

# The impact of music therapy versus music medicine on psychological outcomes and pain in cancer patients: a mixed methods study

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## Abstract

**Purpose** The purpose of this study was to compare the impact of music therapy (MT) versus music medicine (MM) interventions on psychological outcomes and pain in cancer patients and to enhance understanding of patients' experiences of these two types of music interventions.

**Methods** This study employed a mixed methods intervention design in which qualitative data were embedded within a randomized cross-over trial. Thirty-one adult cancer patients participated in two sessions that involved interactive music making with a music therapist (MT) and two sessions in which they listened to pre-recorded music without the presence of a therapist (MM). Before and after each session, participants reported on their mood, anxiety, relaxation, and pain by means of visual analogue and numeric rating scales. Thirty participants completed an exit interview.

**Results** The quantitative data suggest that both interventions were equally effective in enhancing target outcomes. However, 77.4 % of participants expressed a preference for

MT sessions. The qualitative data indicate that music improves symptom management, embodies hope for survival, and helps connect to a pre-illness self, but may also access memories of loss and trauma. MT sessions helped participants tap into inner resources such as playfulness and creativity. Interactive music making also allowed for emotional expression. Some participants preferred the familiarity and predictability of listening to pre-recorded music.

**Conclusions** The findings of this study advocate for the use of music in cancer care. Treatment benefits may depend on patient characteristics such as outlook on life and readiness to explore emotions related to the cancer experience.

**Keywords** Music therapy · Cancer · Symptom management · Mixed methods research

## Introduction

Music interventions have been used to address a variety of symptoms in cancer patients including anxiety [1, 2], stress during chemotherapy or radiation therapy [3, 4], mood disturbance [5], and pain [6]. The use of music in cancer care can be situated along a continuum of care, namely from music listening initiated by patients, to music medicine (pre-recorded music offered by medical personnel for symptom management) and to music therapy (the psychotherapeutic use of music). Several authors have argued for a clear distinction between these areas of practice when researching the efficacy of music interventions [7–9]. Whereas music medicine (MM) does not involve a systematic therapeutic process, music therapy (MT) requires the presence of such a process developed between the client and a trained music therapist through personally tailored music experiences including listening to live, improvised, or pre-recorded

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music; playing music instruments; improvising music; and composing music [7, 8].

We situate the use of music for symptom management within a biopsychosocial framework. On a neurophysiological level, listening to music may reduce anxiety through suppressive action on the sympathetic nervous system [10]. Additionally, its pain-reducing and mood-enhancing effects have been attributed to amygdala mediation [11, 12]. Cognitively, music helps patients focus their attention away from stressful events to something pleasant and soothing. Moreover, music listening may activate imagery, offering a temporarily escape from the reality of cancer diagnosis and treatment. Importantly, music provides patients with an aesthetic experience that can offer comfort and peace during times of distress. Psychosocially, interactive music making within a therapeutic relationship provides a deeply humanizing and validating experience for the patient. These experiences offer opportunities to explore and process emotions in a creative process unique from other therapeutic disciplines and facilitate meaning making through music-evoked reflections [7].

Results of a Cochrane systematic review on the use of music interventions with cancer patients indicate that music interventions may have beneficial effects on anxiety, pain, mood, quality of life, and physiological responses [7]. The review authors concluded that more randomized controlled trials (RCTs) are needed to directly compare the effectiveness of MM versus MT interventions with cancer patients so that the impact and clinical role of each can be better understood. The current study was in direct response to this recommendation, namely to (1) compare the impact of MT versus MM interventions on psychological outcomes and pain in cancer patients and (2) enhance understanding of patients' differential experiences of these two types of interventions.

## Methods

### Design

We firmly believe that research methodology should be driven by research questions rather than by an a priori stance regarding superiority of research method. Therefore, we adhere to pragmatism as our philosophical stance [13]. We used a mixed methods research approach in which both quantitative and qualitative data are gathered and integrated, resulting in interpretations that are grounded in the combined strengths of both data sets [14]. Specifically, we employed a mixed methods intervention design in which qualitative data (i.e., semi-structured exit interviews) were embedded within an RCT [15]. The purpose of the interviews was to (a) bring greater understanding of cancer patients' experience of music interventions and (b) give participants the opportunity to share *in*

*their own words* the impact of the interventions on their well-being.

This study was approved by an Institutional Review Board, and informed consent was obtained from all participants. Thirty-one participants completed two MT sessions and two MM sessions within a 2-week timeframe. Using a list of random numbers, participants were randomized to one of two treatment sequences consisting of two MT sessions followed by two MM sessions or vice versa. The use of sequentially numbered, opaque, sealed envelopes ensured allocation concealment.

### Participants

Thirty-one adult cancer patients at an urban hospital were recruited between August 2012 and June 2013. Patients were eligible if they were currently receiving inpatient or outpatient cancer treatment; were proficient in English; and did not have a cognitive impairment, psychotic disorder, or hearing impairment. The mean age was 53.8 years and 67.7 % were female. Demographic characteristics are summarized in Table 1.

As this was considered a pilot study, no a priori sample size was computed. Instead, we anticipated that this study would provide standard deviation estimates to guide future large-scale trials (see Fig. 1 for participant flow).

### Interventions

*Music therapy* MT sessions were provided by a board-certified music therapist and lasted 30 to 45 min each. The aim of the sessions was to help patients manage stress, mood, and pain and to provide psychosocial support. After a brief discussion about current concerns, the music therapist offered live music based on patient needs. She invited participants to sing and/or play an instrument (e.g., xylophone and small percussion instruments) along to a familiar song or improvised melody. These experiences were followed by additional songs, co-created instrumental or vocal improvisations, song-writing, or music-guided breathing exercises. The therapist provided ample opportunity for verbal processing of emotions and thoughts evoked by the music.

*Music medicine* At the start of the study, participants were asked to list their music preferences on a demographic information sheet. Based on this information, we created individualized playlists. The music therapist met with each participant at the start of the MM session to deliver an iPod with the patient's playlist. The music therapist made sure the patient was able to operate the iPod, but no further assessment took place. Participants were asked not to engage in other activities while the music played. The music therapist then left the room. MM sessions lasted 30–45 min.

**Table 1** Participant characteristics ( $n=31$ )

	<i>N</i> (%)
Age (M±SD, range)	53.8±13.84, 32–88 years
Gender	
Female	21 (67.7)
Ethnicity	
Black	23 (74.2)
Caucasian	6 (19.4)
Asian	1 (3.2)
Other	1 (3.2)
Marital	
Married	7 (22.6)
Non-married	10 (32.3)
Widower/widow	6 (19.4)
Divorced/separated	5 (16.1)
Other	3 (9.6)
Education	
High school or less	24 (77.4)
College/university	7 (22.6)
Type of cancer	
Breast	6 (19.4)
Gastrointestinal	3 (9.7)
Gynecological	3 (9.7)
Head and neck	3 (9.7)
Hematologic	7 (22.6)
Lung	4 (12.9)
Other	5 (16)
Recurrence of cancer	
No (first time)	22 (71)
Yes (second time or more)	8 (25.8)
Not reported	1 (3.2)
Patient type	
Outpatient	22 (71)
Inpatient	9 (29)

We minimized expectation effects of participants throughout the study by referring to both treatment conditions as music sessions rather than referring to one intervention as music therapy.

#### Measures and data collection

Mood, anxiety, and relaxation were measured with a visual analogue scale (VAS), a 100-mm line; the length of which represents a continuum of an experience such as mood. Pain intensity was measured by means of an 11-point numeric rating scale (0–10) [16].

All participants were invited to participate in an audio-recorded semi-structured, open-ended exit interview. Interview questions focused on the participants' experiences

of the music sessions in general and about their differential experiences of the MT and MM sessions. Participants were also asked which of these they would like to receive for future treatments. A blinded outcome assessor collected the quantitative outcome data immediately before and after each music session. After the final session, the outcome assessor conducted the exit interview.

#### Data analysis

**Quantitative analysis** Data were entered into RedCap [17] and exported to SAS/STAT® software for analysis. Average pre- and posttest scores were computed for the two sessions of each treatment condition. We utilized these averages for comparisons within and between conditions. In the event of skewed data, Wilcoxon rank sum tests were used to test the within-condition differences. Otherwise, paired *t* tests were used. Paired *t* tests on the difference scores were used to test for between-condition differences.

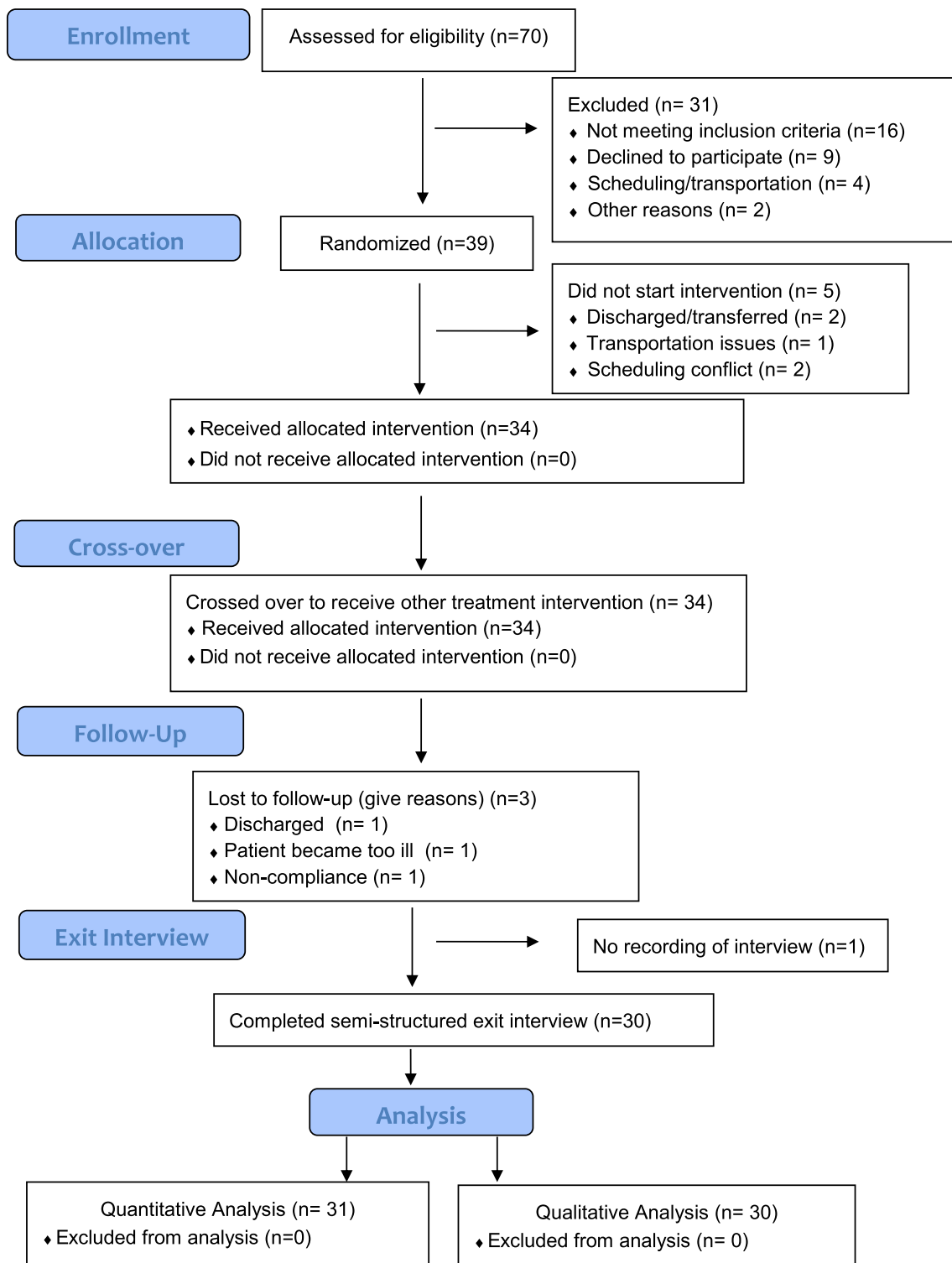
**Qualitative analysis** The interviews were transcribed verbatim and reviewed for accuracy. The transcripts were imported into MAXQDA 11 [18] and analyzed by two coders (NP, JB) using theoretical thematic analysis procedures as outlined by Braun and Clarke [19]. Theoretical thematic analysis is aimed at identifying and analyzing patterns driven by an a priori theoretical framework or specific research questions. The coding was guided by the following research questions: (1) What do participants report as treatment benefits or harms? and (2) How do they describe their (differential) experiences of the two types of music interventions? Themes were identified using a semantic approach [19] in which themes are derived from “the explicit meaning of the data and the analyst is not looking for anything beyond what a participant has said” [19] (p. 84).

**Integration of data sets** After completion of the quantitative and qualitative data analysis, the two data sets were compared to examine (dis)congruence of the findings. In addition, we created a joint display [15] of quantitative and qualitative findings to examine differential experiences of participants whose quantitative data profile indicated much greater benefits in MT than in MM or vice versa.

## Results

### Quantitative results

The quantitative data indicate that the MT and MM sessions were equally effective in improving anxiety, mood, relaxation, and pain. There was no statistically significant difference between the conditions for these outcomes (Table 2).



**Fig. 1** Participant flow chart

The majority of the participants (77.4 %) expressed a preference for receiving MT sessions for the remainder of their cancer treatment or future treatments. Figure 2 depicts participants' treatment preference alongside reasons for preference as gleaned from the qualitative data.

#### Qualitative results

Thirty participants completed the interviews. The qualitative analysis resulted in eight key themes organized into two clusters:

**Table 2** Comparison of mean difference scores between treatment conditions

	Music therapy (n=31)			Music medicine (n=31)			Mean difference <sup>a</sup>	
	Pre-	Post-	p	Pre-	Post-	p		p
Mood	57.6±22.5	84.5±11.7	<0.0001	58.4±23.5	80.7±13	<0.0001	-4.5±20.3	0.23
Anxiety	30.1±22.3	15±16.5	0.0002	31.6±23.1	18.2±16.3	<0.0001	1.8±20.8	0.64
Relaxation	55±24.1	83.8±11.3	<0.0001	55±21.3	80.6±13	<0.0001	-2.9±21.5	0.46
Pain	3.6±2.7	2.7±2.1	0.0004	3.8±2.6	2.7±2.2	<0.0001	-0.2±1.4	0.42

<sup>a</sup> (MM post-pre)-(MT post-pre). For mood and relaxation, negative values indicate more beneficial change in MT; for anxiety and pain, negative values indicate more beneficial change in MM

1. Common themes: Themes related to treatment benefits experienced across the treatment interventions.
2. Unique themes: Themes that were unique to MT or to MM sessions.

The themes are discussed below and presented in Table 3, with example quotes.

*Common themes across treatment interventions* The qualitative data suggest that engagement in MT and MM sessions was both beneficial for symptom management (*Theme 1*). The music enabled participants to escape from stress in general and from worries related to the cancer diagnosis and treatment specifically. Experiencing music as relaxing, peaceful, and soothing was the most commonly stated benefit. Participants furthermore commented that engaging in music was fun and lifted their mood. Noteworthy is that many participants appreciated the playfulness of interactive music making (musicking) and “feeling like a child again” in the MT sessions.

Many references were made to memories elicited by music (*Theme 2*), including childhood memories of carefree times. Music also facilitated connection to the pre-illness self. Music experiences were meaningful because they helped participants bridge the past (Who was I?), present (Who am I now?), and future (Who will I be? Will I survive?). However, for some

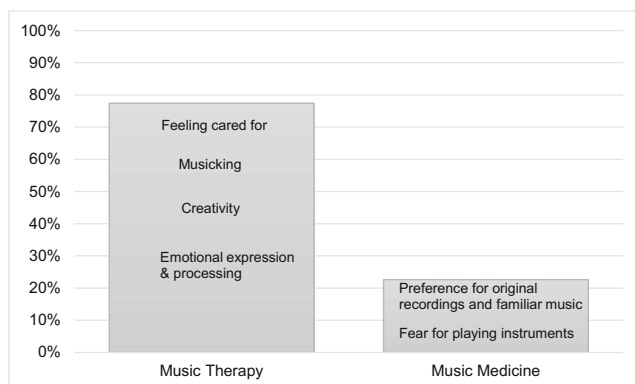
participants, music evoked intense memories of loss and trauma.

Numerous references were made to the fact that music offers hope for the future and inspiration to move forward (*Theme 3*). When confronted with a diagnosis of cancer, people need hope and reassurance. The beauty of music stands in sharp contrast to the hopelessness that a diagnosis of cancer may bring as illustrated by the following participant quote: “When the doctor first tells you that you have a cancer you feel like tomorrow is your last day, but the music makes you feel like there’s a future.”

*Themes unique to music therapy sessions* Many participants commented on the importance of the presence of the music therapist (*Theme 4*). This presence added a valuable dimension to the music experience, namely one of feeling cared for and supported. In addition, several participants stated that they experienced the live music quite differently: “It felt like some of the music when she would play, I could feel it in me, like something like rush right through me like a good vibe right through my body.” Participants who expressed a preference for MT for future treatments identified the musicking and the music therapist’s empathy and support as main reasons (Fig. 2).

A large number of comments spoke of the importance of creativity. One participant, in particular, provided a beautiful metaphor for the creative process: “When I had to participate with the xylophone thing...that made me feel good. You know, like a rush...like if you see a flower...and the flower is blooming and then you go and again and it keeps blooming and blooming until it blooms all the way. Like that.”

Finally, participants valued the opportunity to release emotions not usually expressed as reflected in this quote by a male participant: “I remember one time when I was upset and I didn’t really know Amy that well and I opened up to her and I cried. That is not easy for me to do around someone I know, let alone someone I’m just meeting...Because, you know, the macho myth, man are not supposed to cry and all that”. Music, coupled with the therapeutic relationship, made it safe for these emotions to surface and be explored.

**Fig. 2** Treatment preference and associated reasons

**Table 3** Themes from qualitative data

Theme and definition	Categories and definitions	Example quotes
Common themes across music therapy and music medicine sessions		
<i>Theme 1 Symptom Management:</i> Listening to music and musicking improve patients' stress, pain and mood.	<i>Escape:</i> Music provides a mental escape from concerns related to cancer diagnosis and treatment and other day-to-day worries.	<ul style="list-style-type: none"> <li>• It made me forget about my treatment, you know? The treatment, the pain and it just had me feel like I was floating on a cloud.</li> <li>• It like calm me down. It like take me away from where I was, put me in another place. Took my mind from cancer for the moment.</li> </ul>
	<i>Mood Enhancement:</i> Engagement in music listening and musicking lifts people's spirits and provides enjoyment and fun.	<ul style="list-style-type: none"> <li>• It lifted my spirit and whatever I was feeling before, whatever mood I was in before, it just took it away! It put me in a good mood and put me in a good space and it made me happy.</li> <li>• I was in here dancing, I was singing, I was praising, I was worshiping, I was crying, I was just, (slaps her hands) in here! I was going and just like having a ball! And you know like, I'm still feeling that way... I'm still in that same mode, I'm still in that same space.</li> </ul>
	<i>Peaceful/soothing:</i> Music helps to relax, feel more peaceful, and reduce anxiety and pain.	<ul style="list-style-type: none"> <li>• It calmed me down from the inside.</li> <li>• It also made me forget the pain. You know? It relaxed me more. It was just more relaxing. More soothing.</li> </ul>
<i>Theme 2 Memories:</i> Music brings back memories through which participants connect to pre-illness self as well as to loss and trauma. The music helps to bridge past, present and future.	<i>Memories of childhood:</i> Music evokes memories of a beautiful, carefree childhood.	<ul style="list-style-type: none"> <li>• It takes me back to my childhood when everything was beautiful. Like you know, the sunny days and eating ice cream, sitting on steps.</li> </ul>
	<i>Memories of healthy self:</i> Music helps participants connect to their pre-illness self.	<ul style="list-style-type: none"> <li>• When I was thinking of the music, it was more like looking at my life. You know, the things that I used to do...</li> <li>• Well, in some instances, it took me from my circumstance... of what I am going through... it took me back to a more, not a complicated cancer time.</li> </ul>
	<i>Memories of loss and trauma:</i> Music has the potential to evoke memories and feelings of loss and trauma.	<ul style="list-style-type: none"> <li>• I like the music because sometimes it takes me back...to something that happened, like I remember about being with my mom and even the, um, the abuse that I went through (patient starts to cry).</li> <li>• It also made me think about my husband who died a year ago from cancer (patient starts to cry)...We liked to listen to music and just dance around. He used to like to watch me dance.</li> </ul>
	<i>Memories form a bridge across time:</i> Music helps to bridge past, present, and future.	<ul style="list-style-type: none"> <li>• When I was listening to the music it brought back memories of different things, good and bad. And it's kind of bridging, making a connection from my old life to my new life. I found that very helpful.</li> <li>• The music made me think about my past. It made me think about my past and my future.</li> </ul>
<i>Theme 3 Hope for future:</i> music offers hope and motivation	N/A	<ul style="list-style-type: none"> <li>• When the doctor first tells you that you have a cancer you feel like tomorrow is your last day, but the music makes you feel like there's a future...makes me feel like now I am going to see my grandchildren grow up. Especially when she played how great thou art...it gave me my life back it feels like, you know?</li> </ul>
Themes unique to music therapy sessions		
<i>Theme 4 Interpersonal connectivity:</i> Participants value the presence of a music therapist who		<ul style="list-style-type: none"> <li>• It was really soothing having an actual person here cause you feel the music more and you get</li> </ul>



**Table 3** (continued)

Theme and definition	Categories and definitions	Example quotes
cares for them, provides support through the music, and engages with them in interactive music making.	<p><i>Human connection:</i> Participants value connecting to a person rather than a playback device.</p> <p><i>Empathy and support:</i> Participants feel cared for by the therapist.</p> <p><i>Musicking:</i> Participants enjoyed the music making and creativity.</p>	<p>more out of it when someone's actually here playing it for you than listening from a device</p> <ul style="list-style-type: none"> <li>• I liked the music a lot with Amy because it was a human connection.</li> <li>• I just did not feel like a, just the number, so to speak. It made me feel like she actually cared about what I was dealing with and she cared about the effect the music was actually having on me.</li> <li>• Well, the session when I listened to music by myself, I could do that on my own. It was good. Not that I did not enjoy it. But the session with her, it was about camaraderie! We were singing, we were laughing. It was the interchange.</li> <li>• I guess being active makes me feel better and although I enjoy relaxing and listening to the music, taking an active part in making the music was a better part of it for me.</li> </ul>
<i>Theme 5 Emotional expression and processing:</i> Music therapy sessions stimulate expression and exploration of emotions.	<p><i>Release of emotions:</i> Music enables the expression of suppressed or repressed emotions.</p> <p><i>Verbal processing of emotions:</i> Participants appreciate being able to talk with a therapist about emotions that are evoked by the music experiences.</p>	<ul style="list-style-type: none"> <li>• Well it definitely helped with emotions. That is the key thing. It brought out emotions out of me that I normally don't allow to come out. Beings though, that I'm not that emotional kind of guy, but I guess I am because the music proves that I am. It really helps me on my emotional level.</li> <li>• It [music therapy] is more like one-on-one and it is like, we can relate and I can talk about how I feel and how the music makes me feel...I could easily drift back into my depression but when I would have a therapist, I don't think I would drift back into the depression. I would talk about the depression because I would have someone there and we would change the mood of the music.</li> </ul>
Themes unique to music medicine sessions		
<i>Theme 6 Aesthetics:</i> Participants prefer pre-recorded music because of the aesthetics of the original recordings.	<p><i>Preference for original recording in general:</i> participants may appreciate the original recording more than the music therapist' live performance.</p> <p><i>Instrumentation:</i> Participants may desire to hear some of the unique instrumental qualities/ timbres of the original recording.</p>	<ul style="list-style-type: none"> <li>• I would rather have the pre-recorded music... The Stevie Wonder music has more beat to it... and more of a better sound.</li> <li>• Because the music has like the cordon in it, she sings and she had that guitar, you know, I prefer music...with the cordon [patient was referring to Lawrence Welk's accordion music]</li> </ul>
<i>Theme 7 Familiarity and Comfort:</i> Participants prefer their own music that is familiar to them and prefer the safety of listening to music (in contrast to active music making).	<p><i>Active music making evokes anxiety:</i> Playing instruments is unknown territory for some participants and may evoke anxiety. Singing may cause frustration.</p> <p><i>Preference for familiar music:</i> Participants prefer listening to their "own" music as it is familiar and predictable.</p>	<ul style="list-style-type: none"> <li>• I would choose the music listening...because I don't how to play an instrument and I want to stick to what I know.</li> <li>• What made me mad, and what made me anxious, angry, was that my voice would not carry. It felt squeaky the way it was.</li> <li>• My choice of music was more comfortable</li> <li>• The pre-recorded music...It was...music I was familiar with...music that relaxed me. Music that would take my mind off of the reason why I'm here.</li> </ul>
<i>Theme 8 Listening to music in solitude:</i> listening to music in solitude allows for a better focus on the music without concern of having to interact with somebody.	N/A	<ul style="list-style-type: none"> <li>• When she left the room, you can concentrate more on your music. Concentrate more on what you're hearing and you can like, put your</li> </ul>

**Table 3** (continued)

Theme and definition	Categories and definitions	Example quotes
		<p>mind more into it, and it's like it relaxes you more.</p> <ul style="list-style-type: none"> <li>• When somebody's using the headphones, you can concentrate more. When you're using the headphones, you can sit back and close your eyes and you can enjoy the music. If somebody's in there, then they're watching you, or they're doing something physically. So, I'd rather have it by myself.</li> </ul>

*Themes unique to music medicine sessions* A minority of participants expressed a clear preference for listening to pre-recorded music. Some desired to hear the original recording rather than the music therapist's rendition of the song (*Theme 6*) because they wanted to hear specific musical elements (e.g., accordion and percussion section). Others felt more comfortable listening to pre-recorded music because of familiarity and because they felt insecure about making music (*Theme 7*).

*Theme 8*, wherein a preference for listening to music alone was reported, arose from comments from a small number of participants but provides important guidance to music therapists who work in oncology. First, listening to music via headphones enables a greater focus on the music for some participants. Second, when a therapist is in the room, there is a spoken or unspoken expectation of interaction. One participant stated that he felt "watched" when somebody is in the room, and this prevented him from truly feeling the music.

#### Integration of quantitative and qualitative results

The qualitative findings were congruent with the quantitative results, namely both types of music interventions were effective for symptom management. Whereas the quantitative results informed us about the extent of improvements, the qualitative analysis provided additional information regarding: (1) how music may have brought about the improvements, (2) additional benefits experienced by the participants, and (3) challenges and risks associated with the use of music interventions.

We were also interested in exploring if and why certain patients benefited more from MT than MM sessions or vice versa. To this end, we computed an overall *z*-score for each participant to reflect overall improvement per condition. Based on these *z*-scores, we created four typologies [15], namely participants who showed (a) great improvement in MT but much less or no improvement in MM, (b) great improvement in MM but much less or no improvement in MT, (c) great improvement in both conditions, and (d) worsening in both conditions. Table 4 presents the experiences for participants that fit these typologies. The range of *z*-scores

represents the scores of the four most extreme cases for each typology. This joint display provides insights into how patient characteristics and attitudes may impact treatment benefits. For example, patients who value the therapeutic relationship and the creative aspect of musicking appear to benefit more from MT sessions than from MM sessions. In contrast, patients who are apprehensive about playing instruments and exploring feelings related to cancer may benefit more from listening to pre-recorded music.

#### Discussion

Our findings are congruent with the current literature, namely that MT and MM interventions have beneficial effects on anxiety, pain, mood, and level of relaxation in cancer patients [7]. Our quantitative results indicate that, on average, MT and MM interventions are equally beneficial for symptom management. However, the qualitative findings and the integration of the quantitative and qualitative data sets provide a more nuanced understanding of treatment benefits.

Symptom management is achieved by escaping the reality of cancer through distraction, imagery, and pleasant memories elicited by the music. Through its aesthetic qualities, music furthermore offers comfort and peace during times of distress, lifting people's spirit and improving their sense of well-being. Similar findings were reported in a study exploring adult cancer patients' use of music [20].

Even though MM interventions typically aim to achieve symptom management [7], our qualitative data suggest that listening to pre-recorded music frequently goes beyond a mere reduction of symptoms. First, music helped to bridge pre-illness identity to present identity and facilitated reflection on existential issues. Renegotiating one's pre-illness identity and self-narratives in light of the severe "biographical disruption" caused by cancer is important for experiencing well-being in face of a life-threatening illness [21–23]. Similar to other studies [20, 21], the data furthermore suggest that music gives meaning to people's life and embodies hope for survival.



**Table 4** Joint display of patient experiences per treatment benefits

Treatment benefits	Change in music therapy <sup>a</sup>	Change in music medicine <sup>a</sup>	Patient experiences
↑MT, ↓MM	0.65 to 1.88	-0.11 to 0.38	<ul style="list-style-type: none"> <li>• Emphasize the importance of therapeutic relationship and support by therapist</li> <li>• Enjoy the creative aspect of music making</li> <li>• Are hopeful for the future</li> </ul>
↑MM, ↓MT	-0.46 to 0.59	0.33 to 1.63	<ul style="list-style-type: none"> <li>• Apprehensive about active music making</li> <li>• Prefer familiarity of pre-recorded music</li> <li>• Hesitant about exploring feelings related to cancer</li> </ul>
↑MT, ↑MM	0.61 to 1.07	0.73 to 1.37	<ul style="list-style-type: none"> <li>• Strong conviction about the power of music to support and give hope</li> <li>• Use music for mental escape</li> <li>• Use music for emotional exploration and value processing of emotions with therapist</li> </ul>
↓MT, ↓MM	-0.67 to -1.03	-0.52 to -1.06	<ul style="list-style-type: none"> <li>• Hold little hope for the future</li> <li>• Music evokes sad and traumatic memories</li> <li>• Feel inadequate regarding music making and singing</li> <li>• Prefer aesthetics of original recordings</li> </ul>

↑ great improvement, ↓ less improvement or worsening

<sup>a</sup> Range of overall z-scores (average of z-scores for mood, anxiety, relaxation, and pain)

Given the existential reflections evoked by music, the presence of a music therapist may be particularly important. Several participants specifically commented about the value of being able to discuss these issues with the music therapist.

Even though listening to pre-recorded music offered health benefits, most participants expressed a preference for MT services for future treatments. The therapeutic relationship, interactive music making, and emotional expression were dominant themes in patients' narratives about their experiences of the MT sessions, reflecting the importance of human relating and empathy in cancer care. Furthermore, musicking helped patients tap into their inner playfulness and creative selves. These are important resources that, when strengthened, may facilitate resilience in the face of life's challenges [24]. The MT sessions also enabled participants to access and release suppressed and repressed emotions, especially emotions related to grief. They relied on the therapist for further processing of these emotions verbally and/or musically. Music therapists are trained to go beyond offering verbal support. For example, they may musically accompany the patient's emotional expression, audibly reflecting the emotions and providing a safe musical container for continued exploration.

The findings of this study offer important guidance for the use of music with cancer patients. The results suggest that music lifts patients' mood, reduces anxiety, brings peacefulness, and helps to manage pain. This is in line with previous research demonstrating that the everyday use of music can be an important resource for enhancing one's well-being and sense of empowerment [20, 25]. However, the mixed methods analysis suggests that treatment benefits may depend on certain participant characteristics. Even though most participants experience greater well-being when engaging in music interventions, our joint display of participant experiences and

attitudes per treatment benefits suggests that listening to music may cause distress as well, especially for patients who have a negative outlook on life. Such patients may be at greater risk for music's powerful capacity to access sad and traumatic memories. Given their emotional vulnerability, the surfacing of such memories may be highly distressing. At the same time, these patients appear not to benefit from musicking either as they perceived their music making skills as inadequate. The notion of musical competence has been reported elsewhere as a potential barrier to patients' enjoyment of music therapy sessions [26]. Therefore, it is important to carefully assess the emotional state of patients before offering music for symptom management. These patients may be better served by listening to music in the presence of a music therapist who can help with processing of emotions. Music therapists should be mindful that in short-term care delivery, these patients may not benefit from musicking as they may need a longer timeframe to develop a trusting relationship with the therapist as well as with music. In contrast, patients who strongly believe in the power of music and who value the opportunity to process emotions with the therapist appear to greatly benefit from both types of music interventions.

The qualitative data furthermore indicate that some patients prefer the familiarity of their own music. During this challenging time in their life, patients have a great need for stability and emotional security [27]. Self-selected music presents predictable musical and emotional content, therefore providing a safe holding environment. Repetitive listening to songs may bring a sense of order to the chaos, and the aesthetic beauty of the music may feel like a warm blanket for one who is shaken and afraid. Self-selected music has been described in the literature as a powerful means to "constitute

ontological security” through creating a sense of “aesthetic belonging” [21] (p. 131–132).

### Limitations and research recommendations

The results of this study are based on a small sample size, and the majority of the patients were female and black. This limits the extent to which these findings can be generalized to other patients. In addition, although some patients readily benefit from MT sessions, others may need additional time for relationship building and therefore more sessions may be needed. It is likely that the patients who enrolled in this study already had a special affinity for music. Finally, this study had research funding available for the creation of individualized playlists. This may not be feasible in all settings.

Both MT and MM appear equally effective for symptom management. Although this is a small-sized study, it does present the question of whether comparative RCTs for music interventions focused on symptom management are a worthy research investment. We suggest that future research efforts should instead aim to enhance understanding of (a) how each of these interventions can be optimized for symptom management, (b) how music interventions can best serve patients along the cancer treatment trajectory, and (c) what unique aspects MM and MT interventions contribute to the care of patients.

### Conclusions

The findings of this study advocate for the use of music in cancer care. Listening to pre-recorded music may enhance symptom management. In addition to symptom management, music therapy, offered by a board-certified music therapist, offers psychosocial support and may strengthen inner resources. This study provides guidelines aimed at stimulating continued reflection and awareness in clinicians about the use of music with adult cancer patients. Given our findings, in particular the strong preference for music therapy services by patients, it is recommended that music therapy is made available to cancer patients during active cancer treatment. The findings furthermore indicate the need for patient assessment by a board-certified music therapist to determine which music interventions will most effectively address the in-the-moment needs of patients. Finally, the availability of a music therapist is recommended even when listening to pre-recorded music is offered since music can evoke strong emotional responses and psychotherapeutic support may be needed.

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