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## Understanding and enhancing post-stroke recovery: Insights from a nested qualitative study within the MindFit Project randomized clinical trial<sup>☆</sup>

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## ABSTRACT

**Background:** Stroke survivors experience a wide range of physical, cognitive, and emotional challenges. In the MindFit Project, a randomized clinical trial, 141 chronic stroke patients were divided into three groups: mindfulness-based stress reduction (MBSR) with computerized cognitive training (CCT), physical exercise (PE) with CCT, and CCT alone. The interventions were conducted remotely over 12 weeks, including online group and individual sessions.

**Objective:** This exploratory nested qualitative study aimed to investigate chronic stroke survivors' experiences, opinions, and perceived changes due to the interventions within the MindFit Project. The secondary objective was to describe the broader experience of their recovery journey.

**Methods:** Twenty-seven participants were recruited through purposive sampling and engaged in semi-structured one-on-one interviews. Twelve received MBSR+CCT, nine received PE+CCT, and six received CCT-only. The interviews were recorded, transcribed, and analyzed using thematic analysis.

**Results:** Participants shared insights into their lives after stroke, including emotional and physical challenges, coping mechanisms, and the impact of societal perceptions. The interventions were generally positively valued, with MBSR aiding in emotional regulation, PE enhancing physical capabilities, and CCT improving cognition. The group setting provided valuable peer support and motivation, although some participants noted challenges owing to the heterogeneity. The telematic format was also appreciated for its accessibility, although it posed challenges to personal interaction and intervention supervision.

**Conclusions:** Our study emphasizes the complexity of stroke recovery and the importance of holistic, patient-centered rehabilitation approaches. It also highlights the value of combining physical and non-physical

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interventions in a group setting, along with the potential of remote platforms to enhance the accessibility of rehabilitation programs. These findings generate hypotheses for future randomized clinical trials aimed at improving post-stroke recovery.

## 1. Introduction

Stroke survivors frequently experience sudden and profound life changes. Physical, cognitive, emotional, and behavioral symptoms resulting from cerebrovascular events threaten their functional abilities, daily activities, and social participation, significantly impacting their quality of life, sense of existence, and identity.<sup>1,2</sup> Stroke can lead to complex care needs, encompassing physical, psychological, social, and environmental aspects. Despite evidence-based guidelines advocating for extended comprehensive rehabilitation,<sup>3,4</sup> many interventions focus only on the physical domain during the acute and subacute phases.<sup>5</sup> Professional care often ends after hospital discharge, leaving patients and their families largely on their own to manage the physical and psychosocial challenges.<sup>6</sup> Indeed, several studies have highlighted the high prevalence of long-term unmet rehabilitative needs in stroke patients, such as access to information, cognitive and emotional support, and interventions for physical function, autonomy, and community participation.<sup>7,8</sup>

Therefore, developing or refining interventions that address both physical and non-physical domains while incorporating group-based participation to allow social interaction seems essential. This comprehensive approach aligns with the World Health Organization's (WHO) biopsychosocial definition of health<sup>9</sup> and its 2030 stroke rehabilitation agenda,<sup>10</sup> and could address most of the previously described rehabilitation needs. Furthermore, improving the accessibility of these interventions is also crucial.<sup>11</sup> Telerehabilitation, which gained prominence during the COVID-19 pandemic, offers a promising solution to enhance care equity by overcoming geographic, demographic, and socioeconomic barriers.<sup>12</sup> However, its implementation presents challenges related to usability and technological barriers.

Among the various intervention approaches studied in stroke care, mindfulness, physical exercise (PE), and computerized cognitive training (CCT) have all shown potential for improving patient outcomes. Systematic reviews have suggested that mindfulness may reduce post-stroke emotional disturbances,<sup>13</sup> alleviate fatigue,<sup>14</sup> and enhance sensorimotor functions,<sup>15</sup> though its cognitive benefits require further investigation. Similarly, meta-analyses of randomized controlled trials have demonstrated that PE can improve physical fitness,<sup>16</sup> cognitive function,<sup>17</sup> and health-related quality of life<sup>18</sup> while reducing depressive symptoms in stroke patients.<sup>19</sup> Lastly, CCT has been found to enhance cognitive functioning, both as a standalone therapy<sup>20</sup> and in combination with PE.<sup>21</sup> Even with these encouraging results, many of the abovementioned systematic reviews and meta-analyses highlight inconsistencies and emphasize the need for further studies to confirm these benefits.

Qualitative studies offer deep insights into the perceived benefits of interventions for stroke survivors. Research on mindfulness<sup>5,22,23</sup> has highlighted increased self-awareness, better emotion regulation, and improvements in memory, concentration, fatigue, sleep, and pain management. However, some participants reported challenges such as session length and difficulties with meditation. A recent systematic review of PE interventions<sup>24,25</sup> showed improvements in physical function, confidence, and a renewed sense of identity among survivors. Meanwhile, Withiel et al.<sup>26</sup> found that CCT enhances attention and memory but provides limited everyday functional gains; participants appreciated the training but faced issues like task speed, repetition, and fatigue. Across all interventions, common positive factors included the supportive group setting and the structured routine, which offer meaningful rehabilitation opportunities.

Despite these promising findings, several methodological challenges

persist, particularly in the trial design and intervention protocols. For instance, many mindfulness studies with stroke samples relied on single-group pre-post designs and substantially modified standardized programs such as the mindfulness-based stress reduction (MBSR) curriculum.<sup>27</sup> These modifications included eliminating the group component or reducing the intervention length and session duration without an evidence-based rationale. Furthermore, except for some studies on the combined effects of PE and CCT, combining therapies in a single trial remains uncommon, though this approach seems favorable given the multiple health spheres affected by stroke. The molecular, cerebral, and behavioral mechanisms behind the cognitive and emotional benefits of MBSR, PE, and CCT interventions are also poorly understood.

Given these knowledge gaps and the clinical relevance of these questions, we designed the MindFit Project.<sup>28</sup> This randomized clinical trial of chronic stroke patients was designed to evaluate the cognitive and emotional effects of combining MBSR or PE interventions with CCT, as opposed to a CCT-only intervention. We collected comprehensive data before and after the 12-week interventions, including cognitive, emotional, physical, neuroimaging, and biochemistry metrics. Additionally, the project incorporated a qualitative sub-study performed through individual interviews at the end of the interventions.

The primary objective of this exploratory qualitative study was to describe participants' lived experiences within the MindFit Project, focusing on perceived intervention-related changes, impacts on daily life, and opinions about the interventions and their delivery formats. Additionally, a secondary objective was to gather further information about their overall experiences following a stroke. By providing this wider context, we aimed to enhance our understanding of stroke recovery and situate the specific experiences in the MindFit Project within the broader framework of post-stroke rehabilitation. We hope our findings will inspire new hypotheses for future randomized clinical trials, ultimately guiding healthcare policies to ensure comprehensive, accessible, and effective post-stroke care.

## 2. Methods

### 2.1. Context and qualitative approach

The MindFit Project<sup>28</sup> was conducted between November 2020 and December 2021. It included 141 participants who fulfilled the following inclusion criteria: (1) men and women aged 18–80 years; (2) diagnosis of ischemic or hemorrhagic stroke three to 60 months prior; (3) physician's consent for exercise; and (4) fluency in Catalan or Spanish. Exclusion criteria were: (1) cognitive impairment (Mini-Mental State Examination<sup>29</sup> [MMSE] score  $\leq 23$ ); (2) severe aphasia; (3) severe sensory problems; (4) transient ischemic attack without brain lesion evidence; (5) other neurological conditions; (6) severe pre-stroke psychiatric disorders; and (7) history of alcohol or substance abuse. These 141 participants were randomly assigned into three groups in a 1:1:1 ratio: (1) MBSR plus CCT (MBSR+CCT), (2) multicomponent PE intervention plus CCT (PE+CCT), or (3) CCT-only.

In this nested qualitative study, we used semi-structured interviews to describe participants' experiences with the MindFit Project interventions, highlighting intervention-related changes and their opinions on delivery format. Data were analyzed using both inductive and deductive approaches.<sup>30</sup> We did not use a predetermined theory to guide our deductive analysis. Instead, the initial thematic structure was influenced by our study objectives, while we also looked for themes that emerged directly from the narratives.

This project was registered on ClinicalTrials.org (NCT04759950) and

received ethical approval from the institutional review boards of all participating centers. All participants were given exhaustive information about the study, and they provided oral and written consent before the interview. In addition, this paper followed the guidelines of the Standards for Reporting Qualitative Research.<sup>31</sup>

## 2.2. Research team and reflexivity

AB-G, a psychologist with a background in neuroscience and neuropsychology, was responsible for conducting the interviews. AB-G received specialized training in qualitative interviews and data analysis as part of his predoctoral research. MA, also a psychologist, assisted AB-G in the first interviews, bringing additional expertise and perspective to the early stages of data collection. Despite being members of the MindFit Project, they did not participate in the evaluation or intervention protocols.

An independent team specializing in qualitative methodology analyzed the transcripts and performed coding to counterbalance the familiarity of AB-G and MA with the participants and ensure a critical distance in interpreting the data. This team comprised three nurses with clinical experience and training in anthropology and psychology (AA, MF, and RG) and a sociologist (JB).

## 2.3. Recruitment/participants

In this qualitative study, we employed a purposive sampling strategy that combined homogeneity and maximum variation criteria<sup>32</sup> to select participants from the MindFit Project. First, we identified participants with high adherence to the interventions, defined as average compliance of 80% across both interventions in the combined groups or 80% compliance in the single intervention group. We then applied a maximum variation criterion within this homogeneous group, selecting individuals with diverse demographic and clinical characteristics (i.e., sex, age, years of education, and time since stroke) from each intervention arm. AB-G or MA contacted participants by phone to invite them. Upon agreement, we scheduled a convenient Zoom meeting.

Recruitment was an iterative process. We invited and interviewed participants until data saturation was achieved within each intervention group. This approach led us to invite 30 individuals; three declined due to temporary unavailability. Consequently, we conducted 27 interviews: 12 with MBSR+CCT recipients, nine with PE+CCT recipients, and six with CCT-only recipients. We did not balance participant numbers across groups, prioritizing information saturation for each intervention. The richness of the narratives in the MBSR+CCT group required a larger sample size to achieve saturation. In contrast, the CCT-only group had fewer participants, as their experiences and opinions were also covered in the combined groups.

## 2.4. Interventions

Participants in the study underwent a 12-week program with five weekly sessions, divided into three interventional arms: two groups received combined interventions (i.e., MBSR+CCT or PE+CCT), and one group solely participated in CCT.

The MBSR program was based on Jon Kabat-Zinn's curriculum,<sup>27</sup> with slight adjustments to extend the duration to 12 weeks instead of the standard eight-week program. Participants attended a 150-min online group session weekly, led by an accredited mindfulness instructor. Additionally, they engaged on the other weekdays in individual practices, both formal and informal, lasting 20–40 min per day. We provided audio recordings of meditations and written materials to support these practices.

The PE program followed Billinger's recommendations for stroke survivors,<sup>33</sup> with five weekly sessions lasting 45–60 min each. The program included three group videoconferencing sessions per week, led by a physiotherapist and a strength and conditioning specialist. Two

sessions focused on strength, agility, and balance, while one targeted aerobic capacity. The remaining two sessions involved autonomous walking exercises around participants' homes. We used Fitbit Inspire HR® bracelets to monitor all activities.

The CCT intervention was administered through the Guttman NeuroPersonalTrainer® software,<sup>34</sup> which targeted executive functions, memory, speed, and attention. The software automatically personalized the training based on baseline cognitive assessments, adjusting task difficulty to maintain a 65–85% accuracy range. Participants completed each 45-min individualized session five times a week.

Participants in the combined therapy groups did not receive specific instructions regarding the order of interventions. Their sessions lasted approximately twice as long as those in the CCT-only group. To minimize the potential confounding effect of social interaction in the combined groups, all participants, including those in the CCT-only group, joined WhatsApp groups with peers from their respective arms.

Please refer to the [Supplementary Material](#) and the study protocol<sup>28</sup> for detailed information on materials used, accommodations for physical and cognitive difficulties, the intensity and frequency of exercises, and the progression of physical workloads.

## 2.5. Data collection

Semi-structured individual interviews were conducted to enable informants to speak freely. Whenever possible, interviews were done within two weeks after the post-intervention assessment.

We developed an interview script based on past qualitative studies<sup>35, 36</sup> and the Client Change Interview Protocol.<sup>37</sup> It covered initial post-stroke experiences, expectations, and evaluations of the MindFit Project, and the interventions' effects (see the complete guide in the [Supplementary Material](#)). This guide was pilot-tested on two participants, one each from the MBSR+CCT and PE+CCT groups, to refine our approach toward mindfulness and PE topics. Findings from these pilot tests were included in the study, because they provided relevant insights.

All interviews were conducted via Zoom, adhering to the COVID-19 social-distancing measures, with each session designed to last approximately 45–60 min. While all interviews were audio-recorded, they were not supplemented with field notes to foster a more conversational atmosphere. We saved all interview audio files with coded identifiers to ensure no direct reference to participants' identities. Furthermore, we meticulously reviewed each file to redact any personal information beyond first names. Anonymized audio files were stored on our institutional server, and access required strong passwords without the possibility of files downloading, ensuring data security and confidentiality.

Data saturation was assessed through regular analysis meetings, where the research team actively sought new information or divergent themes in each transcript. After conducting 27 interviews, we reached a consensus on data saturation, as subsequent data did not introduce additional insights or alter the established coding framework.

## 2.6. Data analysis

Data analysis was conducted through thematic analysis by using a seven-stage framework methodology.<sup>38</sup> This process involved: (1) anonymized transcription of interviews by an external company, followed by accuracy checks against original recordings by our team; (2) initial familiarization with the data by MF and AA, who read and re-read each transcript, noting and sharing initial impressions; (3) independent coding of text passages by these two researchers, using the Atlas.ti software for data management throughout this and subsequent stages; (4) development of a coding scheme through discussions among all team members (MF, AA, JB, RG, AB-G) and initial categorization of the dataset using this scheme; (5) comprehensive application of the analytical framework to the data, interpreting and analyzing the categorized information in depth; (6) charting of the data; and (7)

interpretation of the data, identifying subthemes and overarching themes at a latent level. The entire team was involved in extensive discussions during the last two stages until a consensus was reached. This collaborative and iterative approach, along with meticulous documentation, rigorous transcription verification, and the involvement of multiple coders, was key to ensuring the reliability of our findings.<sup>39–41</sup> Although we did not return transcripts to participants for verification because of resource constraints, these combined methods helped maintain the integrity and validity of our findings.

### 3. Results

#### 3.1. Sample characteristics

Our participant cohort comprised 27 individuals (14 women) with a median age of 58 years (IQR: 14, range: 24–79) and a median time since the stroke of 30 months (IQR: 22, range: 6–67). The overall median

duration of the interviews was 49.37 min (IQR: 34.62; range: 23.48–113.93). [Table 1](#) provides a detailed account of participant demographics and clinical<sup>42</sup> and intervention data.

#### 3.2. Overview of thematic findings

The complete content of the interviews was categorized into three main themes, which will be presented in the order they appeared in the interview schedule, following a chronological sequence. [Table 2](#) shows the structure of the themes, sub-themes, and categories. Direct quotations across all categories within Themes 1, 2, and 3 are included in [Tables 3, 4, and 5](#), respectively. To facilitate cross-referencing and provide examples, references to the table categories have been noted in parenthesis in the thematic discussion (e.g., 1.1.1).

##### 3.2.1. Theme 1: Life after the stroke

The first theme referred to the experiences, emotions, and challenges

**Table 1**  
Demographics and clinical and interventional data.

	MBSR+CCT (n = 12)	PE+CCT (n = 9)	CCT-only (n = 6)	Whole sample (n = 27)
<b>Demographic data</b>				
Sex, n				
Female/Male	8/4	4/5	2/4	14/13
Age in years				
Median (IQR)	57.50 (21)	60 (20)	56 (21)	58 (14)
Range	24 – 66	31 – 79	49 – 67	24 – 79
Highest education, n				
Elementary and middle school	1	1	1	3
High school	3	0	2	5
Technical qualification	1	3	1	5
Bachelor's degree	5	4	2	11
Master's degree	1	1	0	2
Doctoral degree	1	0	0	1
Employment status, n				
Employed	1	1	0	2
On sick leave	1	2	3	6
On invalidity pension	8	2	1	11
Retired	2	4	1	7
Unknown	0	0	1	1
<b>Clinical data</b>				
Type of stroke, n				
Ischemic/Hemorrhagic	5/7	5/4	5/1	15/12
Months since stroke*				
Median (IQR)	42 (19)	24 (21)	21.50 (16)	30 (22)
Range	6 – 67	14 – 45	14 – 34	6 – 67
mRS, n				
1	3	3	2	8
2	5	5	3	13
3	2	0	0	2
4	2	1	1	4
<b>Intervention data</b>				
Percentage of adherence to MBSR				
Median (IQR)	94.81 (15.56)	—	—	—
Range	65.19 – 100	—	—	—
Percentage of adherence to PE				
Median (IQR)	—	98.33 (6.65)	—	—
Range	—	86.67 – 100	—	—
Percentage of adherence to CCT				
Median (IQR)	100 (1.67)	100 (15)	100 (0.83)	—
Range	65 – 100	81.67 – 100	96.67 – 100	—
Percentage of global adherence				
Median (IQR)	97.41 (9.35)	98.33 (9.58)	100 (0.83)	—
Range	65.09 – 100	84.17 – 100	96.67 – 100	—
<b>Interview data</b>				
Duration in minutes				
Median (IQR)	66.16 (33.54)	49.65 (39.99)	34.55 (17.89)	49.37 (34.62)
Range	25.50 – 95.98	27.82 – 113.93	23.48 – 49.30	23.48 – 113.93

**Abbreviations:** CCT, computerized cognitive training; MBSR, mindfulness-based stress reduction; mRS, modified Rankin Scale; PE, physical exercise.

**Note:** Quantitative variables are presented in terms of median (IQR) due to their non-normal distribution.

\*Although the inclusion criteria specified a maximum of 60 months post-stroke, delays related to COVID-19 caused some participants who met the criteria at the time of recruitment to exceed this limit when they began the interventions. These participants were retained in the study for ethical and practical reasons.

faced by the participants after stroke (see direct quotations in Table 3).

### 3.3. Initial feelings post-stroke

During the first moments after a stroke, there were a range of emotions experienced by survivors; these included confusion, shock, gratitude for survival (1.1.1), fear, and uncertainty about their future (1.1.2). Coping with the sudden changes in their health and abilities, from visual impairments to complete dependence on others for mobility (1.1.3), was difficult and disrupted patients' vital plans and expectations. This led to feelings of mourning, frustration, and even a sense of loss of self-identity (1.1.4).

### 3.4. Returning home and daily life adaptation

Discharge from the hospital was a significant milestone in their recovery journey, as it represented a return to normalcy and provided hope for the future. However, it also brought an end to the constant medical support, which led to feelings of fear, isolation, and vulnerability due to a perceived lack of information and guidance (1.2.1, 1.2.2). The home environment that was once familiar, now presented new challenges. Even simple tasks like dressing became reminders of their limitations, and dependency on others for such tasks significantly impacted their sense of autonomy, emotional well-being, and self-esteem (1.2.3). This often necessitated a switch in roles and duties among household members (1.2.4).

### 3.5. Coping strategies and rehabilitation

Despite these challenges, participants often showed strong determination to regain their independence and actively participated in rehabilitation (1.3.1). Although they recognized that the process can be slow and laborious, many learned to appreciate even the slightest progress and find motivation in it (1.3.2). Additionally, setting meaningful goals such as returning to work or engaging in cherished pre-stroke activities emerged as a significant motivator during the rehabilitation journey (1.3.3).

As stroke patients progressed through their recovery journey, they experienced a phase of self-rediscovery that helped them better comprehend their post-stroke needs (1.3.4). This understanding was vital to identify new coping strategies for adjusting to the new reality, finding alternative paths to achieve their goals, or occasionally using humor to lighten the situation. An important aspect of this recognition was acknowledging the need to adjust their initial recovery expectations and assimilate that certain activities such as returning to work were no longer feasible or required modifications to accommodate their current abilities (1.3.5).

### 3.6. Social recognition and invisibility

Additionally, post-stroke rehabilitation occurs within a societal context (1.4). Patients explained that societal perceptions can exacerbate their challenges. Many people, sometimes even those closest to them, assume recovery is complete based solely on physical appearance. These perceptions often overlook or underestimate the impact of hidden post-stroke impairments, such as cognitive difficulties or emotional problems. Based on these misunderstandings, patients are often expected to perform tasks beyond their capabilities, forcing them to constantly justify their condition. Overall, these circumstances can lead to additional stress for survivors and further complicate their recovery process. Some may withdraw from social interactions to avoid these situations, increasing their sense of invisibility, isolation, and loneliness.

#### 3.6.1. Theme 2: Intervention-related changes

The second theme focused on the changes experienced due to the interventions and their effect on daily functioning (see direct quotations

**Table 2**  
Organization of themes, subthemes, and categories.

Theme	Subtheme	Category*
1. Life after the stroke	1.1. Initial feelings post-stroke	1.1.1. Acknowledging mortality, valuing life
		1.1.2. Managing recovery's uncertainty
		1.1.3. Struggle with functional loss/dependency
		1.1.4. Grieving identity and life plan loss
	1.2. Returning home and daily life adaptation	1.2.1. Conflicting feelings: euphoria, fear
		1.2.2. Disconnect from the health system, lack of info
		1.2.3. Physical challenges, home adaptation
	1.3. Coping strategies and rehabilitation	1.2.4. Shift in family dynamics
		1.3.1. Seeking autonomy, active rehabilitation
		1.3.2. Recognizing process slowness, cultivating tenacity
		1.3.3. Goal-setting: Work and activity re-engagement
		1.3.4. Self-rediscovery, accepting new limits
2. Intervention-related changes	1.4. Social recognition and invisibility	1.3.5. Readjusting expectations
		2.1. Mindfulness
	2.2. Physical exercise	2.1.1. Change in post-stroke life interpretation
		2.1.2. Self-awareness and acceptance
		2.1.3. Interpersonal dynamics change
		2.1.4. Enjoying the present experience
		2.1.5. Stress reduction, emotion regulation
		2.1.6. Pain management, body awareness
	2.3. Computerized cognitive training	2.2.1. Physical fitness benefits
		2.2.2. Exercise routine establishment
2.2.3. Daily life impact, autonomy increase		
2.2.4. Emotional well-being improvement		
3. Intervention format	3.1. Group setting	2.2.5. Environmental progress perception
		2.3.1. Brain health, active mind benefits
		2.3.2. Cognitive gains
		2.3.3. Self-awareness, strategy generation
		2.3.4. Daily life benefit transfer
	3.2. Online format	2.3.5. Emotional well-being, self-esteem impact
		3.1.1. Peer support
		3.1.2. Heterogeneity: Beneficial aspects
	3.3. Program commitment and continuity	3.1.3. Heterogeneity: Challenging aspects
		3.2.1. Online format benefits
		3.2.2. Online format limitations
	3.3.1. Structured engagement's positive impact	
	3.3.2. Frequency, intensity, and duration challenges	
	3.3.3. Program duration, continuation need	

\* "Categories" in this table emerged from a process of discussing and grouping the initial codes extracted from the data.

**Table 3**

Representative quotes from Theme 1: Life after the stroke.

**Subtheme 1.1.: Initial feelings post-stroke****1.1.1. Acknowledging mortality, valuing life**

"It's a shock because you start realizing, 'I'm alive. And I think almost 49% of hemorrhagic strokes are fatal.'" (MF2112, PE+CCT)

**1.1.2. Managing recovery's uncertainty**

"You start looking and say, 'Damn, I'm depending on others. I'll be depending even more if this doesn't improve.'" (MF2112, PE+CCT)

**1.1.3. Struggle with functional loss/dependency**

"And in the blink of an eye, I was left with half my vision." (MF2051, CCT-only)  
 "Physically, it was very hard for me because I went from being very active to suddenly being in a wheelchair." (MF2116, PE+CCT)

**1.1.4. Grieving identity and life plan loss**

"This disease is very hard; from one day to the next, you're not the same person anymore. Your body doesn't respond, your head doesn't respond; it's a big shock, hard to accept." (MF2007, MBSR+CCT)  
 "You had your life set, and one day, all of a sudden, everything falls apart." (MF2093, CCT-only)

**Subtheme 1.2.: Returning home and daily life adaptation****1.2.1. Conflicting feelings: euphoria, fear**

"Coming home was euphoric because I also thought I wouldn't leave the hospital so early. This gave me a high." (MF002, MBSR+CCT)  
 "In the rehabilitation center, I was very well, as if protected, because when they started telling me that I could go to spend the weekend at home, I was terrified." (MF2075, MBSR+CCT)

**1.2.2. Disconnect from the health system, lack of info**

"When I was discharged to go home, I thought, 'What now?' because no one tells you, 'Well, look, you can go here,' or 'There is a rehabilitation center there,' or 'You can ask for help elsewhere.'" (MF2087, MBSR+CCT)  
 "There is a void that I think is tremendous. It's unacceptable for a person to become completely forgotten after they leave basic recovery." (MF2126, PE+CCT)

**1.2.3. Physical challenges, home adaptation**

"When I was discharged, it was difficult because, with my left vision impaired, I couldn't navigate the street without bumping into streetlights and such. It was overwhelming." (MF2051, CCT-only)  
 "In the hospital, everything was handed to me on a golden platter; it was easy. At home, I was alone. One day, while doing the dishes, three glasses fell, and I felt so frustrated. It led to self-criticism, feeling, 'I'm worthless; I'm useless.'" (MF2042, CCT-only)

**1.2.4. Shift in family dynamics**

"My husband had to change his role and be around the house and the children. The whole thing makes me feel very guilty for having had a stroke and putting everyone through this, poor things." (MF2087, MBSR+CCT)  
 "I had to return to living with my parents, and I didn't understand why I had to be there and not in my own house. Then I understood more or less that I needed help and couldn't be alone." (MF2124, PE+CCT)

**Subtheme 1.3.: Coping strategies and rehabilitation****1.3.1. Seeking autonomy, active rehabilitation**

"I don't like anyone to wipe my butt. And now, with much effort, I shower alone, I dress alone, and I do everything alone." (MF2137, PE+CCT)  
 "I realized that this work did not depend on the doctors. I was the one who had to set all the guidelines and all the methods and ways to improve day by day." (MF2064, MBSR+CCT)

**1.3.2. Recognizing process slowness, cultivating tenacity**

"I told myself, 'Now it's time to work hard; there's a long way to normal.'" (MF2126, PE+CCT)  
 "I was evolving, but the progression for the better wasn't noticeable from one day to the next, only after several days." (MF002, MBSR+CCT)  
 "The first day I got dressed alone, I said, 'I already have a battle won.' Every time I do something, it encourages me to do more." (MF2087, MBSR+CCT)

**1.3.3. Goal-setting: Work and activity re-engagement**

"I set myself a series of objectives, one of which was to return to work. I know that because of my profession, it was still going to be a little difficult, but I got mobility; I left the crutch." (MF2064, MBSR+CCT)  
 "In my case, I resumed climbing. I set myself that challenge, and then, based on work with the professional neuro and a climbing coach, I achieved it." (MF2127, MBSR+CCT)

**1.3.4. Self-rediscovery, accepting new limits**

"For example, I now think about things five times before I answer because just after the stroke, I answered very badly." (MF2042, CCT-only)  
 "I realized the stroke affected my executive functions. Sometimes, simple problems seem unsolvable. I think, 'Sleep on it; it'll be clearer tomorrow.' And it often is." (MF2074, MBSR+CCT)  
 "I think that taking things with humor also helps. The day I don't make a joke about something, then I'm very bad." (MF2112, PE+CCT)

**Table 3 (continued)****1.3.5. Readjusting expectations**

"I always hoped to improve enough to return to work, but it was a very cognitively demanding job. For me, not being able to join my work has been a very hard blow that I've had, and I'm still assimilating." (MF2007, MBSR+CCT)  
 "Currently, I am a little less confident because I have seen that there are certain limitations that are not going to improve or be solved." (MF2018, PE+CCT)

**Subtheme 1.4.: Social recognition and invisibility**

"Not everyone is aware of how a person looks after having a stroke." (MF2141, PE+CCT)  
 "People don't understand me. Everyone thinks that since you don't have anything physical anymore, you're fine; and jeez, you have a wound or something in the brain." (MF2104, MBSR+CCT)  
 "We, stroke patients, always have to justify ourselves. People often tell me, 'You have a very good face,' and I have come to say, 'It's just that there's nothing wrong with my face.' And well, now I say, 'I'm perfect' because I don't want to give any more explanations." (MF2074, MBSR+CCT)

**Abbreviations:** CCT, computerized cognitive training; MBSR, mindfulness-based stress reduction; PE, physical exercise.

**Note:** The quotes presented are original and have been translated from Catalan or Spanish. Each quote is followed by the participant identifier (e.g., MF2001) and the assigned group (e.g., MBSR+CCT).

in Table 4).

**3.7. Mindfulness**

Most attendees of the MBSR program indicated a significant shift in their perspective and approach to life after the intervention (2.1.1). They experienced increased self-awareness, which was helpful to cultivate a deeper connection with themselves, and enabled them to recognize and address their personal experiences and post-stroke needs with calmness, compassion, and without judgment (2.1.2). This renewed self-examination often accompanied a changed interpersonal style characterized by greater empathy, compassion, and confident communication (2.1.3). Furthermore, the focus on observation and being aware of the present moment led to a greater appreciation of daily experiences, free from the burdens of time, making it possible to enjoy transitory moments that were previously undervalued (2.1.4).

Other narratives highlighted the instrumental value of mindfulness in stress reduction and emotional regulation (2.1.5). Even those who believed mindfulness was not for them or did not result in a significant change in their emotional status or daily functioning conceded that the meditation experience was pleasant and led to relaxation. For stroke patients, often grappling with mental and physical fatigue, this relaxation was treasured, offering pockets of rest throughout the day. Some less common but equally interesting voices described the role of mindfulness in fostering greater bodily control, enhancing pain management (by directing attention to other areas), or observing sensations in the affected areas (2.1.6).

**3.8. Physical exercise**

The participants' testimony indicated a highly positive evaluation of the PE intervention. They highlighted the significant improvements in their physical fitness, including increased strength and balance (2.2.1). Furthermore, the commitment to exercise was perceived as a benefit in itself (2.2.2). Although some participants did not perceive noticeable changes, they recognized that the program's routine had been vital in establishing a habit many had previously tried to incorporate into their lives unsuccessfully.

The physical improvement resulting from the intervention directly impacted participants' daily lives. An increased sense of security and a notable reduction in the fear of falling led participants to regain autonomy, often described as a recovery of freedom (2.2.3). This renewed independence positively affected emotional well-being, with participants reporting gains in vitality (2.2.4).

Participants explained that not only themselves but also their

**Table 4**  
Representative quotes from Theme 2: Intervention-related changes.

**Subtheme 2.1.: Mindfulness**

**2.1.1. Change in post-stroke life interpretation**

"Mindfulness helped me to accept what had happened to me and also to see a different approach to life. There were things pre-stroke that didn't lead anywhere. Life is so much more than work." (MF002, MBSR+CCT)  
"It helps you see how important the way you think, act, and relate to others is. More than anything, it adds another layer to life." (MF2075, MBSR+CCT)

**2.1.2. Self-awareness and acceptance**

"Mindfulness makes it easier to know yourself." (MF2074, MBSR+CCT)  
"It allows you to recognize yourself and have an inner vision of who you are. It's not about changing how you are, but about improving all those things that can give you the strength to move forward." (MF002, MBSR+CCT)  
"I've also learned that I tend to forget things. So, for example, when I have an important conversation, I start by apologizing, as I might forget something." (MF2007, MBSR+CCT)

**2.1.3. Interpersonal dynamics change**

"I think it makes it easier to empathize with the person in front of you and to try to put yourself in their shoes, or at least to try not to judge." (MF2074, MBSR+CCT)  
"Especially, my relationship with my parents has changed; I had to have such a difficult conversation with my mother." (MF2087, MBSR+CCT)  
"At the beginning, I was more irritable with others and angry about everything, and in the end, I think the mindfulness classes really helped me in this regard." (MF2104, MBSR+CCT)

**2.1.4. Enjoying the present experience**

"Now I enjoy much more what I do—the little things in life, being with my son, any moment in life that I might not have had time for before." (MF2007, MBSR+CCT)  
"I've learned to be with what I'm doing, giving full attention, and dedicating time to myself. But not doing anything else, just focusing on myself." (MF2127, MBSR+CCT)

**2.1.5. Stress reduction, emotion regulation**

"Meditation brings me peace and tranquility." (MF2115, MBSR+CCT)  
"Mindfulness helps you relax a lot, especially for people who are quite stressed. But I think that the impact is not as strong on people who are already calm, like me." (MF2054, MBSR+CCT)  
"For example, when I get nervous, I wait a few seconds, calm down, see that nothing happens, and then I continue speaking. Before, it would have been an immediate reaction." (MF2106, MBSR+CCT)  
"But above all, there has been an improvement in my mood, in my way of viewing the illness, and in finding my tools to cope with it." (MF2007, MBSR+CCT)

**2.1.6. Pain management, body awareness**

"I have fibromyalgia and suffer a lot of pain. With mindfulness, I have noticed a physical improvement, especially with physical pains." (MF2074, MBSR+CCT)  
"Well, right now, I have a lot of pain in my hand. So, focusing on something other than my hand is helping me manage my pain." (MF2127, MBSR+CCT)

**Subtheme 2.2.: Physical exercise**

**2.2.1. Physical fitness benefits**

"It has improved my strength, for example. By lifting weights and such, we progressively increased both the weight and the number of repetitions." (MF2112, PE+CCT)  
"I think my current body posture is better, more upright, and more dynamic." (MF2126, PE+CCT)  
"My balance has improved." (MF2141, PE+CCT)

**2.2.2. Exercise routine establishment**

"Above all, it has motivated me to engage in more sports." (MF2124, PE+CCT)  
"Before participating in this project, I tried to walk as much as possible, but it wasn't sufficient. I appreciated being compelled to walk more, and I noticed significant improvement." (MF2015, PE+CCT)

**2.2.3. Daily life impact, autonomy increase**

"I highly value the physical intervention. I appreciate it greatly because it has granted me more freedom to do various activities." (MF2116, PE+CCT)  
"Before, I didn't have the confidence I have now. I used to walk looking down at the ground, but not anymore. Now, I look forward. Do you know what I mean? My confidence has grown." (MF2137, PE+CCT)

**2.2.4. Emotional well-being improvement**

"Emotionally, I'm better; I'm not as depressed anymore. I realize I won't reach 100%, but even a little improvement helps emotionally." (MF2116, PE+CCT)  
"I've gained... how should I put it? Vitality." (MF2126, PE+CCT)

**2.2.5. Environmental progress perception**

"My children notice that I walk better, and so do others who observe me. I feel it, and others can see it too." (MF2116, PE+CCT)  
"Although I haven't noticed many improvements in myself, I've observed and really appreciated seeing significant improvements in my peers during the physical sessions." (MF2124, PE+CCT)

**Subtheme 2.3.: Computerized cognitive training**

**Table 4 (continued)**

**2.3.1. Brain health, active mind benefits**

"For me, cognitive training has been like nourishing the neurons, making everything a bit easier." (MF2089, CCT-only)  
"I've realized the importance of keeping the mind active. Cognitive work allows for more brain connections without really losing neurons, right?" (MF002, MBSR+CCT)

**2.3.2. Cognitive gains**

"The cognitive program has been quite beneficial for me, as it made me work on my memory, and I believe my memory has significantly improved because of it." (MF2054, MBSR+CCT)  
"I notice my mind is more agile in many ways, whether in thinking or in solving problems." (MF2089, CCT)

"I think it has helped improve my memory and attention." (MF2126, PE+CCT)

**2.3.3. Self-awareness, strategy generation**

"Then, I developed a tactic to focus on the first syllable of each word. I thought, 'Ah, I've discovered a new strategy!' From there, I developed my mental strategies to perform well." (MF2051, CCT-only)  
"It made me realize a deficit I was unaware of. And it shows that there's always room for cognitive improvement." (MF2127, MBSR+CCT)

**2.3.4. Daily life benefit transfer**

"I've always been an avid reader. But after the stroke, I couldn't keep up with my reading. I would read, and by the second page, it felt like I hadn't absorbed anything, which was frustrating. Now, it's different; I remember more." (MF2137, PE+CCT)

"For instance, I had issues where I would go shopping, return with the change, but not recall what I had given. Now, at least, I can handle this." (MF2018, PE+CCT)

**2.3.5. Emotional well-being, self-esteem impact**

"Recently, I realized there are times when I don't need the program's help for the first words. So, for me, on a personal and emotional level, I am doing well. When I don't fail, it seems to boost my ego." (MF2051, CCT-only)  
"I've shifted from total apathy towards everything to at least having some interest. For example, I now follow news that I previously ignored, despite once being a person you could talk to about anything." (MF2093, CCT-only)

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families and friends acknowledged and commented on these improvements, providing external validation of the progress achieved (2.2.5). Additionally, some participants found inspiration in their peers' physical progress, seeing tangible proof of the potential for improvement with effort and perseverance.

**3.9. Computerized cognitive training**

Participants described CCT as a valuable tool to keep their minds active and promote brain health (2.3.1). The program also improved cognitive functions such as memory, attention, processing speed, verbal fluency, and visual tracking (2.3.2). Some participants reported that, beyond direct improvements, the training also helped them become aware of their cognitive deficits and generate compensatory strategies to reduce their impact (2.3.3). In some cases, participants described a transference of those cognitive benefits into daily activities including reading, watching television, maintaining conversations without losing the thread, counting money, or driving (2.3.4). In addition, detecting these progressive improvements and how they influence daily functioning was an important source of satisfaction that positively impacted the patients' emotional well-being and self-esteem (2.3.5).

Notably, participant narratives were consistent across different intervention arms, indicating that participants perceived the benefits of CCT similarly regardless of whether they also participated in MBSR or PE.

**3.9.1. Theme 3: Intervention format and delivery**

The final theme included comments on the intervention format (see direct quotations in Table 5).

**Table 5**

Representative quotes from Theme 3: Intervention format.

**Subtheme 3.1.: Group setting****3.1.1. Peer support**

"It's been very important for me to meet people in the same situation, share feelings, and see how they've evolved. It's rewarding to see that, despite a tough process, most are grateful for the opportunity to improve." (MF2007, MBSR+CCT)

"The sense of group has been extremely important. Seeing people who don't judge because they've had the same or worse experiences and keep going forward gives strength." (MF2018, PE+CCT)

"It's a pretty cheerful group, and we laugh at ourselves, which is good.

Emotionally, laughing about something like a stroke, I think, is beneficial." (MF2051, CCT-only)

"Doing therapies in a group allows you to see how people change little by little. I remember, for example, someone... If you saw their face at the beginning and then at the end, it's amazing." (MF2089, CCT-only)

**3.1.2. Heterogeneity: Beneficial aspects**

"I think diversity is positive; it broadens your view. Your experience matters, but so does what happens to others, creating valuable feedback. Heterogeneity isn't a problem; it's an asset if well managed." (MF002, MBSR+CCT)

"Another excellent thing is our group's heterogeneity. Diversity is beneficial as everyone sees things differently, leading to a variety of initial thoughts and perspectives." (MF2093, CCT-only)

"Seeing 12 people so different was touching. Some could hardly move; others had already returned to work. This diversity is exceptional. When you go back home and to routine, you stop seeing these realities of stroke." (MF2125, MBSR+CCT)

**3.1.3. Heterogeneity: Challenging aspects**

"I liked that it was done in a group, but I would have preferred it to be more uniform. With fewer people and people who have more in common. I participated little because I felt bad... Embarrassed." (MF2115, MBSR+CCT; patient with aphasia)

"There were people who were not as involved or who, due to physical or psychological impairment, couldn't follow the exercises, so this is a problem when it comes to the group working better." (MF2116, PE+CCT)

"The group was too heterogeneous. A certain degree of heterogeneity is fine, but I think you have to plan to homogenize the groups, considering both impairment and age." (MF2126, PE+CCT)

**Subtheme 3.2.: Online format****3.2.1. Online format benefits**

"Imagine for stroke patients, one of our handicaps is moving around; being able to access and follow a program this way is wonderful." (MF2089, CCT-only)

"There are people like me who are distant or have physical difficulties that would prevent them from doing the program if it were in person. There's no problem with doing it remotely. It's amazing." (MF2064, MBSR+CCT)

"It's the ability to assist remotely, which totally reduces resources, mainly from an economic point of view." (MF2126, PE+CCT)

"With the Internet, it's easier. You are in your environment; you don't have to go somewhere and pretend in front of everyone, you know?" (MF2106, MBSR+CCT)

**3.2.2. Online format limitations**

"You have a Zoom meeting, which is very good and all, and you talk to many people; it's true. But it's not the same as a physical presence; it's just not the same." (MF002, MBSR+CCT)

"I think a bit of humanity has been lost between me and my peers, who I really care about. Seeing them or being able to hug them, that is obviously lost." (MF2007, MBSR+CCT)

"Maybe if it had been in person, they would have corrected some exercises that I was doing wrong on the spot, but through the screen, it's more difficult to detect." (MF2126, PE+CCT)

"Well, I suppose when it can go back to how it was at the beginning, in-person instead of screens, it will be better because I'm a bit tired of screens." (MF2075, MBSR+CCT)

**Subtheme 3.3. Program commitment and continuity****3.3.1. Structured engagement's positive impact**

"In our situation, days can pass slowly, and without a set schedule, you feel unproductive and emotionally down. Realizing this, the program's structured routine became essential for planning my days and fostering a sense of accomplishment." (MF2007, MBSR+CCT)

"Having done this for an hour of cognitive and now an hour of physical, well, those are two hours a day when you feel more useful. It's like it's your job, right? You feel different; you feel better." (MF2141, PE+CCT)

"I was very sorry when it ended. I was very sorry. Because it's not about anything special, but this served me to have like daily tasks, then that filled my day." (MF2075, MBSR+CCT)

**3.3.2. Frequency, intensity, and duration challenges**

"For me, it was manageable, as it didn't interfere with my other activities. But I couldn't spend three hours on this every day if I were working." (MF2112, PE+CCT)

**Table 5 (continued)**

"I liked it, but it was somewhat stressful. It was like being a student cramming for a last-minute exam—I couldn't go out unless I had completed my daily 'exam.' This experience suggests a need for more flexibility in the program." (MF2064, MBSR+CCT)

"The two-and-a-half-hour mindfulness sessions were very long for me." (MF2115, MBSR+CCT)

**3.3.3. Program duration, continuation need**

"Honestly, I believe this program is indispensable. However, it feels too short. Furthermore, exercising is a habit that needs to be maintained, and we tend to revert to old ways when we stop doing something, especially without guidance." (MF2018, PE+CCT)

"As they say, one swallow doesn't make a summer. When the program ends, there's a risk of disconnection, which could lead to losing one's way. So, I think it could be helpful to maintain some continuity, though not as intense as in the beginning, to avoid completely losing touch. It's like a fire that needs tending." (MF002, MBSR+CCT)

"It was so intense for a brief period and then just ended. Initially, it was constant—working hard every day, feeling muscle soreness—and suddenly, it's all over. This doesn't feel right to me." (MF2137, PE+CCT)

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**3.10. Group setting**

Most participants had positive feedback on the group format, regardless of their assigned intervention. The group provided a space where people with a significant common theme in their lives, having suffered a stroke, could share their experiences, receive feedback, and learn from others (3.1.1). Witnessing the strength and determination of others motivated some participants to keep working towards their recovery.

The group also offered emotional support, which helped reduce the sense of isolation and incomprehension that some people felt after suffering a stroke. Due to COVID-19 restrictions, this support became even more significant, offering comfort during the period of enforced isolation. All this fostered strong relationships based on understanding, empathy, and a shared desire to help each other out.

Disclosures within this subtheme also highlighted the heterogeneity within the group. The general feeling about heterogeneity was multifaceted. Some participants believed that the diversity in post-stroke experiences and severity of symptoms enriched the shared experience and could lead to a deeper understanding of the different paths taken by recovery (3.1.2). However, not all participants considered this diversity beneficial (3.1.3). Criticisms about the heterogeneity mostly came from people in the PE group who felt that reducing the difficulty or pace of the activities was necessary to accommodate the more physically affected participants. Moreover, a mindfulness group member with expressive aphasia explained that she did not interact more with the group because she felt embarrassed about her situation. These opinions suggested that segmenting groups by impairment level might be useful to align activities with participants' abilities and ensure more equitable interaction within the group.

**3.11. Online format**

Adopting the online format was seen as a timely and positive response to the COVID-19 pandemic, allowing the program to continue despite restrictions (3.2.1). Most participants appreciated the convenience of avoiding travel. Furthermore, they highlighted the democratizing effect of the online format, which allowed all patients to benefit from the program, regardless of their place of residence or mobility capacities. Some participants also remarked on the intimacy they experienced while practicing the meditations and exercises in a secure and familiar setting without feeling exposed to the scrutiny of other

people.

Although the online modality offered many advantages, some participants longed for the warmth of face-to-face interactions. Some also expressed a preference for returning to in-person sessions, citing reasons such as screen fatigue, technological issues, and limitations in making real-time corrections during PE sessions (3.2.2). However, it should be noted that most participants found the online platform comfortable, easy to use, and enjoyable. Some participants advocated the adoption of hybrid modalities.

### 3.12. Program commitment and continuity

There were two contrasting views on the dedication required for interventions. The majority believed that the program was valuable, because it provided routine and structure to their lives, keeping them active and engaged (3.3.1). This was especially important in the context of stroke recovery and the restrictions imposed by the pandemic, as it served as a compass, offering daily distraction and a sense of usefulness. However, a minority believed that the program's required commitment (i.e., five days a week, lasting between 90 min and 180 min each day) could be challenging to balance with daily responsibilities, leading to fatigue and stress (3.3.2). The weekly 150-min mindfulness session was also considered too long for some participants.

Regarding program duration, most participants thought that it should be extended beyond 12 weeks (3.3.3). They reported that after an intense working period, the program ended abruptly just when they began to experience significant improvements that carried over into their daily lives. To address this issue, it was proposed that the program should focus more on long-term monitoring to ensure that the learned habits and achieved benefits could be maintained.

## 4. Discussion

The present study was a nested qualitative study within the MindFit Project clinical trial,<sup>28</sup> in which chronic stroke patients were randomly allocated to receive MBSR+CCT, PE+CCT, or CCT-only. The primary aim was to investigate the experiences and opinions about the interventions, as well as the perceived intervention-related changes in a subset of participants who completed the program with high adherence. Data were also collected about their journey since the stroke to contextualize the trial findings within the broader context of stroke recovery.

Participants consistently reported satisfaction with their involvement in the study and perceived benefits from the interventions. While some benefits likely stemmed from non-specific factors, such as receiving professional attention, being actively involved in structured and purposive activities, and engaging in social contexts (these aspects will be discussed in more detail later), each intervention appeared to be associated with specific health domains' benefits as described by the participants.

All participants received a common intervention, CCT, which was generally perceived as beneficial, particularly for cognitive enhancement and the development of compensatory strategies. Our findings are consistent with a prior qualitative study<sup>26</sup> and other quantitative research,<sup>20</sup> which also demonstrated the effectiveness of CCT in addressing post-stroke cognitive deficits. Notably, the cognitive improvements observed were similar across participants from different trial arms, making it challenging to isolate any additional benefits attributable to MBSR or PE. Nevertheless, as supported by earlier findings,<sup>17,21,43</sup> we acknowledge the potential for MBSR, PE, or their combination with CCT to enhance post-stroke cognitive functioning. These potential additional gains, which may have been present in our trial, require further quantitative data and appropriate statistical methods to be evidenced.

Beyond cognition, participants who received the combined therapies reported additional enhancements in areas explicitly targeted by the

MBSR or PE interventions. Members of the MBSR+CCT group described increased self-awareness, improved emotional regulation, stress reduction, and a greater appreciation for daily life experiences due to mindfulness. Some participants also noted benefits in pain management, fatigue, and body awareness. These improvements led some patients to say mindfulness helped them accept their new condition and reinterpret life post-stroke. These outcomes align with themes from previous qualitative studies<sup>5,22,23</sup> and the conclusions of systematic reviews of quantitative data,<sup>13,14</sup> reflecting the four mechanisms of mindfulness proposed by Hölzel et al.<sup>44</sup>: attention regulation, body awareness, emotion regulation, and changes in self-perspective. Meanwhile, participants in the PE+CCT group appreciated the positive impact of exercise on fitness and autonomy, which facilitated engagement in other activities and gains in vitality. These findings corroborate those from a recent systematic review of PE qualitative studies<sup>25</sup> and other meta-analyses of quantitative data.<sup>16,18,19</sup>

Therefore, this pattern of specific benefits that participants associated with each intervention is generally congruent with what is known from previous quantitative and qualitative stroke research. However, a unique aspect of our study was the integration of the three strategies within a single clinical trial. The sense that combined interventions appeared to offer additional emotional and physical benefits suggests they may outperform the CCT-only strategy. If this hypothesis is confirmed through proper quantitative analysis, the results would indicate the limitations of single-intervention approaches in comprehensively addressing all health dimensions. These findings would reinforce the need for a paradigm shift in stroke rehabilitation, moving from a biomedical model<sup>45</sup> focused mainly on physical restoration to a more holistic, patient-centered approach to stroke care, congruent with the WHO biopsychosocial definition of health.<sup>9</sup>

The format in which interventions were delivered in our study also provided valuable insights. In line with the findings of other studies,<sup>22,23,25,46</sup> the group setting was highly valued for the opportunity to interact, share support with peers, and have a benchmark against which to compare individual progress. Nevertheless, while diversity enriched the group experience, it hindered interaction and prevented some participants from fully benefiting from the program. Therefore, a careful balance is required to foster a supportive environment while ensuring the intervention's efficacy for all involved subjects. Smaller and more homogeneous groups may be required for certain conditions, such as aphasia.<sup>46</sup>

The online delivery format, adopted during the COVID-19 pandemic, was praised despite reduced personal interaction and the challenges of remote supervision. This format effectively addressed geographical and mobility constraints, suggesting that telematic approaches could significantly democratize rehabilitation services.<sup>12</sup> Furthermore, online formats could increase psychological and social safety owing to the reduction of body exposure, as proposed by Haynes et al.<sup>47</sup> Given these possibilities, future research should investigate the preferences, usability, and economic feasibility of implementing such programs on a larger scale and within different clinical domains and settings.<sup>12</sup>

Our five-session per-week intervention protocol was generally well-received because it provided a regular and focused schedule. This favorable reception mirrors previous findings,<sup>24</sup> which highlight the willingness of stroke patients to participate in more frequent and intense training to prevent inactivity and boredom. However, according to our results, the required commitment and the long duration of some sessions (e.g., the 150-min MBSR sessions) may not be suitable for working individuals or those experiencing fatigue, attentional deficits, or stress. Ultimately, these parameters should be tailored to each patient's preferences, abilities, and family and work responsibilities.<sup>48</sup> Future clinical trials must also focus on investigating longer-term interventions. Such interventions are not only more suited to and realistic for the chronic course of stroke,<sup>10</sup> but they are also crucial for preventing new episodes and reducing the likelihood of developing vascular dementia.

Finally, participants also shared their diversity of experiences,

feelings, and coping mechanisms to deal with identity loss, physical limitations, and societal misconceptions after stroke. These findings coincide precisely with multiple systematic reviews of qualitative studies,<sup>1,2</sup> consistently highlighting a stroke's profound and sudden impact on individuals' lives and the unique, multifaceted, and non-linear nature of the recovery process. A significant concern expressed by most participants was the lack of knowledge and uncertainty they faced after hospital discharge. This aligns with existing research indicating substantial gaps in support and rehabilitation, particularly during the chronic phases of recovery.<sup>6–8</sup> Furthermore, survivors expressed the complexity of dealing with the invisible consequences of stroke. These cognitive and emotional issues, despite their profound impact on mortality, morbidity, and functionality,<sup>49,50</sup> remain poorly addressed by health systems and are not generally well understood by society.

#### 4.1. Limitations

Despite the use of a robust and valid methodology, our study is not without its limitations. The eligibility criteria for our clinical trial,<sup>28</sup> which led to the exclusion of participants with severe aphasia, severe cognitive impairment, or physical conditions that prevented exercise, may limit the generalizability of our findings. As a result, our conclusions may only apply to stroke survivors with milder conditions.

The high intervention adherence requirement we used to select participants for this qualitative study raises a significant concern. While focusing on adherent participants is common in previous qualitative studies (e.g., as seen in all articles included in a recent systematic review<sup>25</sup>), this approach only assesses interventions' perceived effectiveness and acceptability among those who completed them. Our results regarding perceived benefits and opinions on the intervention formats could differ and potentially be less optimistic for those with lower adherence. Future research should investigate whether these benefits extend to participants with poorer adherence and explore strategies to improve intervention compliance.

Based on our purposeful sampling maximum variation strategy, we had a sample with a wide age range and varying times since stroke. Our qualitative analyses did not reveal notable differences in narratives about the intervention's benefits across different participant profiles. Additionally, despite the wide range of values in some variables, our sample only had a few cases of young survivors and working individuals. The results might significantly differ with a sample of young, working individuals, as their rehabilitation needs and engagement possibilities might vary. Therefore, further analyses focused on understanding the specific experiences of different subgroups are needed.

Regarding interventions, their combined nature sometimes made it difficult to attribute specific benefits to particular strategies, even though it was possible to draw some general trends. Our results here are based on a rigorous analysis of participants' perceptions, showing the valuable vision that participants had of the interventions. Nonetheless, the objective superiority of MBSR+CCT and PE+CCT over CCT-only can only be proved by other statistical approaches. We hope our quantitative study will clarify whether there are further benefits and if they present a differential pattern among groups.

It is worth noting that our trial was conducted during the COVID-19 pandemic, a period that significantly disrupted rehabilitation programs and increased loneliness for many stroke patients.<sup>51</sup> This context could have led participants to overestimate the intervention's benefits, the importance of group support, and the positive feedback toward the online method we reported in this study. While our results are supported by previous pre-pandemic evidence, it is important to consider the potential effect of the social context in which these experiences occurred.

Finally, we neither took field notes during interviews nor conducted participant verification, which could have made our findings more reliable. Future studies should incorporate these practices to ensure more robust data collection and validation.

## 5. Conclusions

Our research shows the diverse experiences stroke survivors face during their unique recovery journey. Combining physical, cognitive, and emotional interventions, as well as providing opportunities to interact with other survivors, is pivotal to address the complex biopsychosocial needs of stroke patients and enhance their overall quality of life. Moreover, telematic work in these interventions offers an innovative approach to extending their reach and accessibility. Future clinical trials with mixed-methods designs are expected to provide more evidence of the effectiveness of these combined interventions, adding a robust dimension to these qualitative insights.

### CRedit authorship contribution statement

**Adrià Bermudo-Gallaguet:** Writing – original draft, Writing – review & editing, Methodology, Investigation, Formal analysis, Data curation. **Jofre Bielsa-Pascual:** Writing – review & editing, Formal analysis. **Rosa García-Sierra:** Writing – review & editing, Formal analysis. **Maria Feijoo-Cid:** Writing – review & editing, Formal analysis. **Antonia Arreciado Marañon:** Writing – review & editing, Formal analysis. **Mar Ariza:** Writing – review & editing, Methodology, Investigation, Conceptualization. **Daniela Agudelo:** Writing – review & editing, Methodology. **Neus Camins-Vila:** Writing – review & editing, Methodology. **Maria Boldó:** Writing – review & editing, Methodology. **Maria José Durà Mata:** Writing – review & editing, Funding acquisition. **Alberto García-Molina:** Writing – review & editing, Funding acquisition. **Pere Torán-Monserrat:** Writing – review & editing, Funding acquisition. **Maria Mataró:** Writing – review & editing, Project administration, Methodology, Funding acquisition, Conceptualization.

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### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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### Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.ctim.2024.103100](https://doi.org/10.1016/j.ctim.2024.103100).

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