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The effects of personally preferred music on mood and behaviour in individuals with dementia: An exploratory pilot study

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ABSTRACT

Music has been shown to benefit individuals with dementia. There are, however, limited studies examining how assisted living staff members use preferred music for dementia patients. This controlled pilot study aimed to determine: 1) whether preferred music is effective in improving mood and behaviour and 2) whether a person-centred approach to music-based interventions is feasible for individuals with dementia. The 20 participants (mean age (SD) = 81 (8)) listened to a preferred song or control song in random order over 6 weeks with a five-day wash out period between the exposures. Neurobehavioral Rating Scale (NRS) and Observed Emotion Rating Scale (OERS) were used to measure participants' emotions and behaviour changes. Blood pressure and heart rate were collected to understand physiological responses to music. NRS was used to measure the behavioural changes in response to a listening intervention comprised of both preferred music and control music over the course of 14 sessions administered over six weeks. We observed no changes in NRS symptoms post-intervention. OERS scores and vital signs did not differ significantly between the preferred music and the control song despite trends. Participants/staff/family expressed the importance of preferred songs to evoke specific memories and increase well-being. Thematic analysis using sentiment components indicated a predominance of positive sentiment in the meaningful music category and a minor occurrence of negative sentiment in the control music.

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INTRODUCTION

There is a growing recognition of the benefits of non-pharmacological interventions in individuals with dementia (Anderson et al., 2017; Appel et al., 2021; Wang et al., 2019). Music-based interventions may benefit people with dementia (Gómez-Romero et al., 2017; Van der Steen et al., 2018), improving emotional, cognitive, and social skills and decreasing overt behavioural problems among persons with dementia (Fakhoury et al., 2017; Leggieri et al., 2019; Särkämö, 2018; Van der Steen et al., 2018) (review in (Abe et al., 2022)). Garrido et al. (2018) demonstrated that music preference in persons with dementia differentially affects psychological and behavioural symptoms (Garrido et al., 2018) and this was confirmed by a systematic review (Gaviola et al., 2020). Preferred music was shown to reduce agitation in individuals with dementia in long-term care settings (Sung et al., 2006), and the findings were echoed by Garland et al. (2007). Other studies revealed that personalised playlists improve overall happiness, anxiety, depression, and emotional expression (Buller et al., 2019; Pérez-Ros et al., 2019). Numerous behavioural measures are employed in dementia research to comprehend changes in behaviour. Specifically, the Neurobehavioral Rating Scale (NRS) is widely used as a valuable instrument for the structured assessment of a diverse array of cognitive, psychiatric, and behavioural disturbances in individuals with dementia. (Sultzer et al., 1992). Moreover, the utilisation of the Observed Emotion Rating Scale (OERS) (Schall et al., 2014) has been applied to understand short-term (same-day) changes in emotion. This scale was employed in a study involving music interventions for advanced dementia, revealing an enhancement in the expression of more positive emotions. In addition to behavioural and psychological changes, previous research has evaluated vital signs in order to determine the effectiveness of music in stabilizing blood pressure and heart rate (Lotter & Farquharson, 2021; Raglio et al., 2010; Takahashi & Matsushita, 2006).

However, there are no studies known to the authors of the role of self-selected, preferred songs in persons with dementia in long-term care settings using the following methodologies: 1) a single song selected with a validated preferred song questionnaire and a single control song across participants, 2) masking of administrators to the song condition, 3) involvement of healthcare staff in choosing the control song, 4) engagement of family and clinicians in continuity of care with music intervention, and 5) component of patient assent (i.e., individuals could choose when to participate in the study). In addition, many studies are conducted by a certified nursing assistant or trained music therapist in a nursing facility as a group music activity (Gaviola et al., 2020; Van der Steen et al., 2018; Zhang et al., 2017).

Thus, the aim of this exploratory pilot study was to determine 1) if preferred music is more effective in improving mood and behaviour than non-personally preferred music and 2) whether a

person-centred approach to music-based interventions is feasible for individuals with dementia in long-term care settings. We hypothesised that preferred music would improve mood and behaviour as compared to non-personally preferred music. We also hypothesised that a person-centred approach to music-based interventions is feasible for individuals with dementia.

MATERIALS AND METHODS

Participants

Twenty residents (Female = 12; mean age (SD)= 81 (8)) who resided in a single dementia-specific assisted living community participated in this study (Table 1). All participants in this study were legally incapable of giving informed consent and thus, Powers of Attorney (POAs) were asked to give written consent on behalf of the participant. All participants assented, verbally or nonverbally (e.g., head nods, smiles) to their participation in the music intervention before the study team began observations. This study was approved by the UMBC Institutional Review Board (IRB # Y18TM26107). All procedures performed involving human participants were in accordance with the 1964 Helsinki declaration.

Participants (N=20)		n	%
Age (mean: 81 years; SD: 8)	65-75	4	20
	76-86	12	60
	>87	4	20
Gender	Male	8	40
	Female	12	60
Race	White/Caucasian	19	95
	Asian	1	5
Clinical diagnosis	Alzheimer's disease	8	40
	Frontotemporal dementia	6	30
	Vascular dementia	6	30

Table 1: Participants' demographic data

Study design and data collection

This exploratory pilot study was conducted over eight weeks. Figure 1 shows the study design and data collection timeline. In both the initial and eighth weeks, a certified therapeutic recreation specialist administered the Neurobehavioral Rating Scale (NRS) to identify changes in participant behaviours before and after completion of study interventions. The NRS required a certified therapeutic recreation specialist to rate the level of severity of 27 behavioural symptoms (Bradt et al., 2013). Higher scores indicated greater presence of neuropsychiatric symptoms.

W1	W2			W3			W4	W5	W6					W7		W8
NRS	S1	S2	S3	S4	S5	S6	S7	Wash-out period		S8	S9	S 10	S 11	S 12	S 13	S 14	NRS

Each Session

	Pre-session	During-session	Post-session
Rater 1	OERS (5 minutes)	OERS (5 minutes)	OERS
Rater 2	A short informal interview	Pulse and blood pressure	Pulse and blood pressure
	Recorded the pulse and blood pressure		A short informal interview

Note: NRS = Neurobehavioral Rating Scale; W = week; S = session; First 7 sessions = either preferred or control music;
Last 7 sessions = either preferred or control music; ORES = Observed Emotion Rating Scale;
▢ = either preferred song or control music; ▢ = alternation of previous music

Figure 1: Study design

Over six weeks, the study team observed the participants listening to music, three times a week, for fifteen minutes each session including the assessments (Observed Emotion Ration Scale, [OERS] and vital signs). OERS was used to observe short term outcome changes in emotion among the participants before, during, and after sessions (Van Haitsma & Klapper, 1999). The study team estimated the duration of each emotion (e.g., pleasure, anger, anxiety/fear, sadness, general alertness) before, during, and after each session using a Likert scale 1-5 (i.e., never, less than 16 seconds, 16-59 seconds, 1-5 minutes, more than 5 minutes, respectively). For the vital signs, trained staff members measured the participants' pulse and respiratory rate for one minute before, during, and after each session. During week 8, the certified therapeutic recreation specialist re-administered the NRS.

Participants listened to either the preferred or control song for the first seven sessions and listened to an alternation of preferred or control song for the last seven sessions that was followed by a five-day washout period. The songs were administered in random order. Therefore, each participant served as their own control group in the intervention. A CD player or iPod was used to play the songs. The CDs were labelled with a number in accordance with the participant, so both raters were masked to the song type (either their preferred song or the control song).

To maintain the person-centred (Fazio et al., 2018) nature of the intervention, the study team approached participants based on their preferred time of day and asked if they wanted to listen to music. Prior studies suggest that music-based interventions may have different behavioural effects at different times of the day (Robb et al., 2011). Therefore, study staff played music for each participant at the same time of day in a quiet area to avoid distractions or interruptions.

The preferred songs were identified using Gerdner et al.'s (2000) Assessment of Personal Music Preference (Family Version). The assessment consisted of nine questions which included identifying a specific song that was most enjoyable to the participant. POAs completed this questionnaire and were encouraged to choose a song known to affect the participant in a deep, enduring and emotional way. Importantly, song selection was intended to be a collaborative process between participant and their family (or POAs). Using a Spotify application, the participants' preferred music selections were collected along with tempo (beats per minute), energy (i.e., the higher the value, the more energetic the song), danceability (i.e., the higher the value, the easier it is to dance to the song), loudness (i.e., the higher the value, the louder the song in decibels), valence (i.e., the higher the value, the more

positive mood for the song), acoustic (i.e., the higher the value, the more acoustic the song) and averages with standard deviations for each category (see Appendix, Supplementary Material 1).

The control song "Ex-Factor" by Lauryn Hill from 1998 was randomly selected from a list of nursing staff's favourite songs (characteristics of this song can be found in the Appendix, Supplementary Material 1). The study staff confirmed with the participant's POA that the control song is not personally preferred to the participant. This pragmatic pilot was designed to keep the primary decisional dilemma of the care community staff and patients in the study in mind. Specifically, the staff of the community were playing music relevant to both their own backgrounds and generations for the patients in a generalised fashion, claiming that these forms of music elicited emotional responses from the individuals better than an individualised or even a generation-based approach to background music. Thus, we selected a control song in the study through a staff-led process, focused on not just a song that was in contrast to many of the personally meaningful songs that were specific to patients, but one that was relevant and more likely to be played by staff during times when they were caring for these patients. All staff involved (dining, housekeeping, nursing) were involved in a voting process to select the songs as the most likely to be played during these care times.

Data analysis

The presence of NRS symptoms along four factors (i.e., cognition/energy, metacognition, somatic/anxiety, and language) were compared pre- and post-intervention (i.e., before and after the 8-week study) for a total of 18 participants (2 out of 20 participants did not complete the NRS due to interim hospital stays). Averages of NRS symptom severity was also compared between pre- and post-interventions and was defined on a 0-6 Likert scale (0 = not present, 1 = very mild, 2 = mild, 3 = moderate, 4 = moderate-severe, 5 = severe, 6 = extremely severe). The OERS item scores for pre- and post-intervention were compared for 20 participants. Nineteen participants had adequate data for calculating averages of the vitals [systolic and diastolic blood pressure (mm Hg) post-intervention; heart rate (beats per minute, BPM)] pre- and post-intervention. Change scores (i.e., post- minus pre-intervention) for NRS, OERS, and vitals were also analysed.

Qualitative data were collected by writing down quotes from facility staff who observed the residents before, during and after the interventions. This could be any words, phrases, singing, gestures, or reactions that were observed during the 15 minutes that were related to each intervention timepoint (see Appendix, Supplementary Material 2). Analysis of staff quotes was conducted using MAXQDA (Kuckartz & Rädiker, 2019). In order to comprehend the varied reactions to meaningful music and control music, the staff's statements were categorised into four themes: meaningful music, control music, direct quotes from participants, and additional observations. The entire research team examined the analysis to determine if the quotes were appropriately aligned with the theme. Sentiment analysis involved the automatic identification of words that were then attributed to each code. Emotions expressed by participants were classified as positive, slightly positive, neutral, slightly negative, and negative.

Statistical analysis

Statistical analysis was performed in IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp.,

Armonk, New York, USA). Normality was assessed using the Shapiro-Wilk test. Due to non-normality, a Wilcoxon signed-rank test was conducted to compare pre- and post-intervention presence of NRS symptoms and severity of NRS symptoms (N = 18). For the presence of NRS in the four factors, a 2 (pre-intervention, post-intervention) by 4 (cognition/energy, metacognition, somatic/anxiety, language) repeated measures ANOVA was conducted (N = 18). For average OERS, a two-way 2 (preferred music vs control) by 5 (pleasure, anger, anxiety/fear, sadness, general alertness) repeated measures ANOVA (N = 20) was conducted. Due to non-normality, a Wilcoxon signed-rank test was conducted to determine differences post-intervention for blood pressure and heart rate between personally preferred music and control music (N = 19).

For change scores (post - pre), due to non-normality, a Wilcoxon signed-rank test was conducted for each vital sign (i.e., systolic blood pressure, diastolic blood pressure, and heart rate) to compare between personally preferred music and control music. For change scores in OERS, a two-way 2 x 5 repeated measures ANOVA (N = 20) was conducted. Statistical significance was set to $p < 0.05$ (two-tailed) for all analyses.

RESULTS

NRS

There were fewer neurobehavioral symptoms (out of 27) during pre-intervention (M = 1.90, SD = 1.50) compared to post-intervention (M = 2.70, SD = 2.00) but this was not statistically significant (Z = - 1.63, p = 0.10) (Figure 2A). For the severity of NRS symptoms, both pre- (M = 1.03, SD = 0.66) and post-intervention symptoms (M =1.26, SD = 0.80) were on average very mild (Figure 2B). There was no statistically significant difference between the pre-intervention and post-intervention groups (Z = - 1.16, p = 0.25).
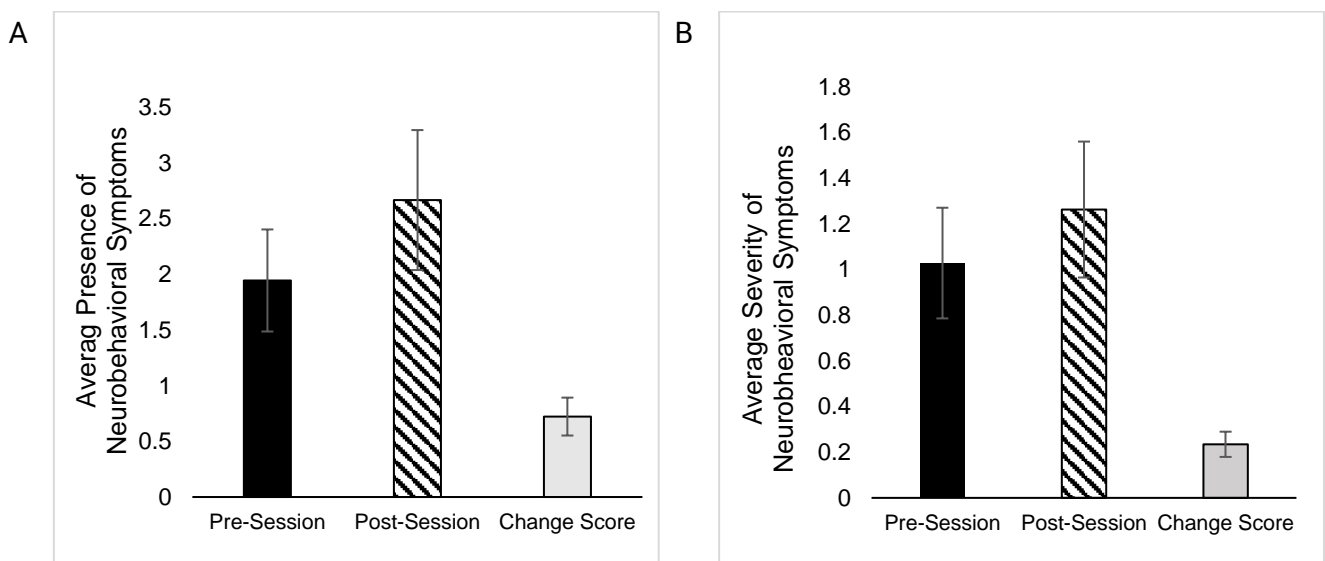
Note: A. Presence of neurobehavioral symptoms; B. Severity of present neurobehavioral symptom; Error bars: Standard error

Figure 2: NRS score

For presence of NRS factors, the 2 (time point: pre-intervention, post-intervention) by 4 (factors: cognition/energy, metacognition, somatic/anxiety, language) repeated measures ANOVA revealed no significant main effect for intervention ($F(1,34) = 1.85$, $p = 0.18$) or intervention by factor ($F(3,102) = 0.29$, $p = 0.84$). There was a main effect of factor ($F(3,102) = 25.90$, $p < 0.001$). Overall, there were fewer symptoms present pre-intervention (M = 1.17, SD = 0.86) compared to post-intervention for factors of cognition/energy symptoms (M = 1.22, SD = 0.94), metacognition symptoms (Pre: M = 0.06, SD = 0.24 vs Post: M = 0.33, SD = 0.77), somatic/anxiety symptoms (Pre: M = 0.17, SD = 0.38 vs. Post: M = 0.28, SD = 0.46), and language symptoms (Pre: M = 0.17, SD = 0.38 vs. Post: M = 0.39, SD = 0.50) (Figure 3A-D).
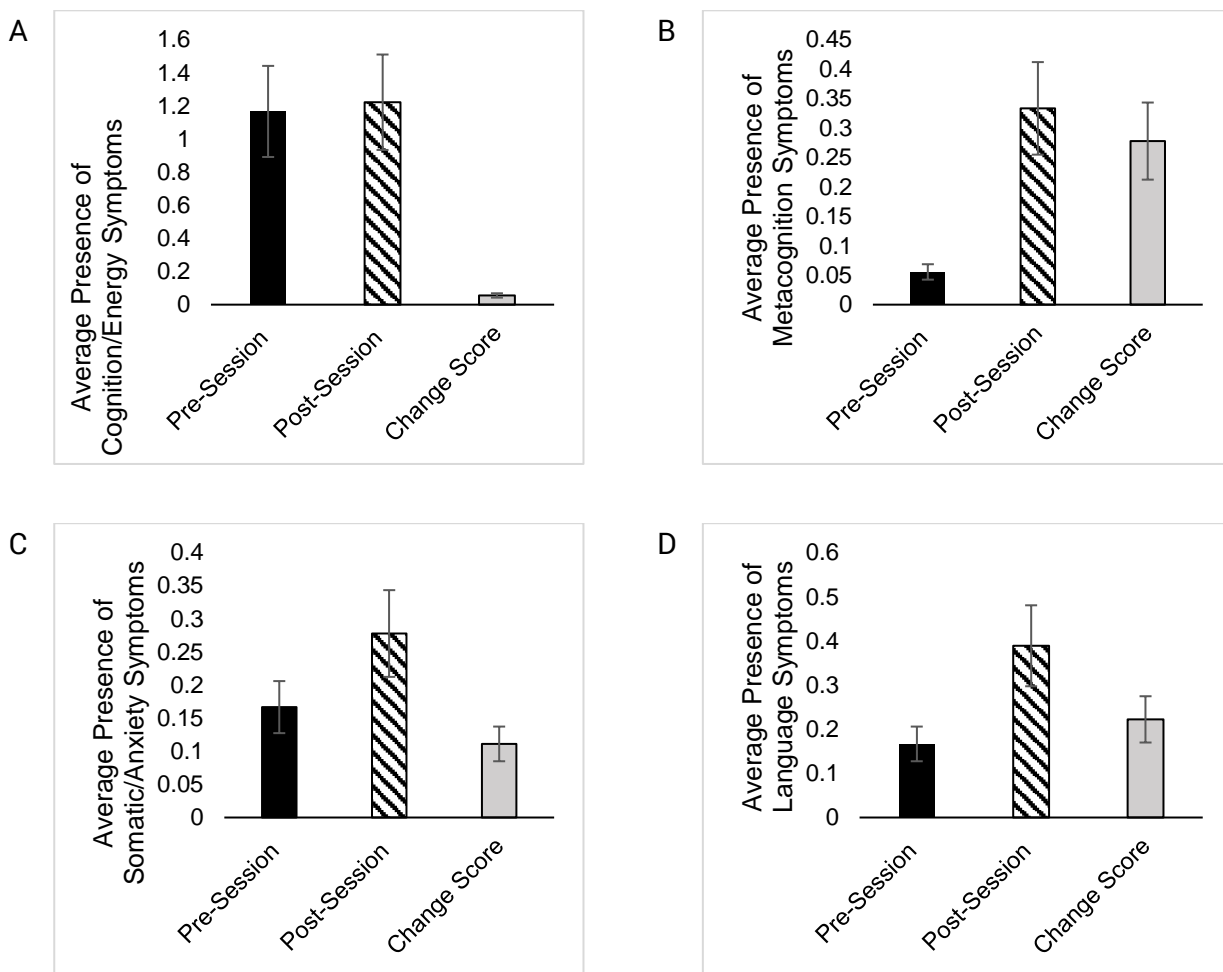
Note: A. Presence of cognition/energy symptoms; B. Presence of metacognition symptoms; C. Presence of somatic/anxiety symptoms; D. Presence of language symptoms; Error bars: Standard error

Figure 3: NRS factor scores

OERS

There were no significant main effects for music condition ($F(1,38) = 0.01$, $p = 0.93$) or music condition by emotion interaction ($F(4,152) = 0.13$, $p = 0.29$). There was a main effect for emotion ($F(4,152) = 92.20$, $p < 0.001$). Pleasure duration was less in the control song condition (M = 3.15,

SD = 1.23) versus the preferred song (M = 3.60, SD = 1.14) and anger duration was greater in the control song condition (M = 2.10, SD = 0.45) compared to the preferred song (M = 2.00, SD = 0.00). Anxiety and fear duration were greater in the control song condition (M = 2.50, SD = 1.00) compared to the preferred song (M = 2.20, SD = 0.52). Sadness duration was greater in the control song condition (M = 2.50, SD = 0.95) compared to the preferred song (M = 2.45, SD = 0.94). General alertness duration was similar for the control song condition (M = 5.00, SD = 0.00) compared to the preferred song (M = 4.95, SD = 0.22) (Figure 4).

For change scores, there were no significant main effect for the music condition ($F_{(1,38)}$ = 0.13, p = 0.72) or emotions ($F_{(4,152)}$ = 1.45, p = 0.23). There was also no music condition by emotion interaction ($F_{(4,152)}$ = 0.66, p = 0.62). However, the control song condition decreased the duration of pleasure, increased anger, anxiety, and fear compared to the preferred song. Sadness and general alertness duration changes were similar between the two music conditions.
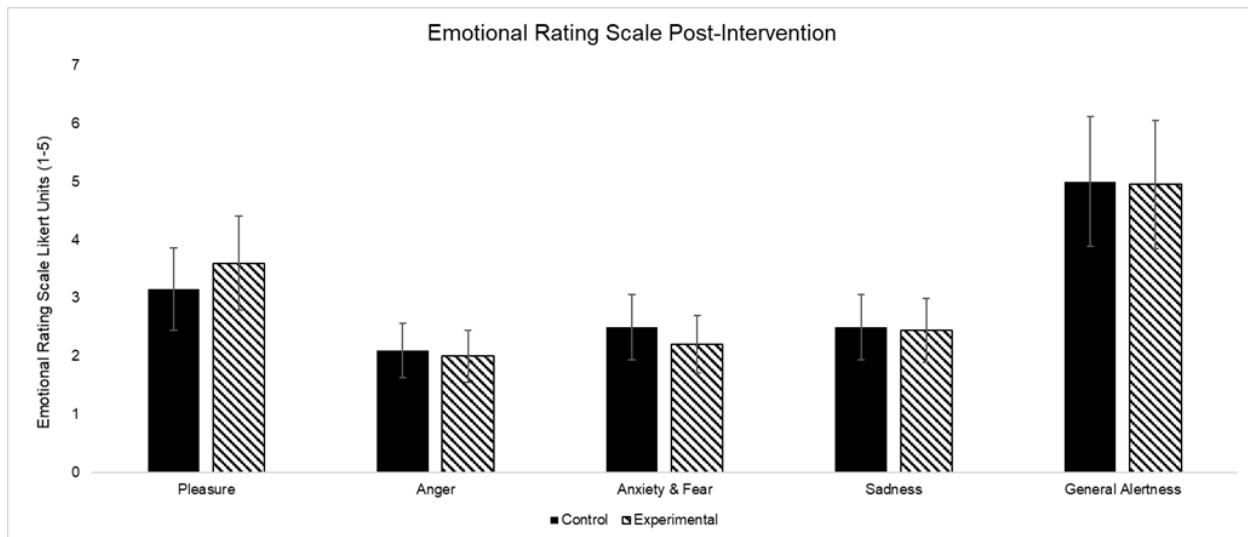
Note: Error bars: Standard Error; Experimental = preferred music

Figure 4: OERS scores post-intervention

Vital signs

Systolic blood pressure was lower in the control song condition (M = 129, SD = 25 mm Hg) versus the preferred song (M = 130, SD = 29 mm Hg) but this was not statistically significant (t(18) = - 0.04, p = 0.97). Diastolic blood pressure was higher in the control song condition (M = 84, SD = 25 mm Hg) versus the preferred song (M = 78, SD = 19 mm Hg) (Z = - 1.11, p = 0.27). Heart rate was higher in the control song condition (M = 76, SD = 12 BPM) versus the preferred song (M = 71, SD = 12 BPM) (Z = - 1.33, p = 0.18) (Figure 1A). There were no significant results for change scores in systolic blood pressure (Z = - 1.01, p = 0.92), diastolic blood pressure (Z = - 1.88, p = 0.06), or heart rate (Z = - 1.02, p = 0.31). However, systolic blood pressure decreased in the control song condition and increased in the preferred song. The opposite was seen for diastolic blood pressure. There was a greater decrease in heart rate for the preferred song condition compared to the control song condition.

Participants' responses

Over 1,000 quality minutes were spent with participants. Some meaningful participant quotes included: "Thank you for my morning pick me up", "These visits added something new to my day," "Thank you for being my friend", and "I've been waiting for you! I'm ready for music." Staff members noted: "While listening to their preferred songs, participants sang, danced, relaxed, cried, and taught the study team words in other languages."

More representative quotes from participants' caregivers are below:

A laugh of pure joy came over her as we played her meaningful music.

During the preferred song, I was blown away by the fact that she had this sparkle in her eyes. She was filled with pure joy. She would sing the ENTIRE song loud and proud – and even would sing the song after the music was over.

He would loudly sing his preferred song, and he would just echo pure joy and happiness during it. I couldn't help but laugh sometimes, because he'd be moving his shoulders, tapping his foot, playing the air piano, and always act like he was conducting. He even took a bow at the end every time. He was having a blast!

Staff members' observations and quotes

Within the pool of 64 statements, 13 were affiliated with meaningful music, 5 were linked to control music, 8 were direct quotations from the patients, and 6 comprised supplementary observations provided by the staff. The sentiment analysis revealed distinct trends across different themes. The sentiments associated with each theme were as follows:

- Meaningful Music: The majority of statements related to meaningful music exhibited a positive trend, with a prevalence of Positive (1) and Slightly Positive (6) sentiments.

Sentiment	Staff's statement
Positive	A laugh of pure joy came over her as we played her meaningful music.
Slightly positive	During the meaningful song, I was blown away by the fact that she had this sparkle in her eyes. She was filled with pure joy. She would sing the ENTIRE song loud and proud – and even would sing down the hall after the music was over.
	Knew all the words to her meaningful song! In German! She would always talk about her family afterwards.
	He said we (meaning him & the study team) would ROCK his end of the hallway, because he would just sing loud and proud his meaningful song.
	When his meaningful song was playing he would talk for a bit afterwards about his music background and how important the saxophone was to him.
	He liked all music, but you could tell when he had his meaningful song he wanted to talk to you all about jazz music.

> Once we switched to the meaningful song, she would be silent and listen. The second the headphones came off, she was back to talking again.

Table 2: Sentiment analysis for the meaningful music

- Control Music: Sentiment analysis indicated a minor occurrence of negative sentiment in the context of control music, primarily characterised by Negative (1) expressions.

Sentiment	Staff's statement
Negative	During part 1 of the study she was not enjoying herself. She would call out "this is too much for me", "I don't want it" (meaning the headphones). She even spit on the table during our first session. She was angry, frustrated and confused. That was during the control song.

Table 3: Sentiment analysis for the control music

- Direct Quotes from Patients: Direct quotes from the patients encompassed a diverse range of sentiments, including Positive (2), Slight Positive (4), Slight Negative (1), and Neutral (1), indicating a nuanced emotional response to the discussed topics.
- Additional Observations by the Staff: Analysis of the staff's additional observations highlighted a limited occurrence of slightly negative sentiment expressions, with a frequency of Slightly Positive (1), Neutral (3), and Slightly Negative (2) sentiments.

For an in-depth exploration of the sentiment distribution within each theme, the specific statements categorised under each sentiment can be found in the Appendix, Supplementary Material 3.

DISCUSSION

This study demonstrated that listening to preferred music can be a practical and feasible intervention for individuals with dementia in an assisted living community. No significant differences were found in behavioural and emotional changes assessed by NRS and OERS before and after music listening and between control and preferred songs post-intervention. Lower than expected severity of neurobehavioral symptoms at baseline limits the generalisability of our results. However, we obtained valuable qualitative insights from patients, family and staff using a short interview.

Reviewing the results carefully and reporting on challenges and limitations are essential for the development of future studies. First, each participant (or caregiver) selected their preferred song, which can evoke varying levels of arousal and emotion. Different emotional responses to each preferred song may limit our understanding of change in emotional components of the OERS (e.g., pleasure, anger, anxiety/fear, sadness, general alertness) between control and preferred song. A post-acoustic characteristic analysis using Spotify revealed significant differences between the control and the average of participants' preferred songs (see Appendix, Supplementary Material 1). The variability in preferred song characteristics (e.g., tempo, energy, dance, loud, valence, and acoustic) among participants should be taken into account when drawing conclusions. Additionally, even though participants or caregivers verified the lack of familiarity and preference for the control

song, the emotional responses/perceptions of the control song for each participant were different, which may have contributed to difficulties comparing it to the preferred songs. Furthermore, even though participants or caregivers verified the lack of familiarity and preference for the control song, the emotional responses/perceptions of the control song for each participant were different, which may have contributed to difficulties comparing it to the preferred songs. In particular, some of the control song's lyrics could have evoked sad/depressing feelings. Future studies should refine the process of control song selection as per the recently published NIH MBI Toolkit (Edwards et al., 2023) and consider using several control songs, or comparing a personally selected playlist to a control playlist.

One of the clinical goals of listening to music was to evoke participants' memories of events and people. Therefore, it would be prudent to formally assess autobiographical memory in a future study. Additionally, the NRS has been used to understand neurobehavioral symptoms including cognitive, affective, and neuropsychiatric domains over longer follow up periods (McCauley et al., 2001). Several prior studies reported significant changes in cognition/energy, metacognition, and language factor scores from the initial assessment (3 months post-injury) to the follow-up assessment at 6 months after the injury (Levin et al., 1987; McCauley et al., 2001). We assessed NRS before and after 6 weeks of music listening, which may have been too short a time span for the NRS.

Further, it is important to note that the preferred songs selected by participants and/or their caregivers may have carried varying levels of meaning/autobiographical valence leading to substantial differences in their neurobehavioral responses. Several participants reported that their preferred song has special meaning for them, but we were not able to collect information about all participants' level of meaningfulness. A standardised assessment (i.e., Gerdner music preference questionnaire (Gerdner et al., 2000) was used to collect preferred music; however, understanding the emotional/arousal changes would benefit from assessing level of personal meaning/connection to each song as well.

Qualitative narratives from the staff, caregivers, and participants provided valuable insight into the short-term behaviour changes induced by listening to music for individuals with dementia (see Appendix, Supplementary Material 2). The importance of qualitative data cannot be overstated in this context. While we can observe and analyse emotional and behavioural changes from standard assessments, drawing conclusions with only quantitative data might not allow us to fully understand participants' or caregivers' perspectives (Bradt et al., 2013). Our qualitative analysis found distinct patterns of sentiment within statements that were reported by the staff when comparing personally meaningful and control music, revealing a higher frequency of positive trends associated with meaningful music and a higher frequency of negative sentiment components during listening to control music. The positive emotional impact of meaningful music has been extensively studied. For example, previous research focusing on daily listening that triggers autobiographical memory found associations with positive or mixed emotions (e.g., happiness, nostalgia (Jakubowski & Ghosh, 2021). They also found that older participants tended to rate their MEAMs (Music-Evoked Autobiographical Memories) as more vivid and accompanied by more positive emotions. We employed the auto-detect sentiment analysis using MAXQDA; however, it is important to note that sentiment analysis may face difficulties in precisely unravelling the subtleties of linguistic nuances and the intricacies inherent to diverse cultural contexts. This could lead to varying interpretations of sentiment or emotional expression. Therefore, rigorous validation processes and a nuanced understanding of the data are

warranted to help mitigate these challenges in the future and enhance the reliability and validity of these types of analysis.

Furthermore, the importance of ecological measures in music-based interventions is growing (Edwards et al., 2023). The vital sign measurements used in this study could have potentially impacted the behavioural outcomes, considering that they were obtained during the course of music listening sessions. To address this challenge in the future, we propose that other measures be used in the assessment of outcomes, such as ecological momentary assessment of participants' behaviour and experience (e.g., smartwatches capable of monitoring/recording heart rate and/or blood pressure). This will improve the quality of care provided, increase the relevance of interventions and support a more holistic and inclusive approach to care delivery. While we aimed to approximate the experience of delivering a music listening intervention in a real assisted living facility, we acknowledge that outside of the study setting, this experience would be different; for example, there would be no control song and rather than playing a single song the patient would most likely be exposed to a playlist.

Music therapy holds significant potential to improve the well-being of individuals with dementia. However, despite its benefits, there are challenges when it comes to ensuring accessibility to these services. In many nursing facilities, retirement communities, and caregiver's homes, the availability of trained personnel and music therapy services remains limited due to financial constraints and a lack of music therapists when considering the number of elder care facilities (Mondanaro, 2019; Wong, 2020). Thus, a "music medicine" approach to music-based interventions (i.e. delivery of music-based interventions by someone other than a licensed trained music therapist), as pursued in our study, is often more pragmatic. Furthermore, multi-centre studies comparing music therapy to music medicine approaches need to be conducted. It is important to educate the community, stakeholders, and decision-makers about the benefits of music therapy. Aside from engaging in preferred song listening, collaborating with the staff and music therapists at the care facility will facilitate a more comprehensive approach tailored to each patient's needs.

CONCLUSION

This study allowed for (a) the involvement of families and residents for identifying a preferred song, (b) the involvement of staff for identifying the control song, (c) the observation of changes in mood, behaviour and vital signs, (d) a one-on-one interaction with participants, and (e) the involvement of a study team who were not trained music therapists. This study was designed for one-on-one music-based engagement at a time that best suited the resident and was tailored to their circadian rhythm. Our results and discussion of pitfalls/limitations provide useful information for those interested in designing and implementing a preferred music intervention for individuals with dementia in institutional settings.

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APPENDIX: SUPPLEMENTARY MATERIALS

Supplementary material 1

Title	Artist	Tempo	Energy	Dance	Loud	Valence	Acoustic
Control song							
EX-Factor	Lauryn Hill	80	62	59	-9	67	12
Participants' meaningful/preferred songs							
Meet Me in St. Louis	Judy Garland	91	24	49	-12	80	78
Die Forelle (The Trout)	Franz Schubert	73	12	34	-19	19	98
Victory in Jesus	Eugene M. Bartlett	115	3	35	-29	29	97
Avinu Malkeinu	Barbra Streisand	130	24	21	-12	7	97
Luck Be a Lady	Frank Sinatra	151	40	36	-14	50	74
Over the Rainbow	Judy Garland	85	5	19	-21	23	91
Serenade in Blue	Stan Getz	77	12	50	-17	31	98
Kokomo*	The Beach Boys	116	57	68	-12	94	1
New York, New York	Frank Sinatra	94	50	31	-7	55	59
Through the Years	Kenny Rogers	131	48	56	-7	24	24
Danny Boy	Frederic Weatherly	97	12	20	-13	13	97
Clair de Lune	Claude Debussy	87	13	20	-18	8	86
Ode to Joy	Ludwig van Beethoven	147	22	24	-17	6	96
Always on my Mind	Elvis Presley	181	39	36	-14	50	75
The Christmas Song	Nat King Cole	79	21	32	-15	21	92
Summertime	Ella Fitzgerald	169	13	16	-18	11	92
America	Neil Diamond	126	76	52	-7	17	1
Minnie the Moocher*	Duke Ellington	103	41	38	-11	60	41
O Tannenbaum	Suber Die Glocken Nie Klingen	120	6	75	-18	38	93
My Way	Frank Sinatra	75	38	40	-7	23	70
Average	N/A	**112**	**28**	**38**	**-14**	**33**	**73**
Standard Deviation	N/A	**32**	**20**	**16**	**5.5**	**25**	**32**

*We were not able to verify the meaning of the selected song with the participant.

Table 4: Participants' meaningful music selections and control song characteristics

Note: Tempo was defined as beats per minute. Energy was defined as the higher the value, the more energetic the song. Danceability was defined as the higher the value, the easier it is to dance to the song. Loudness was defined as the higher the value, the louder the song in decibels. Valence was defined as the higher the value, the more positive mood for the song. Acoustic was defined as the higher the value, the more acoustic the song.

Supplementary material 2

SHORT NARRATIVES FROM OBSERVING

- Ms-01
  - During part 1 of the study she was not enjoying herself. She would call out "this is too much for me", "I don't want it" (meaning the headphones). She even spit on the table during our first session. She was angry, frustrated and confused. That was during the control song.
  - During the meaningful song, I was blown away by the fact that she had this sparkle in her eyes. She was filled with pure joy. She would sing the ENTIRE song loud and proud – and even would sing down the hall after the music was over.
- Ms-02
  - A laugh of pure joy came over her as we played her meaningful music.
- Ms-03
  - Aphasic resident. I (and other staff members) had never heard him speak, but the power of his meaningful song had him speaking a few phrases. Everyone was blown away.
- Ms-04
  - Aphasic resident. Always very anxious, and restless. She would constantly be moving back and forth in her wheelchair. But once we pressed play on her meaningful song, she would instantly sit back and immediately relax for the entire song.
- Ms-05
  - She was very talkative. She would talk through the entire control song. Once we switched to the meaningful song, she would be silent and listen. The second the headphones came off, she was back to talking again
- Ms-06
  - When we began the observations, and would be holding her hand, it would be a tight grip. And then once the music started, her grip would loosen, and then when the music was over it would tighten again.
- Ms-07
  - When his meaningful song was playing he would talk for a bit afterwards about his music background and how important the saxophone was to him. Verses, when we played the control song, he would just say "that's nice."
    - He liked all music, but you could tell when he had his meaningful song he wanted to talk to you all about jazz music.
  - (not Jazz music related) One time, went to go find him for an observation. He was walking towards a piano in the hallway. He wanted to know if it worked, but I wasn't sure. He plugged it in, and started fiddling with the keys on the piano. And after a minute or so, he began to play a familiar tune. He started playing Lean on Me, and then sang the ENTIRE song. I cried.
- Ms-09
  - He would loudly sing his meaningful song, and he would just echo pure joy and happiness during it. I couldn't help but laugh sometimes, because he'd be moving his shoulders, tapping his foot, playing the air piano, and always ask like he was conducting. He even took a bow at the end every time. He was having a blast!
  - He would say "thank you for my morning pick me up."
- Ms-10
  - She would always say "thank you for being my friend" after observations.

- Ms-11
  - He said we (meaning him & the study team) would ROCK his end of the hallway, because he would just singing loud & proud his meaningful song. When the control song was on, he was just listening.
  - Said he would enjoy this continue. Especially on the weekends because tv is no good
  - He would like it if someone came to talk to him more. Felt like prisoner.
    - "It's so great that I have you guys to talk too"
- Ms-12
  - She would always say thank you, and give us hug and kisses.
- Ms-13
  - Thoroughly enjoyed the music session, he said "it just added something new to my days. A nice change of pace." He said he would love for the sessions to continue, and would even enjoy to go the symphony one day.
- Ms-14
  - She would just happily listen to the control song, but when her meaningful song was on she became sombre. She would start to cry, and at first I wasn't expecting it. But as she continued to listen to her meaningful song, she would cry session after session. But this was OK – her and I developed such a great bond through this experience. And she knew it was OK to cry, it's always OK to cry it's an emotion, but she felt safe. Because I would maintain eye contact with her, and rub her hand. And she knew she was in a safe space to express those emotions.
- Ms-15
  - He loves music in general. But when the music would come on, he would always dance. He would sometimes lean in for a kiss too. But it was so funny we couldn't collect his vitals, because he would be hitting his hands on his legs to the beat. Or holding our hands and dancing with them.
- Ms-16
  - She knew all the words to her meaningful song, and it would even make her tear up at times as she would sing through the song.
  - She would say "I've been expecting you" or "I've been waiting for you."
    - She knew we were going to listen to music & sing.
  - She would always conduct with her arm
- Ms-19
  - Knew all the words to her meaningful song! In German! She would always talk about her family afterwards.

Supplementary material 3

Code System	Music Study_Observations_Quotes	SUM
⌄ Additional Observations	●	6
⌄ Sentiment		0
Positive		0
Slightly Positive	·	1
Neutral	●	3
Slightly Negative	●	2
Negative		0
No sentiment		0
⌄ Quatation	●	8
⌄ Sentiment		0
Positive	·	2
Slightly Positive	●	4
Neutral	·	1
Slightly Negative	·	1
Negative		0
No sentiment		0
⌄ Meaningful music	●	13
⌄ Sentiment		0
Positive	·	1
Slightly Positive	●	6
Neutral	●	6
Slightly Negative		0
Negative		0
No sentiment		0
⌄ Control Music	●	5
⌄ Sentiment		0
Positive		0
Slightly Positive	·	1
Neutral	●	3
Slightly Negative		0
Negative	·	1
No sentiment		0
Σ SUM	64	64

MAXQDA 2022 Smart Coding Tool – Meaningful music

Document	Coded segments	Codes
Music Study_Observations_Quotes, Pos. 4	During the meaningful song, I was blown away by the fact that she had this sparkle in her eyes. She was filled with pure joy. She would sing the ENTIRE song loud and proud—and even would sing down the hall after the music was over.	Sentiment > Slightly Positive
Music Study_Observations_Quotes, Pos. 6	A laugh of pure joy came over her as we played her meaningful music.	Sentiment > Positive
Music Study_Observations_Quotes, Pos. 8	the power of his meaningful song had him speaking a few phrases. Everyone was blown away.	Sentiment > Neutral
Music Study_Observations_Quotes, Pos. 10	But once we pressed play on her meaningful song, she would instantly sit back and immediately relax for the entire song.	Sentiment > Neutral
Music Study_Observations_Quotes, Pos. 12	Once we switched to the meaningful song, she would be silent and listen. The second the headphones came off, she was back to talking again	Sentiment > Slightly Positive
Music Study_Observations_Quotes, Pos. 16	When his meaningful song was playing he would talk for a bit afterwards about his music background and how important the saxophone was to him. Verses, when we played the control song, he would just say "that's nice."	Quatation Sentiment > Positive Sentiment > Slightly Positive Control Music Sentiment > Slightly Positive
Music Study_Observations_Quotes, Pos. 17	He liked all music, but you could tell when he had his meaningful song he wanted to talk to you all about jazz music.	Sentiment > Slightly Positive
Music Study_Observations_Quotes, Pos. 20	He would loudly sing his meaningful song, and he would just echo pure joy and happiness during it. I couldn't help but laugh sometimes, because he'd be moving his shoulders, tapping his foot, playing the air piano, and always ask like he was conducting. He even took a bow at the end every time. He was having a blast!	Sentiment > Neutral
Music Study_Observations_Quotes, Pos. 25	He said we (meaning him & the study team) would ROCK his end of the hallway, because he would just singing loud & proud his meaningful song.	Additional Observations Sentiment > Neutral Sentiment > Slightly Positive
Music Study_Observations_Quotes, Pos. 34	when her meaningful song was on she became somber. She would start to cry, and at first I wasn't expecting it. But as she continued to listen to her meaningful song, she would cry session after session. But this was OK—her and I developed such a great bond through this experience. And she knew it was OK to cry, its always OK to cry its an emotion, but she felt safe. Because I would maintain eye contact with her, and rub her hand. And she knew she was in a safe space to express those emotions.	Sentiment > Neutral

Music Study_Observations_ Quotes, Pos. 36	He loves music in general. But when the music would come on, he would always dance. He would sometimes lean in for a kiss too.	Sentiment > Neutral
Music Study_Observations_ Quotes, Pos. 38	She knew all the words to her meaningful song, and it would even make her tear up at times as she would sing through the song.	Sentiment > Neutral
Music Study_Observations_ Quotes, Pos. 43	Knew all the words to her meaningful song! In German! She would always talk about her family afterwards.	Sentiment > Slightly Positive

MAXQDA 2022 Smart Coding Tool – Control music

Document	Coded segments	Codes
Music Study_Observations_ Quotes, Pos. 3	During part 1 of the study she was not enjoying herself. She would call out "this is too much for me", "I don't want it" (meaning the headphones). She even spit on the table during our first session. She was angry, frustrated and confused. That was during the control song	Sentiment > Negative
Music Study_Observations_ Quotes, Pos. 12	She was very talkative. She would talk through the entire control song.	Sentiment > Neutral
Music Study_Observations_ Quotes, Pos. 16	when we played the control song, he would just say "that's nice."	Quatation Sentiment > Positive Meaningful music Sentiment > Slightly Positive Sentiment > Slightly Positive
Music Study_Observations_ Quotes, Pos. 25	When the control song was on, he was just listening	Sentiment > Neutral
Music Study_Observations_ Quotes, Pos. 34	She would just happily listen to the control song,	Sentiment > Neutral

MAXQDA 2022 Smart Coding Tool – Quatation

Document	Coded segments	Codes
Music Study_Observations_ Quotes, Pos. 16	"that's nice."	Sentiment > Positive Meaningful music Sentiment > Slightly Positive Control Music Sentiment > Slightly Positive

Music Study_Observations_ Quotes, Pos. 21	He would say "thank you for my morning pick me up."	Sentiment > Neutral
Music Study_Observations_ Quotes, Pos. 23	She would always say "thank you for being my friend" after observations.	Sentiment > Slightly Positive
Music Study_Observations_ Quotes, Pos. 26	Said he would enjoy this continue. Especially on the weekends because tv is no good	Additional Observations Sentiment > Slightly Negative Sentiment > Slightly Negative
Music Study_Observations_ Quotes, Pos. 28	"It's so great that I have you guys to talk too"	Sentiment > Slightly Positive
Music Study_Observations_ Quotes, Pos. 30	She would always say thank you, and give us hug and kisses.	Sentiment > Slightly Positive
Music Study_Observations_ Quotes, Pos. 32	Thoroughly enjoyed the music session, he said "it just added something new to my days. A nice change of pace." He said he would love for the sessions to continue, and would even enjoy to go the symphony one day.	Sentiment > Positive
Music Study_Observations_ Quotes, Pos. 39-40	She would say "I've been expecting you" or "I've been waiting for you." She knew we were going to listen to music & sing.	Sentiment > Slightly Positive

MAXQDA 2022 Smart Coding Tool – Additional observations

Document	Coded segments	Codes
Music Study_Observations_ Quotes, Pos. 10	Always very anxious, and restless. She would constantly be moving back and forth in her wheelchair.	Sentiment > Slightly Negative
Music Study_Observations_ Quotes, Pos. 14	When we began the observations, and would be holding her hand, it would be a tight grip. And then once the music started, her grip would loosen, and then when the music was over it would tighten again.	Sentiment > Slightly Positive
Music Study_Observations_ Quotes, Pos. 18	He was walking towards a piano in the hallway. He wanted to know if it worked, but I wasn't sure. He plugged it in, and started fiddling with the keys on the piano. And after a minute or so, he began to play a familiar tune. He started playing Lean on Me, and then sang the ENTIRE song. I cried.	Sentiment > Neutral
Music Study_Observations_ Quotes, Pos. 25	He said we (meaning him & the study team) would ROCK his end of the hallway	Sentiment > Neutral Meaningful music Sentiment > Slightly Positive
Music Study_Observations_ Quotes, Pos. 26	Said he would enjoy this continue. Especially on the weekends because tv is no good	Sentiment > Slightly Negative Quatation Sentiment > Slightly Negative
Music Study_Observations_ Quotes, Pos. 41	She would always conduct with her arm	Sentiment > Neutral

Οι επιδράσεις της προσωπικά προτιμώμενης μουσικής στη διάθεση και τη συμπεριφορά ατόμων με άνοια: Μια διερευνητική πιλοτική μελέτη

Stephanie Cairo | Kyurim Kang | Patricia Izbicki | Molly Isinghood | Tabassum Majid | Alexander Pantelyat

ΠΕΡΙΛΗΨΗ

Η μουσική έχει αποδειχθεί ότι ωφελεί τα άτομα με άνοια. Υπάρχουν, ωστόσο, περιορισμένες μελέτες που να εξετάζουν το πώς τα μέλη του προσωπικού που εργάζονται σε δομές υποστηριζόμενης διαβίωσης χρησιμοποιούν την προτιμώμενη μουσική για ασθενείς με άνοια. Αυτή η ελεγχόμενη ποιοτική μελέτη είχε ως στόχο να καθορίσει: 1) εάν η προτιμώμενη μουσική είναι αποτελεσματική στη βελτίωση της διάθεσης και της συμπεριφοράς, και 2) εάν μια προσωποκεντρική προσέγγιση για τις παρεμβάσεις βασισμένες στη μουσική είναι εφικτή για άτομα με άνοια. Οι 20 συμμετέχοντες (μέση ηλικία (ΤΑ) = 81, (8)) άκουσαν ένα προτιμώμενο τους τραγούδι ή ένα τραγούδι ελέγχου σε τυχαία σειρά για έξι εβδομάδες με ένα πενθήμερο περίοδο αποφόρτισης μεταξύ των ακροάσεων. Η Κλίμακα Νευροσυμπεριφορικής Αξιολόγησης (Neurobehavioral Rating Scale, NRS) και η Κλίμακα Αξιολόγησης Παρατηρούμενου Συναισθήματος (Observed Emotion Rating Scale, OERS) χρησιμοποιήθηκαν για να μετρήσουν τις συναισθηματικές και τις συμπεριφορικές αλλαγές των συμμετεχόντων. Συγκεντρώθηκαν μετρήσεις της αρτηριακής πίεσης και των καρδιακών παλμών για την κατανόηση των φυσιολογικών αποκρίσεων στη μουσική. Η NRS χρησιμοποιήθηκε για να μετρηθούν οι συμπεριφορικές αλλαγές ως απόκριση σε μια παρέμβαση ακρόασης που αποτελούντο τόσο από την προτιμώμενη μουσική όσο και από τη μουσική ελέγχου κατά τη διάρκεια 14 συνεδριών που διεξήχθησαν σε έξι εβδομάδες. Δεν παρατηρήσαμε αλλαγές στα συμπτώματα της NRS μετά την παρέμβαση.Οι μετρήσεις στην OERS και οι μετρήσεις ζωτικών ενδείξεων δεν διέφεραν σημαντικά ανάμεσα στην προτιμώμενη μουσική και στο τραγούδι ελέγχου παρά τις σχετικές τάσεις. Συμμετέχοντες/ προσωπικό/συγγενείς εξέφρασαν το πόσο σημαντικό είναι ότι τα προτιμώμενα τραγούδια ανακινούν συγκεκριμένες μνήμες και βελτιώνουν την ευζωία. Στη θεματική ανάλυση που χρησιμοποιήθηκαν στοιχεία για το συναίσθημα βρέθηκε μια υπεροχή του θετικού συναισθήματος στην κατηγορία της μουσικής με προσωπικό νόημα και μια μικρή εμφάνιση αρνητικού συναισθήματος στη μουσική ελέγχου.

ΛΕΞΕΙΣ ΚΛΕΙΔΙΑ

προτιμώμενη μουσική, άνοια, κοινότητα υποστηριζόμενης διαβίωσης, προσωποκεντρική προσέγγιση, παρέμβαση βασισμένη στη μουσική