effects. A couple of people expressed social problems including social isolation and less physical intimacy ("[My wife] is afraid she'll kill me, so that's pretty much stopped").

A few people in the depressed group reported some positive health behavior changes, most commonly improving their diet and exercise ("I've lost 20 pounds, physically fit. I go to the gym three times a week now"). One person reported improved emotional symptoms (enhanced motivation to live). Another person reported improved social support and an adaptive new perspective of greater appreciation for life, stating, "The positive thing that's better for me now is that I don't take anything for granted anymore... Every day that I wake up is a good day."

In the non-depressed group, the most common symptom, reported by half of participants, was increased anxiety about recurrence, physical symptoms, or health ("I still have slight anxiety attacks about my shortness of breath"). Only a few participants reported activity limitations (e.g., reduced endurance in walking and climbing stairs), physical symptoms (e.g., shortness of breath, fatigue), or social problems (e.g., concerned family members). A few participants reported that they experienced depression or anxiety symptoms shortly after their ACS but have improved over time ("I mean, after the heart attack... I would be a little more concerned about, 'Oh gosh, is this going to happen again?").

Most participants in the non-depressed group reported positive health behavior changes, including improved diet, physical activity, stress management, and quitting smoking or reducing alcohol use. One participant stated, "When I was laying in the hospital during the recovery, I made a lot of promises to myself of things that I'm going to do different, from diet and exercise and stress management and even career and everything else. And I've done every single one of those things." A few people reported an adaptive new perspective, including greater appreciation, acceptance, or optimism ("Live life to the fullest... now I have a opportunity to live a better lifestyle"). A few participants described their

ACS as a "wake-up call." Once participant stated, "I'm very much aware that I am neither indispensable or indestructible. So there's a need for me to be more intentional about the way I lead my life. And I think I am using my time more wisely." Another participant said, "I have a different value of everyday situations and people, because I almost lost it... I cherish every breath now." A couple of people reported social improvements including career changes, greater social support, prioritizing relationships, or engaging in volunteer work.

### Needs for a Behavioral Treatment Program

In the depressed group, almost everyone expressed a clear interest in a behavioral health treatment ("Absolutely, I don't want my mental health to deteriorate"). A couple of participants noted that participation would depend on accessibility and convenience of getting to the program. The most common needs to target were depression and anxiety symptoms ("It's not about quantity of life... it's about quality of my life. So don't give me another five years if it's going to be full of anxiety and depression"). A few also wanted help with diet and exercise. Regarding timing of treatment delivery, most participants felt that help should be offered shortly after ACS, within the first 6-12 months, and timed with cardiac rehab.

In the non-depressed group, approximately half were interested in a behavioral health treatment, however participants tended to express a general willingness rather than a direct need ("Anything that makes a better lifestyle for me, other than what I have already done, I'm all for it"). However, a few participants stated help was not needed anymore. The most common reason for interest in a behavioral program was help managing anxiety and stress. One or two people wanted help with health behaviors (e.g., diet or exercise). Most people felt treatment should be offered shortly after ACS and aligned with cardiac rehab, in the same time frame as recommended by the depressed group ("I think it needs to be a huge part of your cardiac rehab. It needs to be discussed before you leave the hospital").

### Perspectives on a Mindfulness Group Program

In the depressed group, almost all participants had a positive reaction to the mindfulness practice, reporting that it felt relaxing or grounding ("I was very good, but to me; it grounded me and it was very calming"). Only two people reported a negative experience: with one person with chronic pain stated that he could not complete the practice because he experienced too much pain, and another person who completed the practice and stated he did not think he would benefit ("I'd rather be distracted most of the time"). Most expressed an interest in participating in a mindfulness program and felt that mindfulness could help with depression symptoms, concentration, and relaxation. The majority felt

that an 8-week intervention with 1-2-hour sessions was acceptable.

Most participants were interested in a group program. One participant stated, *"I live on the American Heart Association's blog because I don't know where to go find people that had a heart attack and be able to talk with others that have experienced similar events. I think you're on the right track right there."* However, a few participants noted that participation would depend on the other group members (*"If for some reason, I didn't feel I'd fit into the group, then it probably wouldn't work"*). Many participants felt the group could include participants regardless of how long ago they had the ACS. A couple of people stated that the group should include people of similar physical health status (*"I don't want to be around sick people...people who are really struggling...who are on oxygen or can hardly walk"*).

In the non-depressed group, two participants declined to do the mindfulness practice (*"I just don't think it's anything I need"*). All participants who did the practice had a positive reaction. Approximately half expressed an interest in a mindfulness program to help with anxiety, concentration, and relaxation. Most felt an 8-week structure with 1-2-hour sessions was acceptable.

Most participants were interested in a group program. One person stated they preferred individual, and another stated they were unlikely to participate in a group (*"I'd like to say that a group setting would do, but it's not my past practice"*). Most participants felt the group could include people at different times since ACS. Two participants felt the group should include people of similar physical health status (*"I think it would be better if there was a group of people that had a similar event, right, and came at it from a similar fitness level to begin with"*).

### Perspectives on Group Videoconferencing Delivery

In the depressed group, most participants were interested in participating in a mindfulness program via group videoconferencing (*"I like that idea. I'm a big fan of videoconferencing"*). Almost all participants discussed logistical benefits of convenience, ease, and efficiency, and a greater ability to reach more patients (*"No travel is involved, you can reach a wider range of people that might have to drive for hours and hours..."*). A few people noted social benefits such as greater sense of comfort. Some expressed that videoconferencing was not their first choice but would still be acceptable (*"Given the preference, I would prefer in-person. But I could do the videoconference"*). The most common concern was that videoconference was less personal. A few participants stated they did not have the needed technology, and a couple of people mentioned concerns about poor internet connectivity. Several participants speculated that other people would be concerned about logistics and security, or need assistance with the technology, but these were not concerns for them personally (*"Lots of people are not*

*computer savvy and they don't know how to operate or get those kind of video apps. But that wouldn't be my case"*).

In the non-depressed group, most participants were interested in using videoconferencing, commonly noting logistical benefits of convenience and ease. A few expressed a preference for in-person but were still willing to use videoconferencing (*"It's ok. I mean, there's nothing like seeing somebody face-to-face. But I mean, that stuff certainly works"*). A few people speculated about concerns others might have, but stated they did not have these concerns themselves (*"Some people are technophobes..."*). Two people stated they did not have the necessary equipment (e.g., computer, camera). No participants expressed concerns about their ability to use the technology if they had access.

### Perspectives on Dried Blood Spot Procedures

In the depressed group, almost all participants were willing to complete remote self-collection of dried blood spots (*"I think it's a good idea... especially being far away, we could just do it here and send it to you"*). Several people noted that they already had experience pricking their finger for blood samples due to their medical conditions (*"I check my blood all the time, because I'm a diabetic"*). Only one person stated they wouldn't do it due to fear of needles. Participants stated they would need information about the purpose of taking the sample, what is being tested in the blood, and how the sample will be securely stored. Participants also expressed training needs and provided suggestions, such as written instructions with visuals or having a phone or videocall with the researcher.

In the non-depressed group, almost all participants were willing to self-collect dried blood spots (*"Wow that's good, I didn't know you could do that. But that's great"*). Only one person had privacy concerns and would not complete the procedure (*"I just don't like the idea of my DNA or whatever being out there in the world"*). All other participants stated no concerns but would want information about the purpose and security of the samples. Only two people expressed training needs such as watching someone else take the sample first or watching a training video.

### Discussion

Patients after ACS reported a multitude of quality of life issues, interest in participating in a mindfulness group program via videoconferencing, and willingness to self-collect dried blood spots as part of a research study. Most participants were interested in getting help for depression or anxiety symptoms and having social support, and felt that a mindfulness program should be offered shortly after ACS and aligned with cardiac rehab. Some participants expressed concerns about videoconference being less personable and perhaps would need training to utilize videoconferencing, but were still willing to try this approach due to benefits of

accessibility and convenience. Most participants were also very interested in a group format due to a desire to connect with similar peers.

There were some differences between the depressed and non-depressed groups. Participants in the depressed group reported both depression and anxiety symptoms, physical symptoms, activity limitations, and difficulty making health behavior changes. In contrast, those in the non-depressed group primarily struggled with anxiety, already made several positive health behavior changes, reported few physical symptoms or activity limitations, and many more than in the depressed group were already using mindfulness-related coping skills (e.g., appreciation of the present moment). We are not aware of previous studies that explored post-ACS symptoms in depth from the patient perspective, and compared experiences among depressed and non-depressed groups, but the current findings are consistent with previous research demonstrating that depressive symptoms are associated with poorer quality of life in ACS patients,<sup>36,37</sup> and that positive health behavior change is important for mood management after ACS.<sup>6</sup> Findings also point to important treatment targets that naturally align with MBCT. For example, some non-depressed patients described that they developed a new more adaptive perspective on life which overlapped with core features of mindfulness, namely greater appreciation for the present moment and acceptance of their health changes.

These findings suggest modifications to optimize relevance of MBCT for patients with depressive symptoms after ACS. Although MBCT was designed to treat depression, mindfulness practice trains non-judgmental awareness of any type of internal experience and thus targets core psychological processes such as cognitive de-centering and distress tolerance that are generalizable to anxiety, physical symptoms, and cognitive-emotional barriers to health behaviors.<sup>38,39</sup> To make this range of treatment targets more explicit for patients after ACS, adaptations may include using the broader term “distress” in addition to “depression” in intervention materials (as the original MBCT materials only name depression as a treatment target, while distress encompasses a wider range of emotions); providing psychoeducation of emotions and maladaptive thought patterns (rather than psychoeducation of depression and depressive thoughts specifically); working with ACS-related physical symptoms during mindfulness practices (e.g., fatigue, shortness of breath); emphasizing self-compassion to target self-blame; applying mindfulness skills to fears of recurrence and barriers to healthy diet and exercise; and leveraging the group format of patients with shared cardiovascular disease. While there are many interpersonal benefits of mindfulness training (e.g., active listening to others, prosociality<sup>40</sup>) the group format itself is also an active ingredient that enhances social connection and enjoyment of mindfulness practice.<sup>41</sup> This social support is important for people after ACS, as social isolation is an independent risk factor for ACS mortality.<sup>42</sup>

Supplementing the standard protocol with these adaptations, while retaining core components of training in present moment awareness and acceptance, may provide a balance between developing a targeted protocol and maintaining the integrity of MBCT. Validated MBCT fidelity measures<sup>43,44</sup> should be used to assess adherence to the adapted protocol and original essence of MBCT.

Although not directly addressed in the current study, trauma is another important consideration. ACS is a sudden and frightening experience with a realistic fear of death, resulting in ACS-induced PTSD for 12% of survivors.<sup>45,46</sup> There is overlap between PTSD symptoms and depression symptoms, including negative cognitions, persistently negative emotional states, diminished interest in activities, inability to experience positive emotions, and difficulties with sleep and concentration.<sup>47</sup> MBCT aims to address transdiagnostic processes that underly both conditions (e.g., repetitive negative thinking, experiential avoidance), and mindfulness interventions show efficacy for reducing PTSD symptoms.<sup>48</sup> Trauma-informed adaptations of MBCT for ACS survivors may include psychoeducation on the window of tolerance and self-regulation; additional guidance around awareness of chest sensations during the body scan; and attention to chest sensations for a sitting with difficulty meditation.

The current findings also suggest that patients after ACS would be comfortable self-collecting dried blood samples to mail to the hospital as part of a research study. Although dried blood spots are widely used in hospitals and epidemiological research,<sup>49,50</sup> at-home self-collection and submission of samples via mail for clinical trials represents an innovative approach that aligns with remote intervention delivery and could be used to support a fully remote clinical trial. Logistically, this approach may also have benefit for patients who are unwilling or unable to travel to the hospital for in-person study visits. The role of inflammation in the comorbidity between depression and cardiovascular disease is complex and requires further research,<sup>51</sup> and the development of feasible approaches to remote collection of blood samples could support future research. Following participants' suggestions in the current study, researchers might promote feasibility of this approach by providing written instructions with visuals and guiding patients through the procedure via videoconference. Overall, the current results suggest the feasibility and acceptability of a full remote trial including biological assessments, which has become more common and needed following the COVID-19 pandemic.

There are some limitations of this study. The first is the lack of demographic variability. Although recruitment was conducted across the health care system, all participants were non-Hispanic, and almost all were white and male. Given the significant health disparities in cardiovascular outcomes by race and sex,<sup>52,53</sup> future research should focus on exploring needs and making preferred treatments accessible to Black and Hispanic patients and women after ACS. Further research

is also needed to understand perspectives on self-collected blood samples among Black and Hispanic patients who may have justified mistrust of medical systems and be uncomfortable submitting blood samples to researchers by mail.<sup>54</sup> It is also important to note that this study was conducted prior to the COVID-19 pandemic when the use of videoconferencing became widespread and thus may underestimate patient's willingness or comfort to use videoconferencing.<sup>55,56</sup> Participants were an average of 7.8 years from their ACS, which may have affected their responses or recollection of their experience, and results may not reflect the needs or preferences of patients closer to the time of ACS. Given the low response rate, results may also overestimate intervention acceptability by sampling patients with an interest in behavioral intervention research. Additionally, we did not probe directly for resiliency factors following ACS, which may limit the understanding of resiliency treatment targets.

Lastly, while we assessed the potential acceptability of specific MBCT components, the aim was to inform treatment adaptations and the results do not represent the actual acceptability of an MBCT course. Thus, future research in clinical trials is needed to test the acceptability of an adapted MBCT intervention for ACS patients. Future directions in line with the ORBIT model of behavioral intervention development include refining the MBCT protocol to target the needs of ACS patients as identified here, and testing the feasibility, acceptability, and changes in emotional symptoms in a proof-of-concept open pilot trial followed by a randomized feasibility trial.<sup>35</sup>

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