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Virtual Forest Bathing Programming as Experienced by Disabled Adults with Mobility Impairments and/or Low Energy: A Qualitative Study

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Abstract: *Background*: Although access to nature is demonstrated to benefit health and wellbeing, adults with mobility impairments and/or low energy often face barriers in accessing nature environments and nature-based programs. This study aimed to examine the experiences and impacts of virtual forest bathing by capturing the perspectives of disabled adults with mobility impairments and/or low energy. *Methods*: A total of 26 adults with mobility impairments provided written and spoken qualitative feedback during and following virtual forest bathing programs and 23 participants provided feedback at a one month follow-up. Virtual programs were presented online, using an accessible format, 2D videos, and images of nature accompanied by guidance led by a certified forest bathing guide and mindfulness teacher. The programs involved disabled facilitators and participants, which created a social environment of peer support. *Results*: Qualitative thematic analysis revealed 10 themes comprising intervention themes (virtual delivery and soothing facilitation); process themes (nature connection, relaxation, embodiment, and memories with complex emotions); and outcome themes (happiness, agency, metaphor making, and belonging). *Conclusions*: Virtual forest bathing may offer an effective adjunct to improve wellbeing and provide peer support for disabled adults with mobility impairments and/or low energy.

Keywords: accessibility; disability; forest bathing; memory; mindfulness; nature connection; pain relief; peer support; social connection; qualitative

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1. Introduction

Access to and living near nature has multiple health benefits [1–3], including reduced incidence of stroke, hypertension, asthma, and coronary heart disease [4]. However, opportunities to access nature are not equal for all, and for those with mobility impairments access to nature can be limited. In addition to poor physical access to nature, few nature-based programs make provisions for people with mobility impairments and/or low energy. Walking interviews with people with mobility impairments revealed that accessible nature sites were a valued health resource, stimulating positive emotions, while providing experiences of "insider-ness" (i.e., belonging) and community [5]. Similarly, accessible nature-based programs created positive experiences and social interaction opportunities for people with mobility impairments [6]. Conversely, a lack of accessibility to nature sites and seeing other people interact with these sites in ways that those with mobility impairments could not (e.g., people going down a trail which a wheelchair could not navigate) led to feeling excluded and like an "outsider" [5]. Access to nature is therefore an equity issue, requiring accessible washrooms and transit in addition to paved paths [5,7–9]. In addition to physical barriers created by lack of accessibility, those with disabilities often experience reduced income, and it is known that lower income neighbourhoods have fewer nature sites [10].

Large-scale surveys suggest that people with mobility impairments visit nature sites much less frequently than able-bodied people [11]. When it comes to visits to wilderness (e.g., national parks), the ecotourism industry has been highlighted as not making adequate provision for those with disabilities [12,13]. There have been some policy changes that have brought attention to the need for improved accessibility within parks [14–17], and this in turn has led to initiatives involving disabled people challenging ableism by identifying ways to improve accessibility to these green spaces [18].

Forest bathing is a nature-based program comprising a slow mindful nature experience while opening the senses, which can improve people's physical and psychological health [19,20]. Forest bathing is demonstrated to reduce stress [21], anxiety, depression [22], social isolation, and rumination [23] and improve blood pressure [24], immune function [25], and cardiovascular health [26]. Nature-based programs are shown to improve quality of life, depression, anxiety, blood pressure, cardiovascular health and inflammation in populations living with chronic health conditions such as pain, Chronic Obstructive Pulmonary Disease (COPD), hypertension, cardiovascular disease, diabetes, post-stroke, and somatic complaints [27]. Many people with these conditions experience low energy.

For those who cannot access onsite nature-based programs such as forest bathing, virtual (online) delivery may offer an alternative or adjunct activity. Indeed, researchers suggest that virtual nature engagement could be used to improve wellbeing and quality of life for those with impaired mobility [28]. Previous studies found that access to virtual nature, such as photos, videos, nature sounds, and virtual reality can reduce stress [29]; be a positive distraction from pain [30]; increase positive affect and physiological arousal (skin conductance); be restorative [31,32]; increase feelings of relaxation and adventurousness [33]; improve cardiovascular health (heart rate variability) and relaxation [34,35]; and increase altered states of consciousness and energy [36]. Immersive nature videos [37] and virtual reality [38] were reported to evoke emotional responses and wellbeing benefits comparable to onsite nature experiences. Some studies directly compared virtual and onsite forest bathing and found improvements in positive affect and wellbeing [39,40] across both delivery formats (although effect sizes were greater for onsite forest bathing). Whilst previous literature features evaluations of onsite and virtual nature, these should not be an either–or option for those with mobility impairments who want to have the choice to access nature onsite or virtually. It is important to understand how people with disabilities may experience virtual forest bathing that incorporates possible direct contact with nature. These insights may be useful in understanding how to make virtual programs, and possibly onsite programs, more accessible and inclusive.

Different approaches to virtual delivery methods may suit specific populations. Beyond virtually sharing nature through videos, photos, and virtual reality, simply viewing nature from a window can improve blood pressure, cardiovascular activity, muscle tension, and brain electrical activity [41], and reduce hospital length-of-stay and pharmaceutical use [42,43]. Bringing nature indoors with houseplants also offers health and wellbeing benefits. For example, viewing a bonsai tree houseplant altered brain activity, improved cardiovascular health, increased positive feelings, and reduced anxiety and depression in people with spinal cord injury [44] and in elderly patients undergoing rehabilitation [45]. Of note, participant feedback in a feasibility study of virtual nature exposure for older adults [33] suggested that virtual nature needed to be more immersive (rather than simply visual), offer better image quality and increase the narrative or guidance of the video content to improve the experience. Forest bathing programs are typically guided and the guide offers mindful facilitation to prompt participants to notice their surroundings using their senses. A meta-analysis found that mindfulness and nature connection were highly correlated, with mindfulness facilitating nature connection and vice versa [46]. Research suggests that mindfulness as an adjunct treatment can facilitate embodiment, resilience, and coping with pain in those with chronic health conditions [47]. Combining forest bathing with mindfulness has been shown to be particularly helpful for at-risk populations during the pandemic [48].

During the pandemic when physical access to nature was limited, those with disabilities were disproportionately affected. For example, an online survey on the effects of COVID-19 on people with disabilities and chronic health conditions revealed that fears of contracting COVID-19 and negative financial effects were associated with increased anxiety, stress, despair, and loneliness and decreased feelings of belonging [49]. Research during the pandemic found that access to virtual nature offered some relief from these stresses and was found to reduce anxiety [50] and improve feelings of community [51], whilst window views of nature increased self-esteem, life satisfaction, and happiness and decreased depression, anxiety, and loneliness [52]. In a review of virtual and onsite nature during the pandemic, research found that access to outdoor (parks), indoor (houseplants, views), and virtual (videos of forests) nature were significantly related to wellbeing, with access to onsite nature having the strongest effect [53]. A recent waitlist-controlled pilot study assessed virtual forest bathing for adults with mobility impairments and low energy resulting from long COVID and found that online 2D forest bathing with guided mindfulness was feasible for this population and reduced tension (POMs), rumination, social isolation, and symptom severity [23]. For context, the current study took place during the COVID-19 pandemic when access to nature was especially limited. The experts by experience who were consulted for this study informed us that access to nature was even more limited for people with disabilities due to fears of infection associated with using crowded public transport and unavoidable close interactions with the public who were not properly using Personal Protective Equipment (PPE).

To date there have been few studies exploring the experiences of people with mobility impairments and/or low energy when engaging in onsite nature-based programs [6] or virtual nature-based programs [23]. In addition, limited studies obtain qualitative feedback from participants with mobility impairments concerning efforts to make nature experiences more accessible. This unique study explores what disabled adults with mobility impairments and/or low energy experience in terms of feelings of inclusion and the program's impact on wellbeing. Very few studies provide qualitative data at longer follow-up durations after a nature-based program. The design of the current study enabled us to understand impacts such as the long-term adoption of nature mindfulness practices introduced during a forest bathing program. This paper, therefore, addresses these research gaps by providing a qualitative evaluation during post-intervention and at one month follow-up to a virtual (online) forest bathing program for those with mobility impairments and/or low energy. The paper also offers a unique evaluation of a program delivered by disabled facilitators who have lived experience with impairments associated with chronic illness, injury, and/or aging-related impairment.

Previous research has shown that a range of virtual delivery options can be beneficial and suit different populations [53]. The current study offers a range of virtual delivery options for participants, such as engaging with nature in their own garden, balcony, or park, viewing nature from their window, interacting with houseplants and natural items, and/or viewing 2D videos and photos provided by the guide. In addition, previous research highlighted that virtual nature needed to offer improved image quality and increased narrative video content to improve the experience [33]. The current study not only utilizes high-quality video and photographs from a particular forest preserve accompanied by natural sounds (e.g., bird song, running water), but also strongly features guided mindfulness to create an immersive and embodied sensory experience.

2. Materials and Methods

2.1. Design

The evaluation used a qualitative design that incorporated input from experts by experience to ensure full participation in the study. For example, accessible methods for collecting survey data were designed, offered, and used. Transcripts of two 2.5 h programs were obtained that included comments from participants as they shared their direct experience in the moment, verbally or in writing using the chat feature of Zoom.

Survey data in spoken or written form (according to the preference of the participant to support their full engagement) was also gathered from 26 participants within 24 h of their engagement in one or two virtual forest bathing programs. One month after the program, 23 participants completed another survey. Finally, a theme checking process was used, involving 9 disabled participants who chose to engage after all participants were invited. This review of central themes led to a refinement of the analysis reflecting a better understanding of their importance, context, and relationship to one another.

2.2. Participants

Individuals living with mobility impairment and/or low energy primarily in Western Canada were invited to engage in a virtual forest bathing program. Given that low energy is a form of mobility impairment, our use of the phrase "people with mobility impairments" in this paper will be inclusive of those living with low energy. Each disabled participant had a unique embodied experience of navigating the world, for example, a few may also live with brain injury, cognitive, sensory, or communication-related impairments. Initially, 49 adults, most of whom self-identified as living with mobility impairments and/or low energy, registered for a program and were approached with an invitation to also take part in the qualitative evaluation. Ethical approval for the evaluation was provided by the College of Health, Psychology and Social Care, University of Derby. Investigations were carried out following the rules of the Declaration of Helsinki of 1975. Consultation on how to adapt data collection procedures to include people with disabilities in research was implemented [54]. Of the 31 participants who consented, 26 provided qualitative data during and within 24 h following virtual forest bathing, whilst 23 participants provided data at a one month follow-up. Of the 26 participants who provided qualitative data, 19 identified as female and cis, 6 as male and cis, and 1 female and trans. In terms of ethnicity, 23 identified as White, 1 East Asian, 1 mixed ethnicity, and 1 preferred not to say. Participants were aged 24–80 years old(M = 57.04, SD = 13.79 years).

Most participants live with significant physical impairments, such as spinal cord injury, cerebral palsy, or multiple sclerosis, requiring assistance from personal support workers for daily living activities (e.g., dressing, eating, and bathing). Participants reported having the following access needs: 21 used wheelchairs; 1 used a walker; and 4 did not use a wheelchair or walker but lived with chronic illness or aging, resulting in low energy. Of the 4 who did not use mobility aids, 3 were required to lie down during the program to manage low energy and/or pain.

2.3. Procedure

The sample was opportunistic because participants had already registered to attend virtual forest bathing programs designed to be accessible for adults with mobility impairments; indeed 56% had already attended a previous program. Potential participants were approached by one of three community partner organisations, two of which were disability organisations in British Columbia, who invited them to take part in the program and, if they wished, also the study. If they showed an interest, a researcher shared the information sheet and consent form via email and verbally. Spoken qualitative data was collected by transcribing verbal and chat contributions generated during two 2.5 h virtual forest bathing programs offered over Zoom. Information about the program experience was also gathered through a survey conducted within 24 h of attending a program and at a one month follow-up. Participants who consented had the option to provide descriptive information of their experience using a modified, more accessible method, and most chose this alternative. They were assisted by a volunteer who transcribed their spoken answers to the survey questions, allowing them afterwards to review and confirm the accuracy of the text. The questions asked were: (1) If the session(s) had an impact on your wellbeing, then please describe how. For example, this impact might be social, emotional, spiritual or physical. (2) Please describe your experience of this program as someone with low energy or a mobility impairment. (3) Did you learn ways to engage in nature-connection as a

person living with low energy and/or a mobility impairment? (4) Did you feel welcomed and included? (5) Were your access needs met? (6) What stood out most about the nature-connection program? (7) Is there anything else you'd like to tell us about your experience of the nature-connection program?

Two researchers (the first and fourth author) independently thematically coded the written qualitative comments collected through surveys. Two researchers (the first and second author) independently coded the data transcribed from participant's spoken and chat contributions made during two programs on Zoom. Nine participants engaged in a thematic review process to refine themes and help researchers understand their significance in the context of their lives and the relationships between themes. This was recorded and transcribed. Four researchers (the first, second, third, and fifth authors) were involved in combining the thematic analysis of the three sets of data to create a single conceptual framework of themes in relationship, which was collaboratively refined through nine iterations.

2.4. Peer Support Intervention

Accessible virtual forest bathing programs were offered online in Zoom to a group of 30–40 participants and involved 2D videos and images of nature, primarily from the EcoWisdom Forest Preserve. Each program was led by five EcoWisdom co-facilitators, most of whom live with mobility impairments and experience disabling barriers. The lead facilitator is a disabled certified nature and forest therapy guide, and mindfulness meditation teacher, who formerly worked as a Disability Studies professor. EcoWisdom offers mindful nature connection programs and nature guide training opportunities that are accessible to people living with disability, chronic illness and pain or fatigue associated with aging. A technician assisted participants who needed support with adaptive technologies. To ensure inclusion and comfort, participants were provided with one 10 min break; however, people who required longer were invited to take 20 min during each 2.5 h online program. Participants were also encouraged to take breaks, turn their camera off, or lie down to ensure their continued involvement.

Most of the facilitation team members have lived experience of disability and modelled peer support through their collaborative guiding and delivery of the program. Just as each participant was encouraged to discern the ways in which they would engage in the program, each facilitator also found unique ways to lead, e.g. modeling an adaptive mindful movement without speech. Peer support was a central part of program delivery, and research with spinal cord injured people indicated that interactions with peers who share their lived experience of disability and resilience in the face of challenges led to increased social connection and integration into community [55]. The program highlighted the importance of self-care and community capacity building within the contexts of peer support and engagement in environmental conservation efforts. Disabled participants were considered competent and valued members of the community worthy of compassion. Prior to the program, participants were provided with a tip sheet describing how to prepare for those virtual forest bathing experiences by: collecting and bringing houseplants, herbs, shells, stones; opening a window; or planning to move outside briefly to a balcony or backyard garden. The tip sheet included information describing the qualities of mindful, non-judgemental, and contemplative communication (listening carefully with curiosity and acceptance) that participants would agree to use during the program.

Virtual forest bathing took place on Zoom and began with a land acknowledgment, expressing gratitude to the Indigenous Peoples for their historical and ongoing caretaking of the land. Importantly, whilst participants were connecting with their own land (i.e., around their homes), the lead facilitator used videos and photos from the nature preserve where she lives. She also shared stories about her land to model and create a sense of place attachment. Place attachment is an emotional bond between people and places, which can be a powerful motivator to spend more time outdoors, engaging with community and pro-environmental behaviours [56,57].

Participants were invited to introduce themselves by providing their first name, geographic region, and a description of the ways they were connecting to nature at that moment (e.g., listening to the sound of wind in trees through an open window). An overview of the program, as well as an explanation of contemplative communication and forest bathing was provided. Embodiment exercises were led with a range of options to accommodate people with limited mobility, e.g., coordinating upper body movement or eye movement with breath, or using mindful visualisation. Participants were encouraged to adapt the program to suit themselves and were offered four options for participating: (a) watch the nature video online (40%) (b) watch the video while also connecting to nature items such as houseplants (30%) (c) connecting to nature items inside or out a window (15%) or (d) going outside into a backyard or onto a balcony (15%).

Programs included three nature connection invitations. The first involved slowing down, opening the senses, and practising a soft gaze. The second was a nature-based guided meditation involving connecting to the atmosphere and qualities of, for example, a beach or mountain. The third invitation supported a deeper connection with nature through, for example, an offering and receiving of *metta* (loving kindness) to and from a tree. The nature videos, drawing upon research on sensory engagement with nature [58], included images and short video clips from the EcoWisdom Forest Preserve incorporating the colours blue and green, fractal patterns, and sounds of water, wind, and birds. They also drew upon neuroscience by including video/images of hands on bark or feet in moss to elicit the activation of mirror neurons in participants. Figure 1 provides examples of 2D hand on tree images and of 2D video of feet in flowing water used during the program to facilitate mirroring. Activation of mirror neurons occurs when a person observes someone else engaging in a movement (e.g., stroking moss), and the same sets of neurons are activated in the brain of the observer [59]. This was done consciously to support the engagement of people who may experience significant mobility impairments or paralysis.

Figure 1. 2D photograph and 2D video still image used during the program.

Non-judgemental contemplative communication was used by the facilitators and by participants after each of the three nature connection invitations. Participants were invited to describe their experience verbally or write in the chat box. Facilitators emphasised being fully present in the moment to witness and honor each person's unique direct experience as described without attempting to fix or analyse the person who was sharing. This was especially important given the frequency of medical and therapeutic interventions in the lives of participants, such as those associated with dexterity, stamina, or speech.

Whilst this study focused on virtual delivery, EcoWisdom also teaches techniques that can be taken out into green spaces, improving mindful access to the health benefits of nature.

3. Results

The themes derived were combined from three sources of qualitative data: (a) Survey data collected within 24 h of the program and at a one month follow-up. (b) 2 program transcripts including chat contributions. (c) A theme checking session involving participants. These data generated three categories of themes related to intervention, process, and outcomes. Following theme checking by participants, 10 themes were confirmed, and 3 themes were given greater weight: feeling part of an inclusive community; soothing and skillful facilitation; and mirroring. The 2 themes of embodiment and agency, which had been combined, were separated again. The themes of complex emotions and memories were combined.

Figure 2 outlines a conceptual framework of the 10 themes starting with Intervention-related themes: virtual delivery, visualization and mirroring; and soothing and skillful facilitation. This was followed by process themes: nature connection with open senses and fresh eyes; mindful and calm relaxation; embodiment and pain relief; and memories with complex emotions. Finally, the outcome themes were: happy, hopeful, and inspired; agency and coping; metaphor making and new perspectives; and belonging to community and Earth.

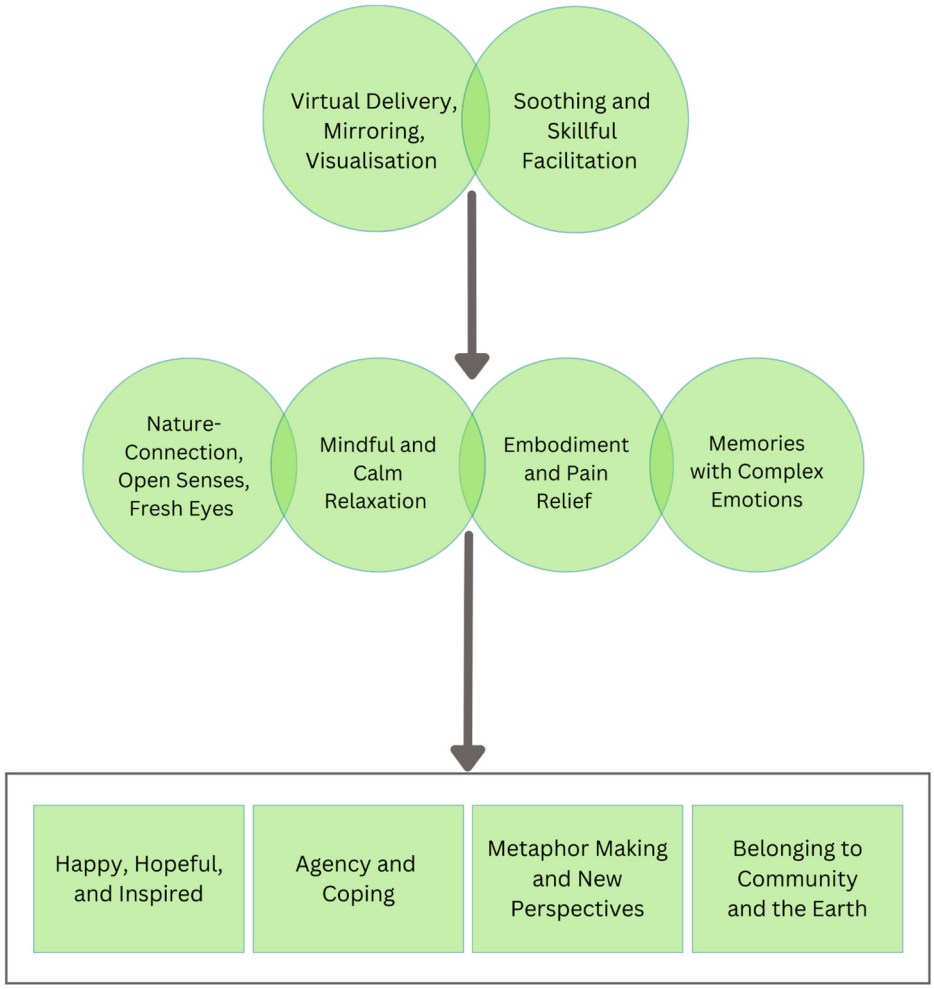

Figure 2. Virtual Forest Bathing for People with Mobility Impairment: Intervention, Process and Outcome Themes.

3.1. Virtual Delivery, Visualisation and Mirroring

Many participants commented on the effectiveness and 'realness' of the sensory experience during the virtual forest bathing program. One participant stated: *"I was*

really surprised by how effective it can be online". Another said: "*It feels real . . . In a way I am kinda using senses that I might not have used when I was able-bodied to get a similar or maybe even fuller experience*". Virtual delivery was emphasised as important for people with mobility impairments, especially in the context of the pandemic: "*Having it online is important. Everybody sometimes can't go out*". The use of high-quality photos and videos which included the sounds of water, wind, and birds were identified as an important part of the immersive virtual experience: "*The photographs are exceptional and very important for those who cannot get out into nature*"and "*I loved the water sound and breeze*".

Visualisation and mindfulness assisted participants in feeling as if they were immersed in a real natural setting: "*You can lay on the bed, and you don't have to get to the river or the forest. You can imagine it and picture it in your mind, which is really powerful*". Another explained that they learned: "*That we can use our mind to be able to feel like you are actually by the water*".

The activation of mirror neurons to elicit sensory experiences of nature connection was a key aspect of the programs and was identified during participant theme checking as central to their experience. The videos and photos included images, such as those of the facilitator's hand on bark, feet in flowing water, and fingers moving through moss, which aimed to stimulate participants' mirror neurons, and this appeared to be effective, with participants commenting: "*When you put your hand on the moss, I could feel... what you were feeling*". Activating paired sensory experiences also occurred with the activation of mirror neurons as reflected by one participant who explained: "*When you have a handful of berries in the video, I could almost feel the texture of the berries*".

The significance of activating mirror neurons in those who are mobility impaired was reflected in comments such as: "*We could hear and see the water and we could see her feet [in the flowing water]. That's probably the closest I am going to get*". One participant emphasised: "*We can have that gift through mirroring . . . It is such a huge gift. It's so important to some of us. I used to love hiking and skiing in the outdoors and . . . I thought that was not available to me, then it has truly become available through this, it's amazing*!"

3.2. Soothing and Skillful Facilitation

The compassionate and respectful approach of the facilitator and their skill in actively listening was commented upon. One participant stated: "*I think she really is the catalyst and her kindness and compassion and understanding . . . when they made a comment, she really knows how to listen—that's very important. She makes one feel valued—that what you have to say is very important*". Another commented: "*I think the connection that people had with the facilitator is what stood out . . . you had the feeling that she had a really profound impact on their lives*".

In an effort to create a sense of place, and to model place attachment, the lead facilitator offers the program from a forest in which she lives off-grid with wild roaming moose and wolves. Participants talked about feeling connected to the facilitator and her forest, as if they were spending time in this forest themselves: "*and the facilitator, through her meditation, will take me through a walk in her forest, and I can be there with her*". Participants described how their experience of social connection to the facilitator and one another could extend beyond the program time frame: "*Next time I'm in nature, you'll be with me*".

During theme checking, participants commented that people with disabilities are often approached as 'broken' and in need of 'fixing' by a 'specialist'. The context of peer support created by most of the facilitation team having lived experience of disability/chronic illness led to the creation of a social space where participants could express complex emotions without the fear or expectation that someone else would immediately need to fix them. One participant described her experience: "*I have certainly wept in this program . . . the facilitator acknowledged that it was happening, that we were together, and that it was OK to bring it to the group. And I didn't feel people running to me to try to get rid of it. And from that I learned that I also didn't need to chase that away—I could hold it. It was a massive, massive change in me to say that it's OK to have that feeling*". This quote illustrates the profound impact that a peer support context can have for disabled people with mobility impairments participating in virtual forest bathing programs.

3.3. Nature Connection with Open Senses and Fresh Eyes

Participants described how they were guided to engage with nature in unique ways, using all their senses to foster an appreciation of subtle details and to see things with fresh eyes: "*I've been out in nature a lot . . . but when you really slow down and look . . . I walked by many things like that, but I didn't really see*". When describing how they noticed novel details in nature which they might have previously missed, participants used words such as wonder, awe, and beauty, e.g.: "*Seeing things I didn't see before—more of an element of wonder*". The program's focus on noticing novel details was used by some participants to calm down and cope with stressors: "*I noticed webs covered with raindrops . . . it was brilliant . . . crystals . . . like jewels on strings. It was absolutely fabulous. I think through this program I have been able to stop and look at things more carefully [which] has been very important in my life. I need that calmness in order to carry on some days*".

Participants mentioned how a focus on the senses enabled them to enjoy the sensation of wind on their skin from their garden or an open window and the sensations from touching garden or house plants: "*Touching plants, using more of my senses in nature*". Some noticed the smell of the earth after rain or watering the garden, and several participants appreciated listening to nature sounds: "*I liked listening to the sounds, whether it's birds or water – calming sound and feeling*".

3.4. Mindful and Calm Relaxation

Many participants reported feeling calm, relaxed, tranquil, and peaceful during and after the program: "*I felt very relaxed throughout—it was almost hypnotic. I may have even drifted off*". A state of calm and relaxation was exemplified by four participants who reported improved sleep after the program: "*I felt calm, relaxed. Had a great sleep after*". Another participant found a way to continue to embody a state of mindfulness, saying: "*I remained in peace, calm and slowed my breathing down thanks to the meditation*". Some participants mentioned how feeling more relaxed allowed them relief from stress, irritability, and rumination: "*It allowed me to withdraw from all the issues in my life and concentrate on self-care*" and "*For the rest of the day it took my mind off what is going on with me*". Some participants mentioned that videos featuring water were especially calming for them: "*I am always attracted to water. Water is like a magnet to me. I think it's the wave action, it was so calming*".

During theme checking, several participants highlighted the significance of feeling calm in a context of high stress such as during the pandemic and while facing challenges associated with constantly having to advocate for disability-related support. As articulated by one disability advocate: "*So many people with disabilities spend so much time advocating for themselves... to be able to stop doing all of that to focus on oneself... [to] get out of the rut of my life—the pain I am dealing with physically, the constant struggles*". Within this context, they stressed the importance of having the program available: "*The chance to feel calm in a very stressful situation was so, so important*".

3.5. Embodiment and Pain Relief

Originally this theme was included under the Mindful and Calm Relaxation theme, however, during theme checking, participants urged the researchers to consider this a stand-alone theme given its importance within the context of their lives. Participants explained that feeling detached from one's own body can be a common experience among people living with chronic pain and/or impairment. Becoming open to feeling bodily sensations and feeling fully embodied can be challenging. Participants also spoke about how specialists that support people with disabilities often compartmentalise the body into parts or functions, leading them away from an integrated perspective of the body. For example, they explained that you may see one specialist for breathing issues and another to assess seating for your mobility device. They described the virtual forest bathing program, in contrast, as offering a holistic approach to wellbeing, where awareness could be brought to both physical sensations and emotions alongside sensing what in nature is soothing or comforting. As one participant explained: "*Quite often when you are disabled, you kind of*

submerge your senses. Say you have chronic pain all the time, you are feeling pain so the only way to get through sometimes is to submerge it, to push it down, not to open up to it, and explore it, and look at it, and analyse it . . . So it's a brand-new experience to really open up to everything and be truly present and accepting of whatever is going on". Becoming aware of what exists without judgement or reaction indicates that participants also assimilated the mindfulness aspect of the program.

Nature connection supported participants in connecting to their bodies in positive ways that fostered body awareness. One participant explained: "*My whole body felt wonderful watching the bees in my garden*". A few participants commented on how feeling more relaxed allowed them to feel more in-tune with their bodies and to experience relief from tension and pain: "*I get chronic tension in my limbs . . . I just tried to relax in the tension rather than resist it which was very helpful*". During each program, participants affirmed that being able to relax reduced their pain levels: "*When I started, I was feeling really tense, I had pain in my knee . . . but the program was just so soothing and relaxing*" and "*I noticed less pain than when we began*". Following a guided meditation that incorporated visualising lying on warm sand, one participant said: "*The beach meditation was particularly helpful for my back, which . . . I felt a lot of tension in . . . I didn't think it was possible to feel better today*".

3.6. Memories with Complex Emotions

For some participants, recalling memories and/or processing challenging emotions played a significant role in their program experience. Many participants reported, for example, that the program triggered positive memories of earlier experiences in nature and fostered a sense of gratitude for these experiences: "*I'm so grateful for my memories of wonder. Being in the bush looking down at my feet in moss with all kinds of miniature life forms, looking up at towering trees replicating one another under the great blue, with me there in-between*".

At theme checking, participants indicated that there was an overlap between triggering past memories of being in nature and experiencing a complex of mixed emotions, such as experiencing feelings of gratitude for previous experiences in nature and the current shared experience of nature connection within a supportive community, whilst simultaneously recognizing feelings of grief from the loss of some opportunities to access nature since acquiring a physical mobility impairment and/or severe fatigue. One participant explained: "*This program was a reminder of all the beautiful moments I've experienced in my life. It made me grieve what I can't do anymore, but made me grieve in a good way, and made me think of ways I can still enjoy nature*". Another participant commented: "*It took me through a variety of emotions . . . there was some grief and loss in seeing some things that I hadn't seen in a while that I physically wouldn't be able to get back into again but it also made me think about the sacredness of life*". Another participant described how the facilitation team's lived experience of disability and their gentle and considerate approach supported them in being able to hold memories and the resulting complex emotions: "*People who have gone through spinal cord injuries, where they were able to do those physical activities before . . . but then to be able to experience it again and remember those positive feelings [from] before. But you have to remember that most of the people also go through periods of anger that they can't actually do those things anymore. So to be able to do it [facilitation] in such a delicate way that allows somebody to feel 'yes, I can't do it anymore but I can still be there [in nature using my mind within community] . . . is very strong actually*".

3.7. Happy, Hopeful, and Inspired

Several participants reported feeling high arousal positive emotions, such as feeling happier, uplifted, and inspired: "*Before I got on, I was anxious about different things, but after I was feeling much calmer and happier*". Another stated: "*The session felt uplifted and encouraged*". Peer support and contemplative communication led to some participants feeling motivated and inspired: "*The enthusiasm of others is motivational!*" and "*It was just really inspiring to hear how other people were also benefiting*". Some participants described feeling motivated to connect more with nature: "*I will use all the senses to further engage with nature*". Another stated: "*I don't sit on my balcony enough and I think I will*". Others felt motivated to care for

themselves:: "*It directed me to spend more time on self-care*". Ultimately, participants were inspired by one another and the program to continue deepening their connection to the natural world: "*The program encouraged me to continue on my nature journey*" and "*I will try to incorporate nature in my life*".

3.8. Agency and Coping

During the forest bathing program, participants were consistently provided information and demonstrations related to ways each activity could be modified, with an emphasis on each participant choosing for themselves how to participate. These adaptations were provided to accommodate disability, fatigue, pain and/or trauma histories, ensuring each person's comfort and full participation. Participants found their own ways to meaningfully connect with nature. Being given choice was an important program design feature incorporated to foster a sense of agency in the participants. One person living with chronic illness explained the significance of this approach in terms of providing choice about how to engage: "*I have full body range to do the activity being suggested but there's always alternatives . . . we are encouraged to try . . . different alternatives for instance just moving your eyes . . . putting those alternative methods in the context of 'that's just one way' . . . it normalises and equalises everything*". Another example of being able to feel a sense of agency in relation to how a participant could adapt the program to suit their needs was reflected: "*The second time watching the video, I turned the volume down so I could hear the dog breathing and birds singing in my backyard*". One participant appreciated being able to take techniques they learned in the program to support self-care into everyday living: "*Much of what we talk about is . . . how to utilise our own strengths, ways to really care for ourselves in such a powerful way . . . we can reutilize these [mindful nature connection] strategies*". The strengths of adaptation and resilience are not unfamiliar qualities among people with disabilities, as one participant articulated: "*People assume that disabled people aren't resilient. And I think that in some cases we are more resilient than the more able-bodied people . . . we have no other choice but to adapt*".

Significantly, after one month, most participants described using and benefiting from the program's mindful nature connection practices. They consider them to be a helpful resource and a part of their toolbox to cope with everyday stress levels: "*I've gone back to the [nature] video a couple of times and watched it when I was feeling stressed—it gave me a really good resource that was helpful*". Participants also described how they used the practices to cope effectively with specific high-stress events, such as illness, hospital stays, and falls: "*I'm so glad I had that experience because it has helped me cope with many difficult situations that have arisen in my life*". Another explained: "*I was hospitalised with COVID and I was able to do the meditations several times. It was a high anxiety process [and situation] so it helped alleviate that and reduce my stress*".

3.9. Metaphor Making and New Perspectives

Participants derived many metaphors which arose from mindful nature connection. One participant described the meaning she derived from the program experience, reflecting upon diversity and self-acceptance: "*I was looking at lots of trees and there was one tiny tree . . . . and I thought,* "You're little but you're just as important" *here you are . . . with all the rest and that's completely fine . . . I don't have to be a big tree, I can be a little tree—I have a place too*". Sometimes the metaphors generated were instructive, for example, a participant described finding meaning and support through guided meditation: "*In the meditation . . . when you asked what the wind could offer the expression 'This too shall pass' came to me and I thought, it's not just that it will pass but I can help it to pass. I can let it go and use the wind to help me*". This illustrates that some participants were able to combine learned techniques associated with forest bathing, mindfulness, and visualisation with a sense of agency to find pathways to nurture their own wellbeing.

One participant who is a disabled photographer described how she gained new perspectives from the program which changed her creative approach: "*I am a photographer and I kinda get a stress... [when] I'm trying to capture something . . . I am only learning now that I*

can enter into the space in a different way and it has really relieved me of that craving to capture or consume . . . I've learned how to feel that in my body and it changed completely that frustration I have had". Participants spoke about the new perspectives gained from sharing the program experience with others. One participant explained how the program brought light to the circumstances of some people that would otherwise go unnoticed: "*I think that running the program with a community of people is a good idea. People bring their different experiences to light that otherwise might not be seen*". Being seen is particularly relevant among members of society who experience social isolation.

3.10. Belonging to Community and Earth

Participants repeatedly spoke about feelings of connectedness, a deep sense of belonging to community and the earth: "*I like being a part of the large group . . . it's sort of comforting, and it really does actually add to the sense of community*". When asked what they recalled most vividly about their program experience, one person described a: "*Grounding sense of social connection . . . sense of community*". Similarly, another person stated: "*The people—I remember the people with great fondness*".

Most of the facilitators and participants identify as disabled or chronically ill, and this offered a sense of common humanity and belonging for some participants. Involving facilitators with lived experience of disability supported the creation of an inclusive community: "*People with visible significant disabilities often feel like we stand out in a crowd. The facilitator helped everyone to feel free of judgement, common perceptions, and assumptions [about disability]. Regardless of religion and other beliefs, everyone and everything felt welcome*". Many participants described a sense of inclusion and acceptance, as one stated: "*I felt very included . . . I feel I can be fully myself because the community is so accepting*". Hence being able to be absolutely oneself and to feel a sense of belonging with ongoing access to a community resulted in feelings of gratitude from participants. Peer support was therefore an important factor in creating an atmosphere for non-judgmentally exploring alternative and accessible ways to connect to nature: " . . . *to be with a group of peers that understand . . . and who all together are experiencing, maybe for the first time, how you can imagine being in the forest and imagine being part of nature—even though you are using technology to do it*". Social isolation related to mobility impairments, chronic illness, and the pandemic was referenced. A participant described connection to community within a general context of social isolation in this way: "*I just felt more connected with people. I'm always alone, I'm pretty much isolated*". This highlights the need for programs that foster social connection among people who share similar challenges, and interests.

Observing benefits in others was described as helping to build empathy and a sense of community. For example, one participant said upon arrival that she had just come from her mother's funeral and was relieved to be attending the program because she found it supportive. Another stated: "*That people who take the program say they want to come back and often they do. I can see it's helping people and it is building community*".

The program not only facilitated a sense of community building but also a sense of belonging to the natural world and Earth: "*By showing so many images of nature, I just felt very connected with all of nature and all things on earth and all of you*". For example, one person spoke about connecting to the perspective of trees: "*I was still able to connect and exchange energy with the trees outside and feel how much they love and welcome the rain*". The practices, especially those involving mirroring, mindfulness, and visualisation appeared to facilitate a sense of connection to the earth and one another. One wheelchair user stated: "*I can no longer get on the moss that way but nonetheless I'm taking you with me re-living the richness of being still and feeling the soft, green microcosm within the macrocosm of the trees, skies, and beyond*". The sense of being connected to something larger than oneself was described: "*Watching that little trickle, I just imagined it connected to the oceans . . . I love the tiny things but imagining them with the whole . . . now that I'm saying it out loud, [I see] I'm part of the whole*".

4. Discussion

This qualitative study aimed to understand the experiences of adults with impaired mobility and/or low energy as they engaged in virtual forest bathing. Perspectives and reflections were obtained within 24 h of the program to capture immediate impacts and impressions. A rare one month follow-up documented longer-term outcomes and reflections. Spoken and written survey data were thematically analysed and then checked with participants, resulting in 10 themes. Themes can be conceptualised as intervention themes: virtual delivery, visualization and mirroring; and soothing and skillful facilitation. According to the conceptual framework, this is followed by process themes: nature connection with open senses and fresh eyes; mindful and calm relaxation; embodiment and pain relief and memories with complex emotions. This is followed by outcome themes: happy, hopeful, and inspired; agency and coping; metaphor making and new perspectives; and belonging to community and earth. These themes were present within 24 h after participating in one or two virtual forest bathing programs and the majority of participants reported ongoing use of the techniques they were introduced to in the program at a one month follow-up.

In terms of intervention themes, participants reported that the virtual delivery was very effective and felt like being in real nature. Participants noted the high quality of the images and videos; the skillful guided mindfulness encouraging embodiment visualisation and imagination resulted in the perception of being in a sensory-rich natural setting. The comments gathered were consistent with those found in previous literature, where during feasibility testing of virtual reality nature experiences, feedback from older adults suggested that virtual nature needed to be more immersive (rather than simply visual), with better image quality and increased narrative video content to improve the experience [33]. Many participants in the current study also felt that the unique inclusion of mirroring adopted by the guide to stimulate mirror neurons (e.g., photos and videos of the guide's hands touching tree bark and moss) led to the sensation of being able to feel what the guide was feeling and to feel present with the guide in the forest. To our knowledge, mirroring has not been employed in a virtual forest bathing program previously, so this finding is unique and could be valuable to replicate in future evaluations of virtual forest bathing.

Participants felt that the virtual delivery was particularly valuable during the pandemic when physical access to nature was challenging due to fears of infection. Participants stated that the opportunity to feel calm during such high-stress circumstances was rare and extremely beneficial. The value of such virtual experiences during the pandemic was noted in previous quantitative research also taking place during the pandemic, which found that accessing virtual nature via houseplants, views, and videos of forests resulted in a range of wellbeing benefits [53]. Consistent with the current study, a virtual forest bathing study conducted during the pandemic with adults experiencing mobility impairments and low energy through long COVID found reduced tension (POMs), rumination, social isolation, and symptom severity [23]. Additionally, this is consistent with research which found that forest bathing in combination with mindfulness can be especially helpful for vulnerable populations within the context of the pandemic [48].

Participants also reported feeling that the soothing and skillful facilitation of the guide was crucial to the effectiveness of the program and led to a feeling of connection to the guide and the forest in which she lives. Participants commented on the guide's personal qualities of compassion, respect, and a genuine interest in what participants had to say. The guide and co-facilitators' lived experience with disability or chronic illness created a social context of peer support where people could feel free to express emotions without someone trying to fix them. The program emphasis on peer support and being guided by those with disability experience may have made it possible to be exposed to images of inaccessible spaces in nature without the sense of exclusion noted in previous studies [5]. Participants felt it would not have been the same experience without the compassionate qualities of the guide and the shared lived experience of disability. The comments about feeling connected to the guide and the sense of peer support are consistent with previous research which

found that people with spinal cord injury indicated that interactions with those who shared their lived experience of disability led to feelings of social connection and community [55].

In terms of process themes, participants commented on experiencing nature connection with open senses and fresh eyes, noticing things they would not previously have seen or appreciated and experiencing a sense of novelty, awe, and wonder. The experience of high-arousal positive emotions such as awe is consistent with previous research where engagement with virtual nature led to increased positive affect and physiological arousal (skin conductance) [31,39]; increased feelings of adventurousness [33]; and qualitative comments of feeling joy and appreciation [23].

Another process theme was feeling that the program facilitated feeling mindful, calm, and relaxed, which was believed to be especially valuable in the context of the pandemic. Photos and videos featuring water were reported to be especially calming. These comments about sessions resulting in relaxation and calm are consistent with previous studies where engagement with virtual nature was employed [23,33,34].

Participants commented on how the program facilitated the process of embodiment and feeling more connected to their bodies. This was reported by some participants as a unique experience because usually they are coping with chronic pain and hence tend to suppress their body sensations. They spoke of feeling an acceptance for how things were and experienced pain relief during the program. This embodiment and pain relief is consistent with previous research which found that virtual [23] and onsite [60] forest bathing and mindfulness practices [47] provided distraction or help with coping with pain. The comments about the program offering a holistic approach to wellbeing can be understood within the context of how medical specialists tend to look at only a particular part of the body. Additionally, some therapies focus on improving "functioning" by changing the body. This approach is rejected in the EcoWisdom forest bathing program model being studied, where participants are invited to choose how to participate and the facilitators focus on creating an environment conducive to inclusion and engagement. This is consistent with and moves beyond a social model of disability [61]. The social model of disability highlights the social, economic and political environmental factors that create disabling barriers. However, the social model has historically discounted the significance of embodied experience [62] and the importance of emotion in the experience of living with disability, [63]. Indeed, participants described the virtual forest bathing program as offering an holistic approach to wellbeing where awareness could be brought to physical sensations and emotions while also referencing the context of disabling barriers.

During theme checking, participants reported that an especially salient theme for them was that the program activities triggered fond memories of their times in nature when they were younger and more carefree or more able-bodied and could more easily access experiences such as hiking and kayaking. These memories were often associated with feelings of gratitude for these previous experiences in nature but could also simultaneously generate feelings of grief from the loss of some opportunities to access nature due to mobility impairments and/or low energy. This theme of eliciting memories alongside complex emotions offers a unique finding of the impacts that virtual forest bathing programs can have upon people with mobility impairments. These findings are consistent with previous research showing that emotional regulation can be supported by mindfulness and meditation practices [64].

In terms of outcome themes, participants commented that they felt happier, uplifted, and inspired to spend more time connecting with nature following the program. The program offered a complete break from their usual experience of coping with pain, fatigue, and constant advocacy for much-needed support. The content and conversations during the program were felt to be extremely positive and uplifting. These comments are consistent with research undertaken during the pandemic which found that views of nature from inside the home were associated with increased happiness [52].

Participants appreciated being able to choose how they would engage in and adapt the program to suit their needs and believed this gave them agency. Some participants

described the agency they felt because they could use their existing strengths of adaptability and resilience when applying the new techniques learnt during the program. In fact, most participants mentioned during the one-month follow-up survey that they were still utilising and benefitting from nature-based mindfulness techniques they were taught during the program. Many participants reported that the program provided them with tools to cope with stress, hospitalisations, falls, and illness. In terms of previous literature, this was a rather novel theme; however, one previous study involving people with long COVID in virtual forest bathing found that participants felt better resourced by the new skills they had learnt [23].

Participants derived many metaphors for how nature mirrored aspects of their own lives. The program helped them gain new perspectives within a supportive context of peer support. The metaphors and the new perspectives they adopted often supported an acceptance and appreciation of diversity, such as the participant who noticed a little tree amongst bigger trees and commented that it was okay to be like the little tree and that they still had a place in the world. Other metaphors related to a sense of common humanity and feeling like a part of something greater than oneself. For example, the participant who noticed a trickle of water and imagined it leading to the sea, and that like the water, they were a small part of something much bigger. Nature's ability to teach, reflect, normalise, and even celebrate diversity was especially comforting to disabled participants who experience some level of rejection from people and institutional systems within dominant society. To our knowledge, this is a unique theme which does not appear in previous virtual nature or forest bathing literature. It may be interesting to see if other populations that experience marginalization might similarly find that they can be resourced through a peer support or affinity group approach to nature connection programming designed specifically to suit the needs and comfort of their members. Finally, in terms of outcome themes, an especially strong theme for participants was the sense of belonging and feeling connected to community and the earth generated through their participation in the virtual forest bathing program. Participants reported that their sense of social connection and nature connection improved and that they experienced an increased sense of empathy for people, plants, and animals. Their compassionate care extended beyond themselves as they considered the perspectives and needs of other beings. Participants spoke with warmth about the people they shared the program experience with, their deep sense of belonging, community, and peer support, and how observing growth and self-directed improvement in others was a source of pleasure. These comments of increased community connection are consistent with previous research which found that virtual forest bathing led to reduced scores of social isolation [23]. They are also consistent with previous qualitative research where participants commented that accessible nature [5] and accessible nature experiences [6] could provide experiences of belonging and community.

5. Conclusions

The qualitative feedback suggested that participants found the virtual delivery was effective, leading to positive outcomes in terms of having beneficial emotional responses, developing coping strategies, adopting new perspectives, physiological relaxation, and feeling connected to community. These virtual forest bathing programs supported participants in understanding and celebrating adaptation, interdependence and diversity, which are particularly relevant to their lives as people facing ableism. The effectiveness of the virtual delivery reported by participants indicates that virtual forest bathing could be considered an accessible option for adults with mobility impairments and/or low energy seeking to improve their wellbeing in this way. When qualitative themes were checked with participants, they reported that the strongest themes for them were feeling part of an inclusive peer community, the skillful guided virtual delivery with soothing facilitation, and the use of mirroring (i.e., incorporating images/videos showing hand on bark or feet in moss) supported with mindfulness, embodiment and visualisation enabling them to feel as if they were actually in and connected to nature.

For guides wanting to use the findings of this study in designing an accessible virtual forest bathing program, it is crucial that expertise, feedback, and involvement is sought from disabled people who live with various impairments and that they are collaborative partners in designing as well as co-facilitating nature wellbeing programs. Participants reported that the program would not have offered the same benefits had it not been for the guide and members of the facilitation team having lived experience of disability. Not only did this result in compassionate and respectful guiding, but also contributed to a sense of peer support, belonging, and community. The virtual delivery of forest bathing was successful in terms of eliciting a rich sensory experience and feelings associated with being immersed in nature—in some cases, an even richer nature connection than prior to living with mobility impairments. The effectiveness of the program was also due to the use of high-quality 2D images and video as well as the emphasis on guided mindful meditation, embodiment, visualisation, and mirroring within a supportive social context. Therefore, these features should be adopted when offering virtual nature experiences. Finally, the theme of experiencing memories of earlier times in nature and holding or processing complex emotions were very powerful descriptors of the process for many, but not all, participants. Facilitators cannot expect or push participants to have these kinds of experiences as this could be experienced as re-traumatizing. A trauma-informed approach which incorporates choice in all aspects of the program is needed in supporting participants should earlier memories of their more able-bodied experiences in nature emerge and be accompanied by complex emotions of gratitude and grief. A social context of peer support is also a critical consideration.

The program emphasises that virtual nature connection is not a replacement for onsite nature connection, and both should be made available so participants can choose when and how they engage with nature. Indeed, as found in this study, virtual nature connection activities often inspire and motivate participants to access parks more regularly, highlighting the need for increased accessibility in green spaces. Worldwide, 16% of people live with mobility impairments [65], and their access to nature environments and nature-based programs must be considered by policy makers and program developers. These are necessary steps to address access to nature and forest bathing programs as health equity issues.

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