Group-Based Telehealth Music Therapy Intervention for Patients with Dementia: A Pilot Study

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Abstract

Background: The behavioral and psychological symptoms in dementia (BPSD) make caregiving particularly challenging. In-person music therapy sessions with a professional have been shown to be helpful for BPSD and reducing caregiver burden. There are few music therapists practicing in rural settings, specifically for this population, so telehealth offers an alternative way to access their care. However, there have been limited studies demonstrating the efficacy of telehealth music therapy, and the authors are not aware of studies investigating group-based telehealth music therapy in dementia. This investigation seeks to explore the feasibility of group-based music therapy via telehealth for people living at home with dementia.

Methods: Our participants were community-based outpatients recruited from a memory clinic with mild to moderate dementia and had a willing caregiver to participate. We ran a single blinded block-randomized control pilot study. The patients were randomized one-to-one to receive either 6 weekly telehealth music therapy group sessions with a board-certified music therapist or a personalized music playlist on a platform of their choice. There were 12 participants total in each group, for a total of 24 participants, along with their caregivers. The participants were divided into 3 cohorts that took part in the study sequentially, with 8 participants per cohort and 4 participants per group (Music Therapy vs Music Playlist). Each cohort's session lasted for 6 weeks. Our initial outcome measures were to compare scores at baseline and at 6 weeks on measures of the patient's cognition (Mini Mental State Examination, or MMSE) and mood (Geriatric Depression Scale, or GDS); caregiver report of BPSD (Neuropsychiatric Inventory-Questionnaire: Severity/Distress scales, or NPI-Q/S/D); caregiver strain (Modified Caregiver Strain Index, or MCSI); and caregiver depression (Patient Health Questionnaire-9, or PHQ-9). As the investigation progressed, we measured study attrition and qualified reasons for dropout.

Results: Throughout the investigation, there was a 67% dropout rate, equal between groups. Some of the most common reasons for dropout included unavailability of the participant due to a busy schedule with other appointments, loss to follow-up with nonresponse to calls, and deteriorating health/increasing hospitalizations that impacted participant's ability to actively participate in sessions. There was no appreciable trend from the pre-scores to the post-scores in both the interventional and control groups.

Conclusion: Despite both interventions being relatively non-burdensome, dropout rate was high among both groups, which limits the ability to draw meaningful conclusions about potential benefits of group telehealth music therapy intervention vs music playlist. Our results may help researchers to design and implement a larger group-based telehealth music therapy study with lessons we are learning from this investigation, which will hopefully better guide treatment and management of dementia in the primary care setting.

Introduction

Dementia (including Alzheimer's disease, Lewy body disease, frontotemporal dementia, and other related disorders) can lead to premature disability and death (1). It is costly financially and emotionally, for families affected as well as for society as a whole:

afflicted patients can no longer be in the workforce; their unpaid caregivers often have to reduce their working hours or leave their own jobs in order to provide care; patients with dementia have increased hospitalizations and their stays tend to be more protracted than those without dementia; and, finally, dementia leads to earlier placement in nursing home care. The most prevalent contributing factors to emergency room visits and earlier placement in nursing homes are the behavioral and psychological symptoms of dementia (BPSD) (2). BPSD can include apathy, aggression, delusions, hallucinations, agitation, aberrant motor behaviors, and other dysregulated emotional expressions. BPSD have also been shown to be associated with increased caregiver strain, although it is unclear exactly which symptoms are most linked or if a certain threshold number is required for maximal strain (3).

There are few approved pharmaceutical treatments for BPSD, and those that are available often carry undesirable side effects and have limited efficacy (4). A systematic review and meta-analysis showed that cognitive enhancement, assessment and management of BPSD, and caregiver education and support are strategies for delaying nursing home placement (2). Music therapy has also been shown to be an effective tool in ameliorating BPSD including agitation (5–9), depression and anxiety (10–12), and stabilizing cognitive function (12). For patients with dementia, cognition and BPSD are the most cited contributing factors to nursing home placement (2), which is more expensive than care at home and may lead to decreased quality of life for the individual with dementia. By reducing BPSD, patients may enjoy a better quality of life, and caregivers may experience reduction in stress, thus delaying nursing home placement.

With limited numbers of qualified music therapists in the country, access to music therapy can be challenging, especially for patients with dementia who live in more rural areas. With the recent COVID pandemic necessitating the expansion of telehealth, music therapists could potentially reach patients who reside in more isolated regions. There is a paucity of studies for group-based telehealth music therapy for patients in this population. However, a few studies have examined the efficacy of music therapy telemedicine interventions in other populations (such as veterans (13, 14)) and children with neurodevelopmental disorders (15)). Those studies have concluded that there is potential for music therapy conducted via a remote platform to have positive impacts on these populations (13–15). These studies that were conducted in other patient populations involved a mixture of both individual and group telehealth interventions, depending on patient preference and music therapist.

This investigation seeks to explore the feasibility of group-based music therapy via telehealth for people living at home with mild to moderate dementia. The COVID-19 pandemic has provided a unique urgency to this question, but it is relevant even outside of the recent pandemic. Given the number of rural settings in the United States, telehealth is an attractive treatment option for those patients who would otherwise not be able to access care, and a group-based modality may allow for more access to care for those with limited resources and provide additional socialization which may also provide benefits for people living with dementia and their caregivers. A meta-analysis of studies that analyzed the impact of in-person individual and group music therapy sessions suggested that music may be a promising component of the antidote to mental illness (16). Furthermore, several studies have suggested that there is an immense advantage to group-based music therapy sessions over individual for those with mental illness, as the benefits of social connections and strengthened bonds between people may improve the impact that music therapy can have for this population (17, 18).

There is evidence that suggests that in addition to stabilizing electroencephalogram (EEG) rhythms for patients with neurological disorders, music has the capacity to revive networks in our brain that have become deactivated because it is built into our evolutionary blueprint (19). Specifically, studies have shown that music can "actively facilitate the recovery of movement" in patients with various movement disorders, that those with memory disorders (such as Alzheimer's disease) are "more resilient to neurodegenerative influences when their neuronal memory traces are built through music," and that music can "decrease seizure frequency, stop refractory status epilepticus, and decrease EEG spike frequency." (19) With these specific neurological correlates of music reactivating brain networks, we believe that organized music therapy, delivered by a trained music therapist through telehealth in a group setting, can create real change.

We hypothesized that group-based music therapy intervention via a telehealth platform for patients with mild to moderate dementia would demonstrate improvement in participants' BPSD and reduction in caregiver burden as compared to passive listening of a personalized music playlist. We designed a pilot study to see if delivering this intervention would be feasible and if there was signal for improved outcomes in the music therapy arm. Our first specific aim was to assess the feasibility of a telehealth group-based music therapy intervention and determine the practicality of carrying out this project over a longer period with a larger participant sample size. For this aim, we calculated study attrition and qualified reasons for dropout. Our second specific aim was to compare pre- and post-scores on measures of cognition, BPSD, caregiver strain, and depression for participant and caregiver for those undergoing the telehealth music therapy intervention vs. those who receive a personalized music playlist.

Methods

Participants

We recruited a total of 24 participant/caregiver dyads for the investigation from a memory clinic. The memory clinic was Geisinger Memory and Cognition Therapy Services Wilkes-Barre, located in Wilkes-Barre, PA. This clinic is in a relatively rural area, where elderly patients would have limited access to in-person music therapy. Many of the patients travel from afar to even receive in-person care at this memory clinic.

The participants recruited had mild to moderate dementia of any cause (as diagnosed by board-certified behavioral neurologist MLL) and lived at home with their caregivers, who were also consented into the study. Participants and caregivers were specifically asked if they thought that they would be able to commit to the full period of the study (6 weeks), after being provided with a complete explanation of the protocol. An inclusion criterion was that the participants necessarily needed to have access to high-speed internet to engage in the telehealth music therapy sessions. Participants were randomized by 3 blocks of 8: one-to-one telehealth music therapy vs music playlist (Figure 1).

This protocol was approved and overseen by the Institutional Review Board. Our IRB approval number is 2021-0409. The investigation was conducted in accordance with relevant guidelines and regulations of the IRB, including the Helsinki Declaration.

Interventions

The investigation was carried out with the 24 participant/caregiver dyads divided into 3 sequential cohorts with 8 participants in each cohort, 4 in the Music Therapy group and 4 in the Music Playlist group. Each cohort's session lasted for 6 weeks.

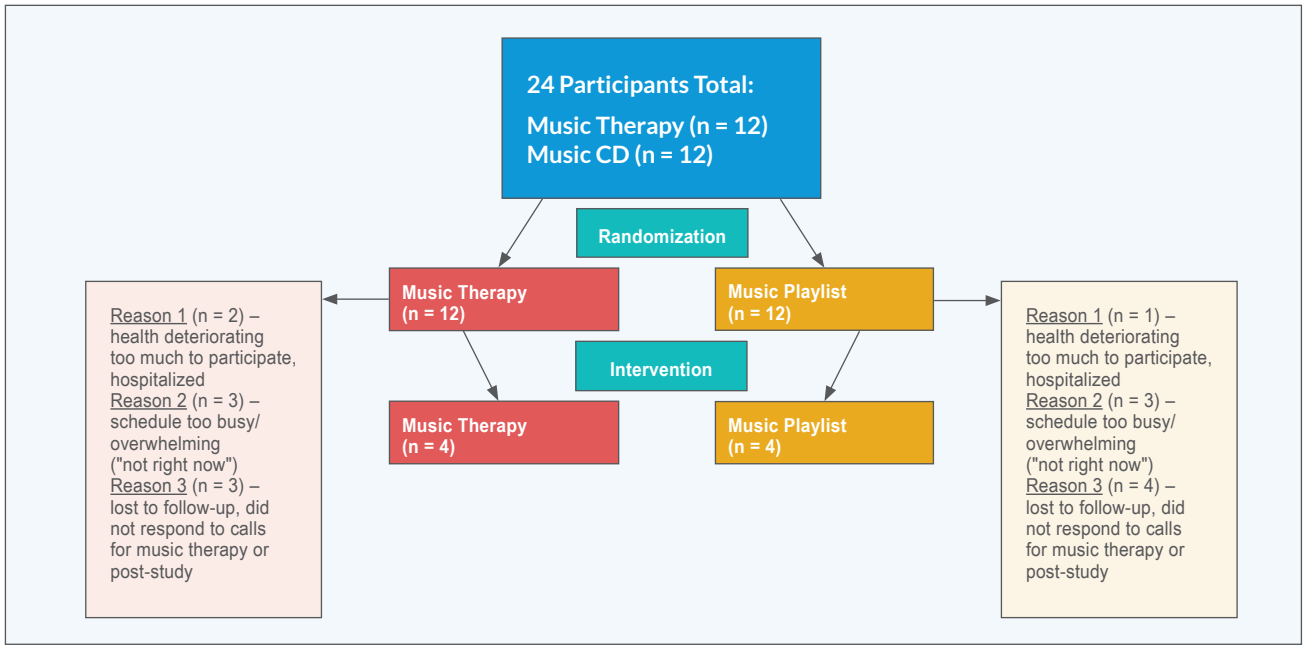

Figure 1. Flowchart of attrition rate for all 3 cohorts

A total of 12 participants were randomized for the music therapy intervention. The music therapy took place once a week for 6 weeks via telemedicine, with the first session reserved for an informal music-based assessment by the board-certified music therapist (AS) to determine whether the patient was an appropriate candidate for music therapy as indicated by response to various interventions. There were 5 additional visits, once per week. The format of the sessions included: a greeting song to orient the participant to the start of the session; singing of 1 to 3 preferred/chosen songs to address cognition and communication; 2 movement songs with instrument playing interventions (either makeshift instruments played by the participants/caregivers, or actual instruments played by the music therapist) to stimulate cognition and movement; songwriting for self-expression, cognitive, and emotional support; relaxation/mindfulness; and a closing song to help the participant transition at the completion of the session. The music therapist also provided training to caregivers in techniques to utilize music for behavioral support. Each group telemedicine session lasted for 1 hour every week. Additionally, each group telemedicine session had 4 participant/caregiver dyads assigned to it (the entire cohort that was assigned to the Music Therapy group for that 6-week session).

The other 12 participants were randomized to receive a personalized music playlist that they kept and listened to as they wished — there was no particular guideline that identified how often they should be listening to the music and for how long. Specifically, each participant was called and asked a detailed set of questions about what genre and decade of music they preferred and which artists were their favorites. They were then asked how they wanted to access the playlist (Apple Music, Spotify, CD, memory stick, etc.) and how they wanted it to be sent to them — all participants/caregivers in the Music Playlist group wanted their playlists to be emailed to them on a Spotify playlist for ease and convenience. There has been no evidence of prior studies using a music playlist as a comparison. However, we wanted to use a music playlist as a comparison so that participant/caregiver dyads could get at least some form of tangible benefit from participation in the study for their dementia, instead of no benefit that would be received if the comparison group was no music intervention.

At baseline, we obtained demographic information from chart review as well as interview, which included participants' sex, age, dementia type, severity (per most recent behavioral neurology office visit notes), and relationship to caregiver. At baseline and at Week 6 (study completion), participants underwent a Mini Mental State Examination (MMSE) (20) – in this case, a telephonic MMSE (21) since the appointments were conducted over telemedicine. This was done to ascertain a general sense of cognition. Participants also completed the Geriatric Depression Scale (GDS) (22), which measures any symptoms related to depression with higher scores indicating more depressive symptoms. The caregivers completed the Neuropsychiatric Inventory-Questionnaire Severity/Distress scales (NPI-Q/S/D) (23) to determine the severity of the participants' neuropsychiatric symptoms and the distress these caused the caregiver with higher scores indicating higher severity of symptoms and distress; the Modified Caregiver Strain Index (MCSI) (24) for assessing their strain related to caregiving with higher scores indicating greater strain; and the Patient Health Questionnaire-9 (PHQ-9) (25) to assess their own symptoms of depression. All data (initial demographics and survey results) were tracked in a Microsoft Excel spreadsheet dedicated to data collection. As a single-blinded intervention, the person making the pre-study and follow-up calls for survey completion did not know which participants were in the music therapy vs. music playlist group to prevent bias in data collection.

Data Analysis

In quantifying our data, descriptive statistics were provided for all variables. We primarily used the mean and range to compare age and scores on the various scales for the two groups at baseline (Table 1). We also used the mean and range to compare pre- and post-scores on various measures for both the Music Therapy and Music Playlist groups. Given the small sample size, high dropout rate, and exploratory nature of the analysis, it was not feasible to investigate statistical differences between the 2 groups. Thus, we embraced a qualitative approach in analyzing our data. This type of approach yielded more valuable conclusions about our data and its feasibility.

Results

A total of 24 participants were successfully recruited and randomized into the study and baseline measurements were completed for all participants and their caregivers (Table 1); groups were similar.

During the investigation, there was a 67% dropout rate, equal between the Music Therapy and Music Playlist groups (Figure 1). The reasons for dropout included unavailability of the patient due to a busy schedule with other appointments (6 participants), loss to follow-up with nonresponse to calls (7 participants), and deteriorating health/increasing hospitalizations that impacted the patient's ability to actively participate in sessions (3 participants).

Given the attrition rate, there were 4 participants in each group who completed the post-intervention follow-up. We compared those participants' pre- and post-intervention scores (Tables 2 and 3).

Table 2 demonstrates the pre- and post-scores on the measures of BPSD and cognitive function for the Music Therapy group that were part of the second specific aim. The difference between the post- and pre-scores for each measure has also been calculated for ease of interpretation. Note that for the MMSE, a positive difference score indicates improvement in overall cognitive function. However, in all other measures, a positive difference score would demonstrate deterioration due to a higher count of symptoms that correlate with depression, BPSD, or caregiver strain. A score of zero always indicates no change.

Based on this understanding, the scores for the Music Therapy group are split overall between improvement on some measures and deterioration on other measures, with little change in others. Thus, results were overall similar between pre- and post-intervention for the Music Therapy group.

Table 3 demonstrates the pre- and post-scores on the measures of BPSD and cognitive function for the Music Playlist group. The difference score for each measure has also been calculated and displayed here and should be interpreted in the same way that was previously described for Table 2.

	Music Therapy (n=12)	Music Playlist (n=12)
Age	75.83 (63-99)	74.92 (58-87)
MMSE (0-30)	17.08 (8-21)	19.83 (15-25)
GDS (0-30)	4.75 (0-10)	3.42 (0-10)
PHQ-9 (0-27)	13.33 (9-22)	12.42 (9-24)
NPI-Q (0-36)	7.92 (3-12)	8.92 (4-11)
NPI-S (0-36)	7.42 (1-20)	4.67 (0-15)
NPI-D (0-36)	10.50 (3-27)	6.92 (0-30)
MCSI (0-26)	8.58 (1-23)	8.25 (0-20)

Results average (range); MMSE=mini mental status examination, GDS=geriatric depression scale, PHQ-9
(Patient Health Questionnaire-9), NPI-Q,S,D (Neuropsychiatric Inventory Questionnaire, Severity, Distress)
MCSI (Modified Caregiver Strain Index)

Table 1. Demographics and Baseline Measures of Music Therapy and Music Playlist Groups

	Music Therapy Pre-score (n=4)	Music Therapy Post-score (n=4)	Music Therapy Score Difference
MMSE (0-30)	20.33 (20-21)	18.83 (16-23)	-1.50
GDS (0-30)	4.33 (0-8)	3.67 (0-6)	-0.66
PHQ-9 (0-27)	12.25 (9-17)	10.75 (9-12)	-1.50
NPI-Q (0-36)	7.50 (5-10)	8.00 (5-12)	0.50
NPI-S (0-36)	8.00 (2-13)	9.25 (0-16)	1.25
NPI-D (0-36)	9.50 (3-15)	13.75 (0-21)	4.25
MCSI (0-26)	3.75 (1-6)	3.75 (2-6)	0.00

Results average (range); MMSE=mini mental status examination, GDS=geriatric depression scale, PHQ-9 (Patient Health Questionnaire-9), NPI-Q,S,D (Neuropsychiatric Inventory Questionnaire, Severity, Distress), MCSI (Modified Caregiver Strain Index)

Table 2. Pre- And Post-Score Comparison of BPSD Measures and Cognitive Function for Music Therapy Group

	Music Playlist Pre-score (n=4)	Music Playlist Post-score (n=4)	Music Playlist Score Difference
MMSE (0-30)	19.00 (14-23)	20.64 (16-24)	1.64
GDS (0-30)	1.67 (1-3)	2.00 (1-3)	0.33
PHQ-9 (0-27)	10.25 (10-11)	9.75 (9-10)	-0.50
NPI-Q (0-36)	9.50 (8-11)	9.75 (7-12)	0.25
NPI-S (0-36)	3.25 (1-7)	3.25 (0-9)	0.00
NPI-D (0-36)	2.25 (1-4)	3.25 (0-6)	1.00
MCSI (0-26)	3.75 (1-8)	3.75 (1-10)	0.00

Results average (range); MMSE=mini mental status examination, GDS=geriatric depression scale, PHQ-9 (Patient Health Questionnaire-9), NPI-Q,S,D (Neuropsychiatric Inventory Questionnaire, Severity, Distress), MCSI (Modified Caregiver Strain Index)

Table 3. Pre- and Post-Score Comparison of BPSD Measures and Cognitive Function for Music Playlist Group

For the Music Playlist group, while the MMSE score improved by more than one-and-a-half points, the other scores either did not change, deteriorated, or improved only slightly (e.g., less than one point). Thus, there is no appreciable trend, and results were again overall similar between pre- and post-intervention for this group.

Discussion

As a pilot (proof-of-concept) study, this project presented many challenges along the way to successful completion. As the investigation progressed, there was a higher-than-expected dropout rate of participants. This two-thirds dropout led to a lower sample size, meaning that we could not use statistical testing to yield statistically significant conclusions about our data.

While there was a high attrition rate, this investigation had numerous strengths to offer. For one, the use of a single board-certified music therapist to provide the music therapy to all participants ensured that the intervention was standardized between intervention groups. In addition, the participant/caregiver dyads were also randomly assigned to the intervention and control groups. Furthermore, the pre- and post-study assessor was blinded to the group assignments. Overall, this is a low-risk intervention that may help alleviate BPSD without causing harm.

We were interested in delving into the qualitative side of data analysis to explore the underlying reasons for the high attrition rate by following up with the participants who dropped out and the music therapist's impressions of the intervention. Reasons for attrition included that the intervention was too time consuming, it was not interesting, there were too many house distractions, worsening course of dementia, loss to follow-up (nonresponse to follow-up calls), anxiety of the dyads (both members), low engagement with the therapy for some participants, scheduling difficulties, inconsistent attendance, interference with retirement, and health of the caregiver which impacted ability to participate.

There were several unanticipated challenges to successfully performing group telehealth music therapy. Limitations to this investigation include moderately high attrition rate for the reasons enumerated above leading to lower statistical significance and power; different severities of dementia in the participants (which may have led to differential engagement during therapy); and no way to know how much those in the Music Playlist group were listening to the music on their own.

With the Music Therapy and Music Playlist pre- and post-scores for BPSD and cognitive function, with special attention given to the difference scores, it does not appear as though there is any clear pattern with the trend of scores. While overall there are fewer downward trends in the Music Playlist group, the scores appear to be relatively stable before and after the intervention. The Music Therapy group has larger upward and downward trends when they occur. With such sizable variability of trends in the pre- and post-scores and a small sample size due to a high attrition rate, the data can only be qualitatively analyzed with no comment on statistical significance. With only four participants who completed the intervention in each group, the data is quite mixed, and there can be no firm conclusions drawn from it.

One question that we had regarding the high attrition rate was whether those who had dropped out had more advanced/severe stages of dementia as compared to those participants who completed the study. Because we only recruited participants with mild to moderate dementia, we wanted to explore whether those who did not complete the investigation tended to have more advanced stages of dementia while those who did complete tended to have milder dementia. This theory, however, did not hold. For the Music Playlist group, one out of the two participants with moderate dementia dropped out and 7 out of the 10 participants with mild dementia dropped out. In the Music Therapy group, 5 out of the 8 participants with moderate dementia dropped out and 3 out of the 4 participants with mild dementia dropped out. Thus, the data are again mixed, and nothing can definitively be concluded about the dementia severity of participants who tended to leave the study.

Due to the nature of this project as a pilot study, there is sparse literature exploring the feasibility of delivering group-based telehealth music therapy for persons living with dementia, while using a control group to compare effects on measures of BPSD and cognition. However, as briefly discussed in the introduction, veterans and children with neurodevelopmental disorders have been exposed to music therapy over telemedicine to relieve negative psychological symptoms experienced by these populations (13–15). Another group of studies had

looked at in-person individual and group music therapy sessions and assessed if these could be helpful for those with mental health disorders (16).

While these studies were promising, they posed several limitations, as well. One telehealth music study for veterans mentioned many challenges, including a lack of specificity in reporting and low evidence levels that supported statistical significance in music therapy making a real difference. (13) These limitations were like that in our investigation — where self-reports from participants about the quality of the music therapy varied, dropout rate was appreciable, dementia severity of the participants was uncontrolled for (i.e., proportion of mild versus moderate dementia in each group), and there was not enough power to confirm any specific trend of improvement with the intervention. However, another telehealth music study stated that while technological challenges were notable drawbacks in the study, major benefits of the neurologic music therapy were the ability to continue providing telehealth music therapy when in-person sessions were not possible, increased accessibility for clients living in rural areas, and positive outcomes due to increased engagement with the caregivers. (15) These benefits were also appreciated in our report — flexibility for participants who did not have to come in person for music therapy, increased accessibility for participants living in remote areas, and more involvement/enjoyment for the caregiver; these were all comments directly made by participant/caregiver dyads.

Another investigation emphasized limitations of music-based therapy more generally, without the telehealth component: "synthesis continues to be precluded by a wide variety of outcomes and outcome measures, a lack of quality reporting, and the inherent complexity of music-based interventions" (16). In our report, we did have quality reporting and used real, robust outcome measures — however, like the aforementioned investigation, we found that studying music-based interventions is complex. Another interesting investigation interestingly performed group-based telehealth music therapy on caregivers themselves, rather than those with dementia. Much like our study, telehealth music therapy was found to be a promising mode of care for caregivers, but that "more research is needed to develop clinical guidelines and best practices; to determine when, where, and why in-person or telehealth services might be indicated" (26).

There are numerous next steps that can be taken to establish future directions for this feasibility study. These may involve incorporating a formal protocol (27) that could improve generalizability and replicability (e.g., standardizing how much those in the Music Playlist group should listen to the music on their own, making sure that participants have similar severities of dementia) and integrating a structured open-ended discussion with patients and their caregivers which could provide more solid qualitative feedback about the investigation. Due to the high dropout rate, we did not believe that simply increasing the sample size or improving advertising would help to enhance feasibility for this study.

The board-certified music therapist offered a few more suggestions for next steps based on her direct experience with the participants. These include ensuring that the caregivers understand the time commitment and will be actively involved in the sessions, attempting a protocol in which the music therapist trains the caregiver in the use of music (the person with dementia is not expected to attend the session) to create a more caregiver-facilitated intervention, and grouping dyads based on assessment instead of random assignment to ensure higher group cohesion.

While there is a possibility that this investigation could be reproduced in the future while addressing the above challenges, it should be cautioned that the limitations may objectively outweigh any tangible benefit the participant/caregiver dyad can obtain in the long term. In other words, feasibility of carrying out such a group-based telehealth music therapy intervention may be low. Given the differential in dementia severity, music therapy engagement, and music preferences among the participants, music therapy with a single individual (or participant/caregiver dyad) over video call may be more advantageous due to the individualized attention that can be given in that setting. Another alternative would be to continue with in-person group or individualized music therapies as being superior to telehealth options due to better ability to build therapeutic rapport in that modality. A third interesting option would be carrying out a therapist-trained caregiver study. As caregivers are the individuals that the patients spend the most time with, there may be benefit if the caregivers were directly trained by therapists to provide music therapy.

The therapy may be better received by the patients in a more flexible setting with greater opportunities for growth, for both patient and caregiver.

Conclusion

While this was truly a novel study to investigate the feasibility of a group-based telehealth music therapy intervention for patients with dementia, it is our opinion that this specific therapy modality may not be feasible for this population of patients given the numerous limitations and challenges outlined above. Despite both interventions being relatively non-burdensome, dropout rate was higher than expected for a variety of reasons, resulting in mixed data from which no firm conclusion could be drawn. We had hypothesized a trend toward some benefit for participants in the Music Therapy group as compared to the Music Playlist group, but the sample size was too small to establish enough power to support this hypothesis. However, we were able to draw some qualitative conclusions about the investigation as described above, which may be helpful as teaching points or in other practical variations of the study in which feasibility may be improved for participant/caregiver dyads. We hope that these alternatives will better guide treatment and management of dementia in the primary care setting.

Disclosures

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