

Music & Memory[®] Effects on Nursing Facility Residents

**Evaluation Report
Phases 1 to 3**

**Texas Health and Human Services
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TEXAS
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Services

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Executive Summary

Music & Memory® is a program developed to assist people with dementia by allowing them to reconnect with the world through the use of familiar music that has personal meaning. In 2015, the Texas Department of Aging and Disability Services (DADS) launched Music & Memory® as a pilot program with 32 nursing homes across the state. Since then, availability of Music & Memory® has expanded to over 1,000 nursing homes, state supported living centers, and state hospitals (Music & Memory, 2020). Texas Health and Human Services Commission's (HHSC) Office of Data, Analytics, and Performance (DAP) conducted a multi-phase study on the Music & Memory® program to understand its impact on nursing facility residents and staff. The current report summarizes findings from the three phases of the study.

Findings from Phase 1 suggest residents enjoyed the Music & Memory® program, and that it led to improvements in residents' behavior and mood; these findings are replicated during Phase 2. Additionally, Phase 1 findings indicate that Music & Memory® participation was associated with a reduction in medication use. Findings from Phase 2 suggest that staff who participated in the Music & Memory® program were generally more satisfied with their job, however these differences were mostly not statistically significant. Phase 3, a replication of Phase 1, provides additional evidence on music's positive impact on behavior and mood and suggests that music use was associated with decreases in some medication use.

Collectively, these findings provide preliminary support that the Music & Memory® program is well-received by residents and staff and leads to improvements in residents' dementia symptoms.

Background and Introduction

In 2015, The Texas Health and Human Services Commission began a project with Texas nursing facilities to investigate the use of the Music & Memory® Program to mitigate behavioral and psychological symptoms of dementia. The program of research started with a pilot study used to identify problems and refine research techniques. After the pilot study, three main studies were conducted. In Phase 1, the effects of the Music & Memory® Program on resident behavior and psychological symptoms were investigated. Phase 2 was focused on the relationship of the Music & Memory® Program with Staff Satisfaction and Retention. The final Phase, Phase 3, had the same focus and design as Phase 1, but an attempt was made to eliminate some of the problems with implementation identified in Phase 1.

Overview of Dementia

Dementia is a general term used to refer to the impaired ability to remember, think, or make decisions that interferes with doing everyday activities (Centers for Disease Control and Prevention, 2019). Dementia includes a wide range of medical conditions, but Alzheimer's is the most common cause of dementia, representing 60% to 70% of all dementia cases (Centers for Disease Control and Prevention, 2019; World Health Organization, 2022).

Prevalence rates of dementia in the United States vary, but it is estimated that approximately 6.5 million adults aged 65 and older in the United States may be affected by Alzheimer's, and up to seven million people aged 65 or older may have dementia (Alzheimer's Association, 2022; Population Reference Bureau, 2022). Furthermore, these numbers are expected to increase as the number of individuals aged 65 years or older continues to increase (Population Reference Bureau, 2022).

Dementia is of particular concern to Texas given that the state has the fourth highest number of Alzheimer's cases and the second highest number of Alzheimer's related deaths in 2022 (Texas Department of State Health Services, 2022). Furthermore, about two-thirds of residents in Texas nursing facilities have been diagnosed with dementia (Texas Department of Aging and Disability Services, 2015).

Treatment of Dementia

Dementia cannot be cured, so treatments focus on improving or slowing symptoms (Alzheimer's Association, 2022). Symptoms of dementia vary and can include behavioral and psychological symptoms such as: "...disturbed perception, thought content, agitation, aggression, calling out/screaming, intrusive behaviors, disinhibition (sexual), wandering, nighttime disturbance, shadowing, swearing, depression, anxiety, apathy, delusions, hallucinations, irritability and elation/euphoria." (Peisah & Skladzien, 2014)

These symptoms can be difficult to manage. One way nursing facilities address the behavioral and psychological symptoms of dementia is by administering psychotropic drugs, particularly antipsychotic medications. Use of antipsychotics for this purpose presents particular risks by increasing the likelihood for cardiovascular events (Contributor, 2017), (Tampi, Tampi, Balachandran, & Srinivasan, 2016) and death among elderly people (Maust, Hyungjin, & Seyfried, 2015), (Raglio, et al., 2008), (Yan, 2008), (Tampi, et al, 2016). Other adverse effects of antipsychotics include excessive sleepiness, abnormal gait, and extrapyramidal symptoms like restlessness, uncontrolled muscle contractions, and tremors (Tampi, et al., 2016).

Given the risks associated with the use antipsychotics to treat dementia symptoms, the Centers for Medicare & Medicaid Services (CMS) launched the National Partnership to Improve Dementia Care in Nursing Homes (referred to as *the National Partnership*) in March 2012 to reduce antipsychotic medication use in lieu of more person-centered approaches. This national effort has proven to be successful; nationwide, the percentage of long-stay nursing facility receiving antipsychotics decreased from 23.9% in Quarter Four of 2011 to 14.5% during in Quarter Four of 2021 (The National Partnership to Improve Dementia Care in Nursing Homes, April 2022). Similarly, the use of antipsychotics among long-stay nursing facility residents in Texas decreased from 28.8% in Quarter Four of 2011 to 11.5% in in Quarter Four of 2021 (The National Partnership to Improve Dementia Care in Nursing Homes, April 2022).

Music & Memory[®], a Non-Pharmacologic Approach

As nursing facilities have decreased their reliance on antipsychotics to treat the symptoms of dementia, non-pharmacologic interventions and person-centered approaches have become increasingly important to treating the symptoms of individuals with dementia. One approach to mitigating the behavioral and psychological symptoms associated with dementia may be the Music & Memory[®] Program^a.

The Music & Memory[®] Program is an intervention that uses individualized selections of music (playlists) to help a person reconnect with the world through music-triggered memories. Favorite songs are identified through interviews with residents and their loved ones. Listening to these playlists is expected to provide meaningful entertainment to residents, in particular residents with dementia, and improve behaviors that might otherwise lead to the use of psychotropic medication and/or mechanical restraints (Gerdner, 2013).

In addition to the primary goal of improving the quality of life for individuals with cognitive and physical conditions, Music & Memory[®] may also improve relationships between staff and residents; and may ease staff burden. These secondary benefits of Music & Memory[®] could improve job satisfaction, and thereby improve staff retention.

Texas Implementation of Music & Memory[®]

In 2015, the Texas Department of Aging and Disability Services (DADS) launched Music & Memory[®] as a pilot program with 32 nursing homes across the state. Since then, availability of Music & Memory[®] has expanded to over 1,000 nursing homes, state supported living centers, and state hospitals (Music & Memory, 2020). DADS conducted a study on the Music & Memory[®] pilot between July 2015 and June 2016. The study investigated the impacts of the Music & Memory[®] Program on resident and staff outcomes. Results from the pilot study provided preliminary evidence that the Music & Memory[®] Program may improve residents' behavioral and psychological symptoms, but additional research was necessary to adequately examine the effects of Music & Memory[®] on residents and staff. After DADS moved under the Texas Health and Human Services Commission (HHSC),^b HHSC's Office of Data,

^a Additional information is available at <https://musicandmemory.org/>

^b DADS moved under Health and Human Services on September 1, 2017.

Analytics, and Performance (DAP) analyzed the Music & Memory® Program during three subsequent study phases (implemented between June 2016 and December 2017; refer to Table 1 below). The purpose of this report is to summarize findings from all three phases of the Music & Memory® study.

Table 1. Summary of Study Phases

Study Phase	Implementation Period	Primary Purpose
Pilot	July 2015 to June 2016	Examine impact of the Music & Memory® Program on behavioral and psychological effects of dementia, staff satisfaction, and staff retention. Test study materials and implementation.
Phase 1	June 2016 to December 2016	Additional explorations on the impact of the Music & Memory® Program on residents' mood, behavior, and use of psychotropic using a pre/post randomized design.
Phase 2	January 2017 to June 2017	Continued exploration on the impact of the Music & Memory® Program on residents, plus additional explorations of the impacts the on staff retention and satisfaction.
Phase 3	June 2017 to December 2017	Additional explorations on the impact of the Music & Memory® Program on residents' mood, behavior, and use of psychotropic using a pre/post randomized design.

Phase 1: Resident Mood and Behavior

Phase 1 focused on the implementation of the Music & Memory® Program across 48 nursing facilities between June 2016 and December 2016. Participating nursing facilities were located across the state and ranged in size from 34 beds to 207 beds. The purpose of Phase 1 of the study was to obtain additional information on the impact of the Music & Memory® Program on residents' moods and behaviors. Subsequent sections describe study methods and key results for Phase 1.

Methods

Study Design

The Phase 1 study used a randomized delayed-start control group design. Nursing facilities nominated 15 residents who might benefit from the program. HHSC staff assigned eight of them into one of two groups: a 'Music Group' and a 'Comparison Group'. The remaining seven residents were "held in reserve" as potential replacements for the Music or Comparison Groups. HHSC staff randomly selected four residents to begin participating in the Music & Memory® Program immediately (Music Group), and then randomly assigned four additional residents, who were similar in age, gender, and perceived receptivity to the Music Group, to have their participation in the Music & Memory® Program delayed for six months (Comparison Group). This study design allowed researchers to control for factors that might affect results, such as aging and disease progression from the effects of the Music & Memory® Program.

Analytic Sample

A total of 85 facilities expressed interest in Phase 1, but only 48 implemented the program and submitted at least partial study materials. Altogether, 559 nursing residents participated in the Phase 1 study of the Music & Memory® Program: 230 in the Music Group and 329 in the Comparison Group. Twenty-three participants left the study early.^c They were replaced primarily by nominated participants held in reserve, although in a few cases facilities replaced participants in the Music Group

^c The number of participants who left the study early was too small for analysis (n=23), but the percentage who were female and the percentage who had dementia were comparable to the music and comparison groups; those who left, however, did appear to be older than participants in the two study groups.

with the Comparison Group. These participants were re-categorized as Music Group members.

Residents who participated in the Phase 1 study averaged 81 years of age. Sixty-eight percent of the participants were female, and 85% were diagnosed with dementia. Participant demographics did not significantly vary across the Music and Comparison Groups (refer to Table 2 below).

Table 2. Participant Demographics

Measure	Music Group (N=230)	Comparison Group (N=329)	Total Study Population (N=559)
Average Age	81	81	81
Percent Female	66%	69%	68%
Presence of Dementia Diagnosis	87%	83%	85%

Note: Study population includes available data for participants who left the study early as well as participants from the reserve group who served as replacements.

Source: Minimum Data Set. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Data Sources

Three primary data sources were used in Phase 1: Music Logs, Monthly Medication Administration Records (MARs), and the Minimum Data Set (MDS) Nursing Assessments. Additional details on the staff retention log and the staff satisfaction questionnaire are provided below.

- **Music Logs:** Nursing facility staff or volunteers completed Music Logs for residents participating in the Music & Memory® Program weekly. Music Logs captured information on when music was offered, when residents listened to music, and the impact of the music on residents' behavior and mood. The Music Log is provided in Appendix A.
- **Monthly Medication Administration Records (MARs):** The MARs contain a daily record of each drug given (including both prescriptions and over-the-counter medications), the dosage, the method of administration (e.g., oral, transdermal, injection, etc.), and the frequency of administration. Both maintenance medications and as-needed medications (PRN)^d were included. MARs were used to track medications given to nursing facility residents in the

^d PRN is a Latin term that stands for "pro re nata," or as needed.

Music and Comparison Groups for three months prior to the beginning of the intervention and during the entire intervention.^e The MARs provided information necessary to identify changes in medication and dosages during the intervention.

- **Minimum Data Set Nursing Assessments (MDS):** The Centers for Medicare and Medicaid Services (CMS)—the federal agency that regulates nursing facilities—requires nursing care assessments for residents upon admission, annually, quarterly, and when there is a significant change in the resident’s status. Additional nursing care assessments are required more often for residents whose stay is funded by Medicare. The nursing assessments cover multiple areas of care, including cognitive patterns, mood, behavior, functional status, diagnoses, health conditions, medications, restraints, and others. A resident should have at least one assessment every three months. These assessments are conducted by nursing facilities for each resident and are recorded in the MDS. Nursing assessments obtained from the MDS provide information on behavioral symptoms, psychoactive medications, restraint use, wandering, pain, falls, and weight changes. When multiple MDS assessments were available for an individual participant, results across assessments were aggregated for the purposes of the Phase 1 study.

Analytic Methods

Phase 1 relies on descriptive and inferential statistics to compare outcomes across two different perspectives. First, participants in the Music & Memory[®] Program were divided into two groups based on responses to their playlists; groups with more favorable responses were compared to groups of participants with less favorable responses. Second, the analysis compares people who participated in the Music & Memory[®] Program during the study and those whose participation was delayed until after the study was complete.

^e MARs were not always available for three months prior to the beginning of the intervention. Some participants had not been residing in the facility for the full three months prior to starting Music & Memory[®] and some facilities did not send all three months of MARs prior to starting the intervention.

Phase One Findings

Response to Music among Music Group

All Phase 1 participants had completed Music Logs. Although the Music & Memory® Program is a six-month program, Phase 1 participants only stayed in the program for just under three months, on average. Lower than designed participation may be due to starting the program late, opting out of the program early, or leaving the nursing facility. Participants who left the study were replaced by residents in the reserve group. On average, participants were offered music nearly 4 days per week and listened about 3 days per week. On average, participants listened to music 85% of the time it was offered (refer to Table 3 below).

Table 3. Phase 1 Findings: Overall Individual Time Listening to Music

Measure (Average per Person)	Average
Number of Months Participating in the Music & Memory® Program	2.81
Days in the Week Music was Offered	3.77
Days in the Week Listened to Music	3.13
Percentage of Times Listened to Music	85%

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Overall, participants who listened to music appeared to have favorable behaviors (e.g., calm, talkative, or quiet). On average, participants were described as calm when listening to music about 69% of the time (refer to Table 4 below). Around 11% of the time, the behavior of people listening to music was described as talkative. Participants were also described as quiet about 11% of the time. Less often, they were described as agitated (7%) or aggressive (2%).

Table 4. Phase 1 Findings: Behavior when Listening to Music

Behavior	Average Percentage of Time
Calm	69%
Talkative	11%
Quiet	11%
Agitated	7%
Aggressive	2%

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Participants' mood varied across sessions. Most of the time when they were listening to music, participants' moods were described as happy (42%), or cheerful (26%). Conversely, less than 10% of the time, participants' moods were nervous, angry, sad, bored, or grieving. Participants were described as having a flat effect 22% of the time (refer to Table 5 below).

Table 5. Phase 1 Findings: Mood when Listening to Music

Mood	Average Percentage of Time
Happy	42%
Cheerful	26%
Flat	22%
Nervous	3%
Angry	3%
Sad	2%
Bored	1%
Grieving	<1%

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Observers were also asked to indicate whether they believe the music sessions changed participants' mood or behavior, and participants' overall enjoyment with the session. On average, observers reported that participants' behaviors and moods improved as a result of the music sessions (average scores of 0.45 and 0.50, respectively, with -1 reflecting behavior or mood worsened, 0 reflecting no change, and 1 reflecting behavior or mood improved (refer to Table 6 on the next page).

On average, observers also reported that participants generally enjoyed music sessions. On a scale of 1 to 5, with 1 meaning they hated the music session and 5 meaning they loved the music session, the average response was a favorable 4.2.

Table 6. Phase 1 Findings: Responses to the Music Log

Measure	Average	Description of Scale
Change in Behavior	0.45	-1 Worsened 0 No Change 1 Improved
Change in Mood	0.50	-1 Worsened 0 No Change 1 Improved
Overall Enjoyment	4.2	5 Loved 4 Okay with use 3 Take it or leave it 2 Did not like 1 Hated

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Effects of Level of Enjoyment and Percent of Times Listening on Response to Music

Researchers ran two sets of analyses to examine the impact of the Music & Memory® Program on behavior, mood, and program participation. Researchers examined the impact of the amount of time spent listening to music had on enjoyment, behaviors, and mood. In addition, researchers examined the impact of enjoyment on time spent listening to music, behavior, and mood (refer to Table 7 below). To conduct these analyses, researchers divided participants into two groups based on whether they fell above or below the median of each predictor,^f and then compared differences in outcome variables between the two groups. Researchers used Mann-Whitney U to compare outcomes across the two groups for each predictor because the predictors were not normally distributed.⁹ Additional details on the analyses are provided in Appendix D.

Table 7. Phase 1 Predictors and Outcome Variables

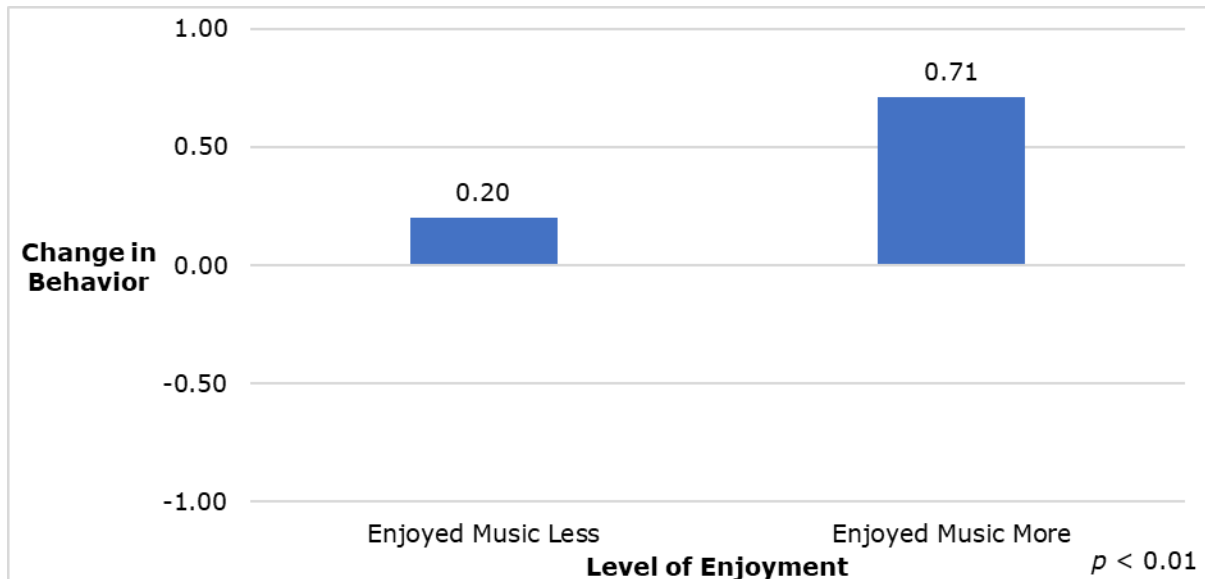
Analysis Set 1 Predictor	Analysis Set 1 Outcome	Analysis Set 2 Predictor	Analysis Set 2 Outcome
Level of Enjoyment	Change in Behavior Change in Mood Percentage of Times Listened to Music	Percentage of Times Listened to Music	Change in Behavior Change in Mood Level of Enjoyment

^f The median is the value that falls exactly in the middle of everyone's responses to a question. On any measure, half of the responses will fall below the median, and half of the responses will fall above the median.

⁹ In statistical tests, assumptions are made about how responses are distributed. In a normal distribution, most responses center around the mean, and with roughly equal numbers of responses falling above and below the mean. A non-normal distribution means that responses are not necessarily centered around the mean and the number that are higher or lower than the mean are skewed, or lopsided. When this happens, the assumption that the responses are normally distributed is not met, and alternative statistical tests that do not rely on this assumption must be used. This report relies on Mann-Whitney U tests, which do not rely on an assumption of normally distributed responses.

As shown in the subsequent figures, these analyses suggested greater enjoyment and more time spent listening to music lead to improved outcomes. The more a participant seemed to enjoy music, the more likely they were to demonstrate improved behavior ($U = 2743.5$, $p < 0.01$; refer to Figure 1 below). On a scale from -1 (behavior worsened) to +1 (behavior improved), the median change in behavior for participants who enjoyed music more was 0.71. Among participants who enjoyed music less, the median was 0.20.

Figure 1. Phase 1 Findings: Degree Behavior Improved by Level of Enjoyment

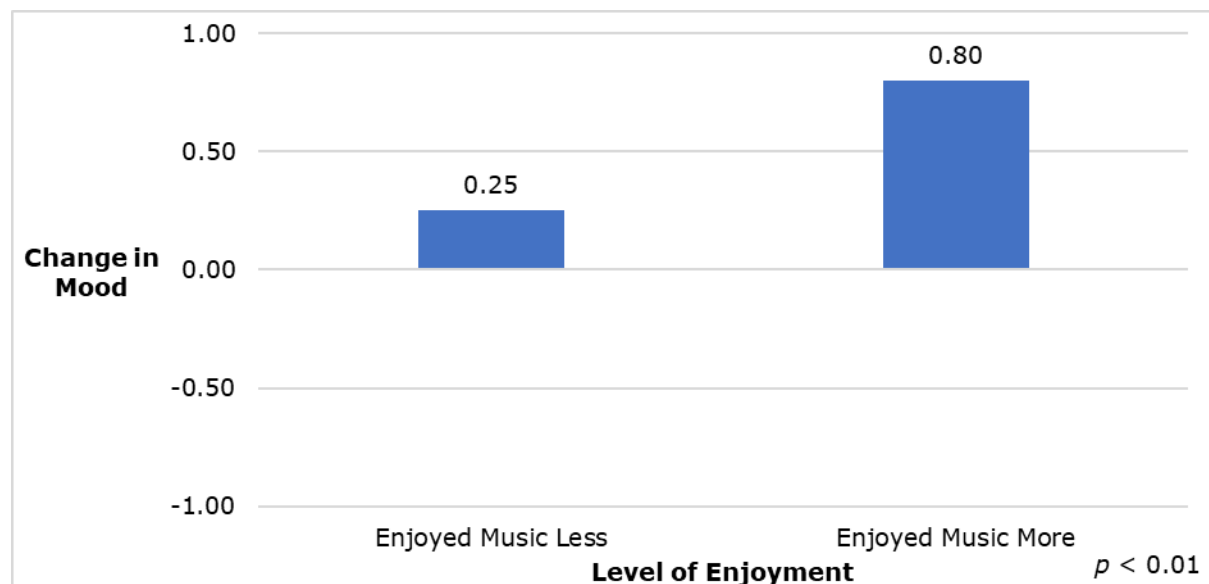


Notes. Median scores range from -1 to 1, with -1 reflecting worse behavior, 0 reflecting no change, and 1 reflecting improved behavior.

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Mood also improved as a function of how much participants enjoyed listening to music (refer to Figure 2 below). The more they seemed to enjoy the music, the more likely they were to demonstrate improved mood ($U = 2644.5$, $p < 0.01$). On a scale from -1 (mood worsened) to +1 (mood improved), the median change in mood for participants who enjoyed music more was 0.80. For participants in the lower half, the median was 0.25.

Figure 2. Phase 1 Findings: Degree Mood Improved by Level of Enjoyment

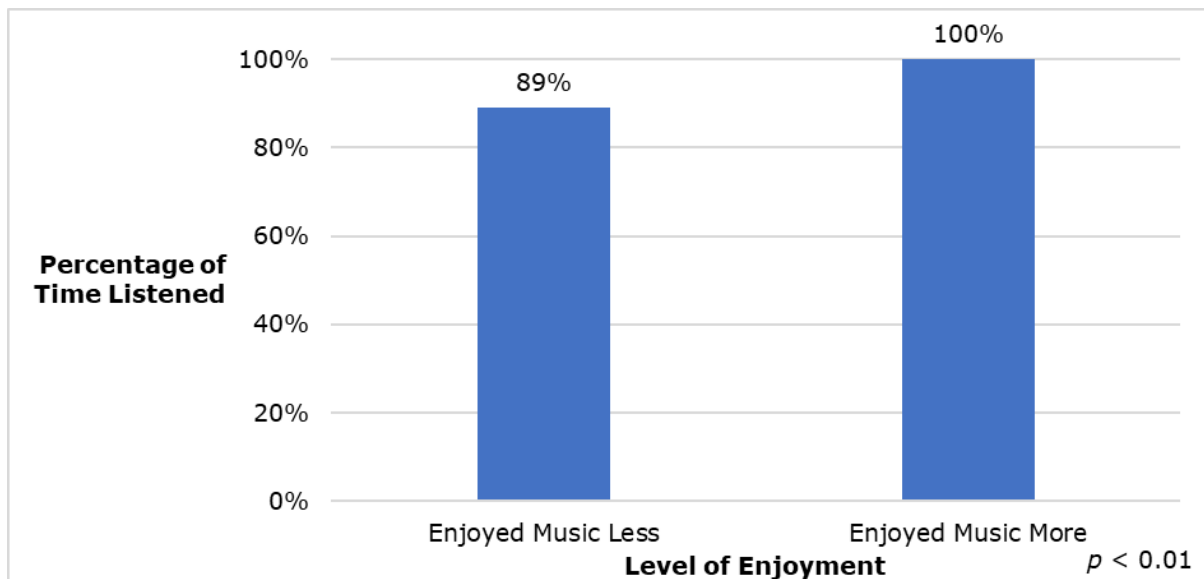


Notes. Median scores range from -1 to 1, with -1 reflecting worse mood, 0 reflecting no change, and 1 reflecting improved mood.

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

The degree to which participants enjoyed music significantly affected the percentage of times they chose to listen ($U = 3994.0$, $p < 0.01$). Participants in the upper quantile listened 100% of the time compared to lower quantile participants who listened a median of 89% of the time (refer to Figure 3 below).

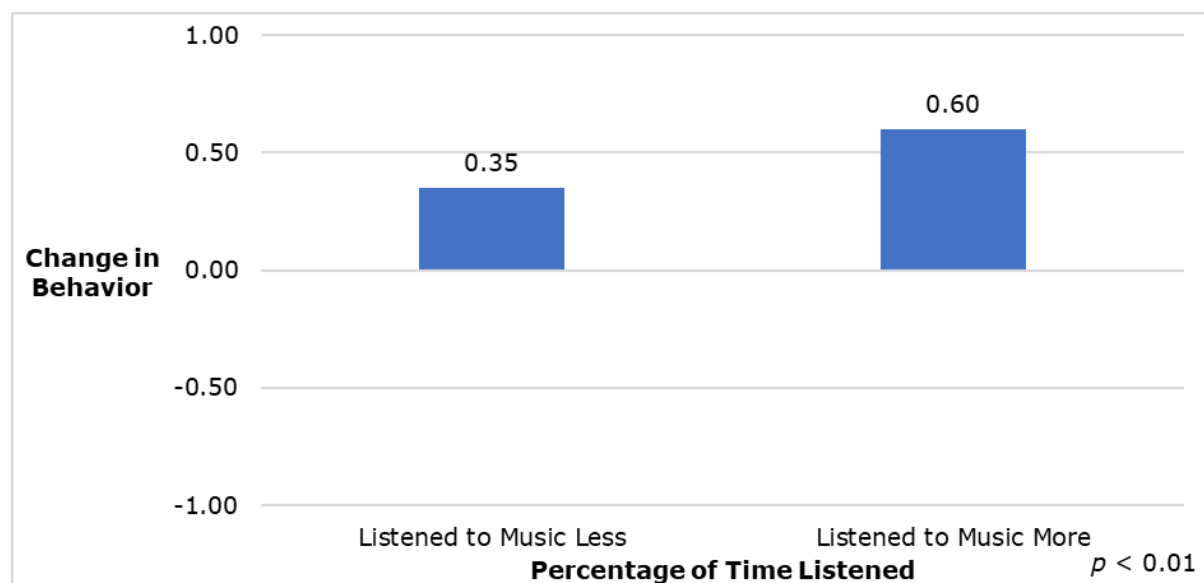
Figure 3. Phase 1 Findings: Percent of Time Listening to Music by Level of Enjoyment



Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Higher percentage of listening to music was associated with improvements in behavior. The median change in behavior for participants in the upper half was 0.60. The median change among lower half participants was 0.35 ($U = 4569.5$, $p < 0.01$; refer to Figure 4 below).

Figure 4. Phase 1 Findings: Degree Behavior Improved by Percentage of Music Use

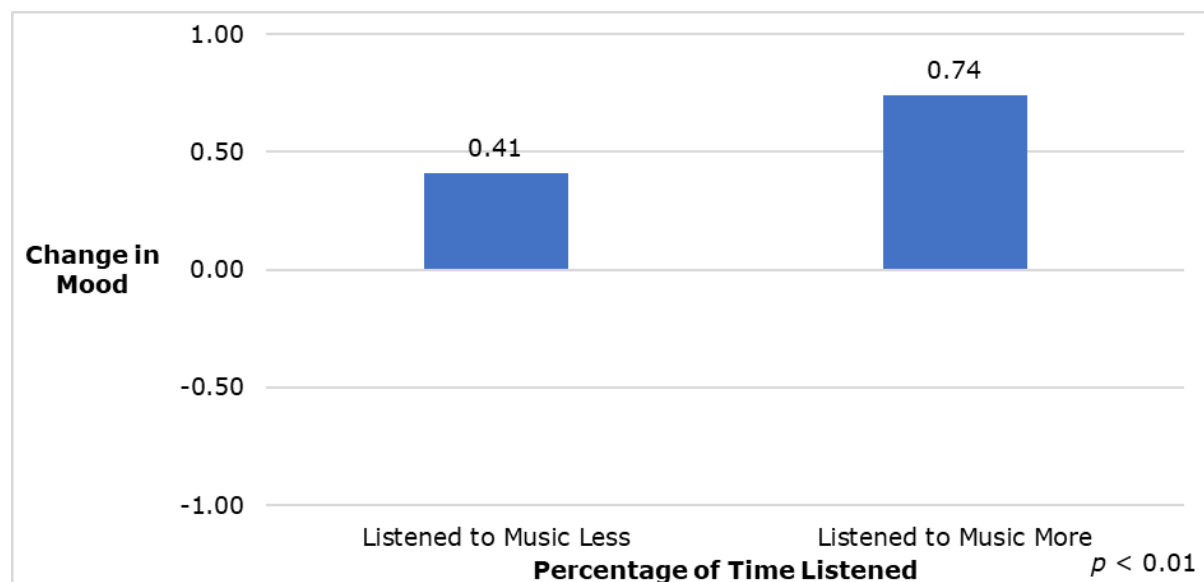


Notes. Median scores range from -1 to 1, with -1 reflecting worse behavior, 0 reflecting no change, and 1 reflecting improved behavior.

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Lastly, mood improved with higher percentage of music use. The median mood improvement was 0.74 among upper half participants and 0.41 among lower half participants ($U = 4262.0$, $p < 0.01$; refer to Figure 5 below).

Figure 5. Phase 1 Findings: Degree Mood Improved by Percentage of Music Use

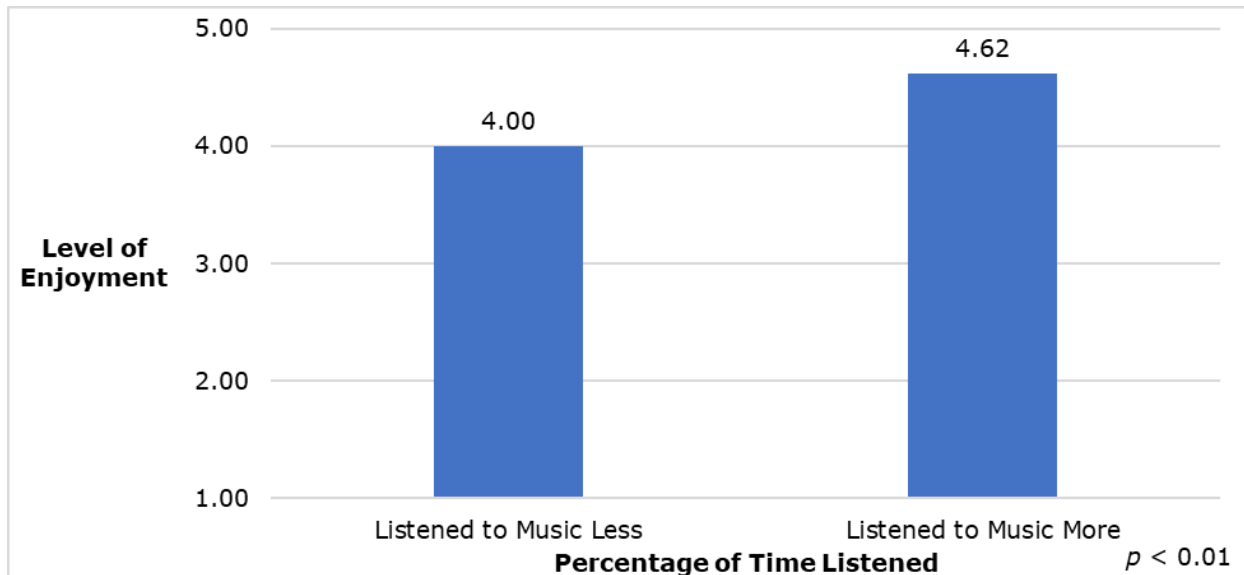


Notes. Median scores range from -1 to 1, with -1 reflecting worse mood, 0 reflecting no change, and 1 reflecting improved mood.

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

The percentage of time spent listening to music affected participants' overall enjoyment. The median overall enjoyment was 4.62 among upper half participants and 4.00 among lower half participants ($U = 3994.0$, $p < 0.01$; refer to Figure 6 below).

Figure 6. Phase 1 Findings: Level of Enjoyment by Percentage of Music Use



Notes. Median scores range from 1 to 5, with 1 reflecting least enjoyment and 5 reflecting most enjoyment.

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Analyses Comparing Music Group Participants Before and After Starting Music & Memory®

Differences in MDS-related outcomes were examined prior to and after participants began the Music & Memory® Program. In addition, changes in MDS and MAR-related measures after the Music & Memory® Program were examined across two key predictors (percentage of music use and level of enjoyment). The MARs were collected starting three months before participants began the Music & Memory® Program, and throughout the duration of their participation. Participants varied in the number of months they participated. However, except for the association between duration of participation on falls and vocalizations of pain,^h there were no effects of duration on outcome variables. Therefore, as long as they had pre-music measures and post-music measures, all participants' MAR data were included regardless of their duration of participation.

Wilcoxon signed-rank tests were used to compare MDS measures prior to and after the Music & Memory® Program, and Mann-Whitney U tests were used to examine changes in MDS and MAR-related outcome scores after the Music & Memory® Program across percentage of music use and level of enjoyment. These nonparametric tests were used because MDS and MAR outcomes were not normally distributed.

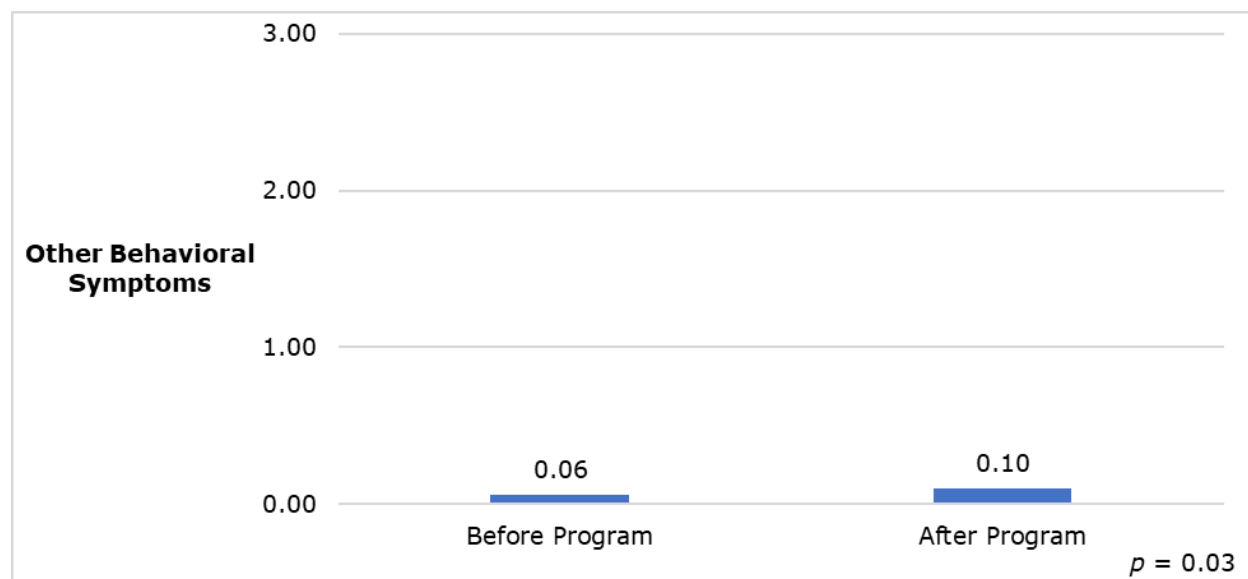
Wilcoxon signed-rank and Mann-Whitney U tests are median-based tests. However, for almost all outcomes compared, the medians were zero. The averages take into account specific values among all participants and are more sensitive to the distribution of those values. Therefore, to provide a more informative measure of the differences between groups, averages are presented in the figures instead of medians. Additional details on the analyses, as well as medians for all MDS and MAR-related outcomes are provided in Appendix D.

^h Two unexpected significant outcomes related to time spent participating in Music & Memory® were observed. First, individuals who participated in the program for more months had an increase in falls (median = 0.03 falls) after starting the program. Participants who spent fewer months listening to music had a decrease in falls (median = -0.06 falls; $U = 4413$, $p < .05$). Second, individuals who participated in the program for more months had an increase in vocalizations of pain (0.04 vocalizations) while those who listened for fewer months had a decrease in vocalizations of pain (median = -0.07 vocalizations; $U = 498$, $p < .05$). Observed differences between participants with differing tenure in the program may be confounded with illness progression. As time goes by, symptoms of illness may worsen. The positive effects of the Music & Memory® may be diluted by the progression of illness.

MDS Measures

MDS measures were available prior to, after prior to, and after the Music & Memory® Program for 222 individuals. Among those participants, percentage of music use was available for 215, and level of enjoyment was available for 214. There was only one statistically significant change in MDS measures after the Music & Memory® Program. Participants were more likely to note other behavior symptoms in the prior seven days after the Music & Memory® Program (average = 0.10) than before (average 0.06; $Z = -2.532$, $p = 0.03$; refer to Figure 7 below). Despite this significant finding, other behavioral symptoms in the prior seven days remained low prior to and after participants began the Music & Memory® Program.

Figure 7. Phase 1 Findings: Change in Other Behavioral Symptoms Before and After the Music & Memory® Program



Notes. Mean scores reflect the number of days other behavioral symptoms occurred in the seven days prior to the assessment.

Source: Minimum Data Set. Prepared by the Office of Data, Analytics, and Performance, HHSC.

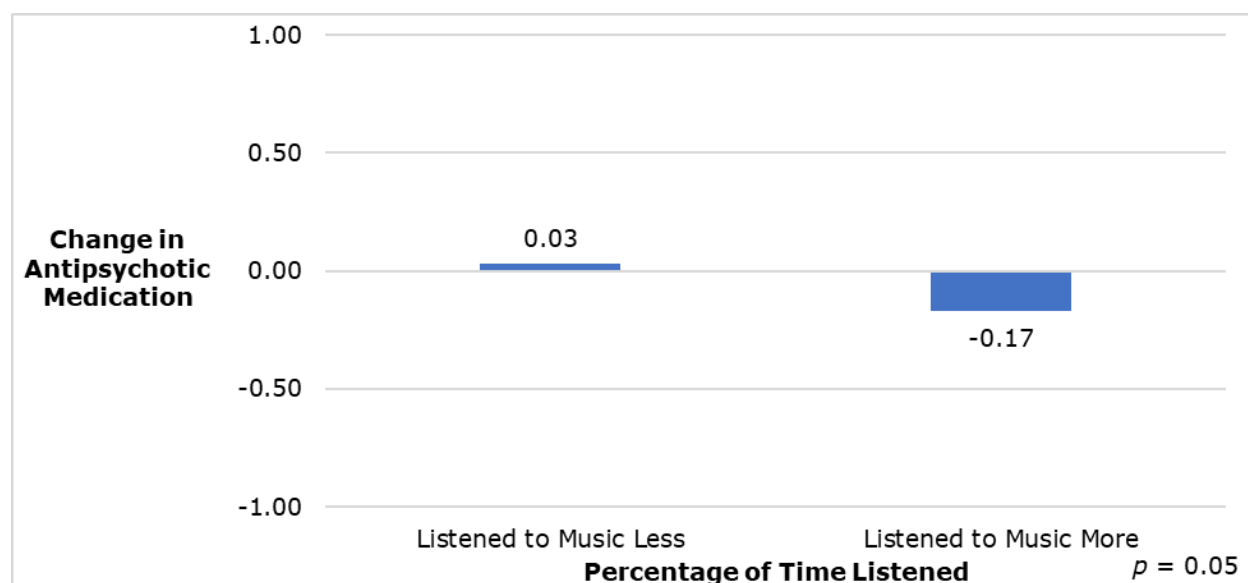
Changes in MDS measures after the Music & Memory® Program did not significantly vary across percentage of music use or level of enjoyment. However, although not statistically significant, participants who listened to music more reported greater reductions in antipsychotic and antidepressant medications, and greater increases in antidepressant medications. Additionally, participants who enjoyed music more reported reductions in antidepressant medications, while those who enjoyed music less reported increases. Detailed findings on all of the pre/post differences examined are presented in Appendix D.

MAR Measures

MAR measures were available prior to and after the Music & Memory® Program for 200 individuals. Among those participants, percentage of music use was available for 112, and level of enjoyment was available for 105. Percentage of music use was associated with significantly different changes in antianxiety medications, antipsychotic medications, and combination of sedatives, hypnotics, and antianxiety medications.

Participants who listened to music more frequently experienced reductions in antianxiety medication use (average change = -0.17) while participants who listened to music less frequently experienced a slight increase (average change = 0.03; $U = 1281.5$, $p = 0.05$; refer to Figure 8 below).

Figure 8. Phase 1 Findings: Change in Antianxiety Medication and Percentage of Music Use

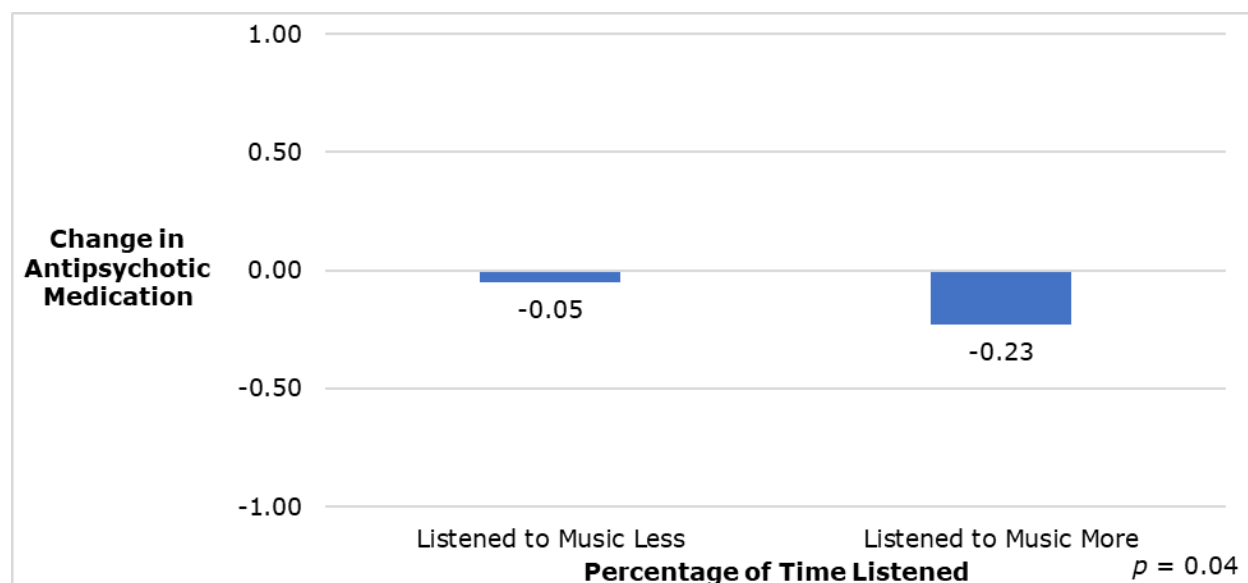


Notes. Mean scores range from -1 to 1, with -1 reflecting less medication, 0 reflecting no change, and 1 reflecting more medication.

Source: Music Logs; Monthly Medication Administration Records. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Participants who listened to music more frequently experienced greater reductions in antipsychotic medication use (average change = -0.23) when compared to participants who listened to music less frequently (average change = -0.05; $U = 1291.5$, $p = 0.04$; refer to Figure 9 below).

Figure 9. Phase 1 Findings: Change in Antipsychotic Medication and Percentage of Music Use

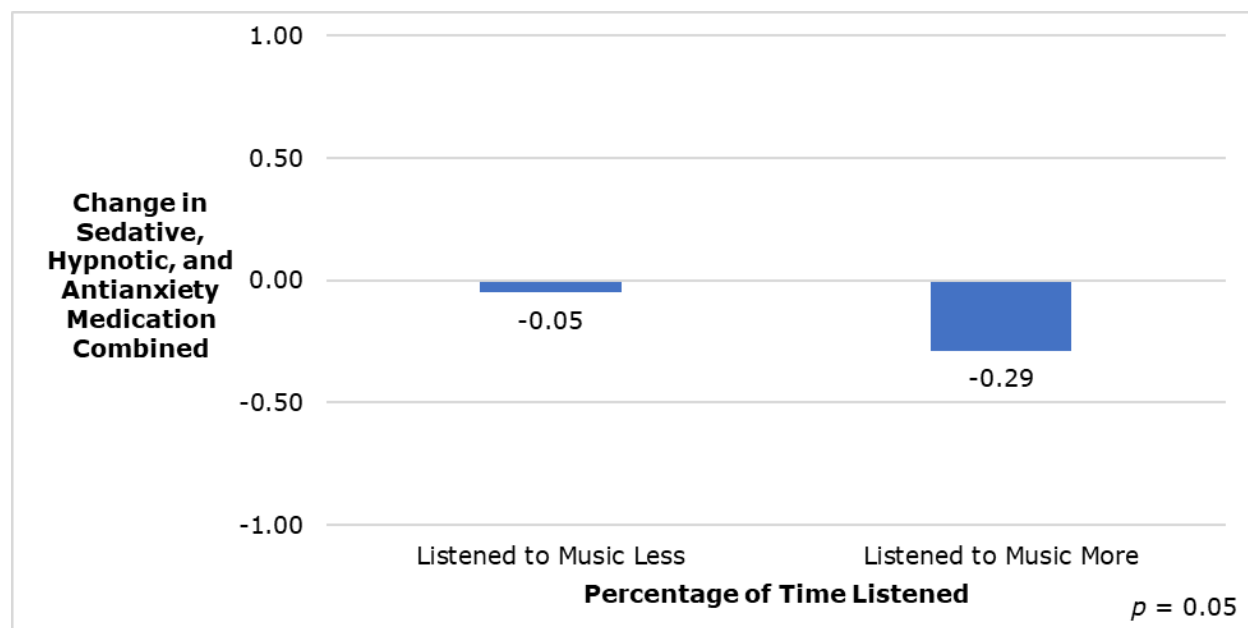


Notes. Mean scores range from -1 to 1, with -1 reflecting less medication, 0 reflecting no change, and 1 reflecting more medication.

Source: Music Logs; Monthly Medication Administration Records. Prepared by the Office of Data, Analytics, and Performance, HHSC.

The frequency of music use also appears to have impacted the use of a combination of sedatives, hypnotics, and antianxiety medications. The more participants listened to music, the more likely they were to use fewer sedatives, hypnotics, and antianxiety medications (average = -0.29) compared to the negligible change among those who listened to music less (average = -0.05; $U = 1251.0$, $p = 0.05$; refer to Figure 10 below).

Figure 10. Phase 1 Findings: Change in Sedative, Hypnotic, and Antianxiety Medication Combined and Percentage of Music Use



Notes. Mean scores range from -1 to 1, with -1 reflecting less medication, 0 reflecting no change, and 1 reflecting more medication.

Source: Music Logs; Monthly Medication Administration Records. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Additionally, although not statistically significant, participants who listened to more music reported greater reductions in pain medications, antidepressants, and sleep aids. Changes in MAR measures after the Music & Memory® Program did not significantly vary across level of enjoyment. Detailed findings on all changes in MARs measure differences by percentage of music use and level of enjoyment are presented in Appendix D.

Analyses Comparing the Music Group with the Comparison Group

Differences in MDS and MAR outcomes were compared between the Music Group and the Comparison Group. Changes in MDS and MAR-related measures after the Music & Memory® Program were compared to changes within a similar timeframe for the Comparison Group. MDS measures were available for 222 Music & Memory® Program participants and 162 individuals in the Comparison Group, while MAR measures were available for 114 Music & Memory® Program participants and 86 individuals in the Comparison Group. Mann-Whitney U tests were used to examine changes in between the two groups MDS and MAR outcomes were not normally distributed. Mann-Whitney U test is a median-based test, however there were no significant differences between the Music and Comparison Groups on the MDS measures or the MARs medication outcomes. Additional details on the analyses are provided in Appendix D.

Phase 2: Staff Satisfaction and Retention

Phase 2 focused on the implementation of the Music & Memory® Program across 158 nursing facilities between January 2017 and June 2017. Participating nursing facilities were located across the state and ranged in size from 58 beds to 242 beds.ⁱ Phase 2 of the study had two primary purposes: 1) continue to examine the impacts of the Music & Memory® Program on participants; and 2) examine the impact of the Music & Memory® Program on staff satisfaction and retention. Subsequent sections describe study methods and key results for Phase 2.

Methods

Study Design

The Phase 2 study primarily used a one-group posttest only design, where outcomes among staff and residents were examined after beginning the Music & Memory® Program. The Phase 2 study also attempted to use a one-group pretest-posttest design to examine changes in staff satisfaction outcomes after participating in the Music & Memory® Program, but very limited staff completed the Staff Satisfaction Questionnaire prior to and after program participation. As a result, Phase 2 findings support the growing knowledge of outcomes associated with the Music & Memory® Program, but do not imply causality.

Analytic Sample

A total of 158 nursing facilities expressed interest in Phase 2, however, only a subset of those submitted at least partial study materials (n=40). Among those nursing facilities, only 38 provided Music Logs, and 25 submitted Staff Retention Forms. Staff survey respondents were not asked to identify their nursing facility due to privacy concerns, so it is unknown how many of the 158 nursing facilities are represented in the Staff Satisfaction Questionnaire. Altogether, 500 nursing residents participated in Phase 2.

ⁱ Bed capacity was based on April 2020 data. However, nursing facility bed capacity is a relatively stable measure and should not have changed substantially in the 3 years since the study was completed.

Data Sources

Three primary data sources were used in Phase 2: Music Logs, a staff retention log, and the staff satisfaction questionnaire. The Music Logs were the same as those used in Phase 1 (described on page 9). Additional details on the staff retention log and the staff satisfaction questionnaire are provided below.

- **Staff retention logs:** Human Resources personnel at participating nursing facilities were asked to complete a staff retention log for every nursing facility employee between July 2015 and June 2017. The staff retention log captured a variety of information about nursing facility staff, including demographics such as date of birth and gender, and tenure at the facility. The staff retention log template is provided in Appendix B.
- **Staff Satisfaction Questionnaire:** HHSC developed the Staff Satisfaction Questionnaire for nursing facility staff at facilities participating in the Music & Memory® Program. HHSC administered the survey to all applicable nursing facility staff twice, prior to and after Music & Memory® implementation. The Staff Satisfaction Questionnaire asked nursing facility staff to provide some basic demographic information, describe their position and tenure at the nursing facility, involvement in the Music & Memory® program, and answer a series of questions aimed at assessing job satisfaction and retention. The Staff Satisfaction Questionnaire is provided in Appendix C.

Analytic Methods

Phase 2 relied on descriptive and inferential statistics to compare outcome measures from two different perspectives. Percentages, medians, and average responses to the Music Logs, the staff retention log, and the staff satisfaction questionnaire were calculated. Comparisons between groups were conducted using Mann-Whitney U tests, which do not rely on an assumption of normally distributed responses.

Phase Two Findings

Nursing Facility Residents' Response to Music

Music Logs were completed for all residents who participated in the Music & Memory® Program during Phase 2 (N=500). Although the Music & Memory® Program is designed as a six-month program, Phase 2 participants only stayed in the program for a little over 3 months, on average (refer to Table 8 below). Lower than designed participation may be due to participants starting the program late, opting out of program early, or leaving the nursing facility. Throughout their participation, residents were offered the chance to listen to music a little more than 3 days a week on average. Participants accepted the offer of music an average of a little more than 2 days a week (78%).

Table 8. Phase 2 Findings: Overall Individual Time Listening to Music

Measure (Average per Person)	Average
Number of Months Participating in the Music & Memory® Program	3.31
Days in the Week Music was Offered	3.23
Days in the Week Listened to Music	2.31
Percent of Times Listened to Music	78%

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Overall, when participants listened to music, they appeared to have favorable behaviors (e.g., calm, talkative, or quiet). Participants were described as calm when listening to music about 60% of the time on average (refer to Table 9 on the next page). Around 15% of the time, the behavior of people listening to music was described as talkative. Also, about 11% of the time, participants were described as quiet. Observers described participants as agitated 11% of the time, and aggressive 3% of the time.

Table 9. Phase 2 Findings: Behavior when Listening to Music

Behavior	Average Percentage of time
Calm	60%
Talkative	15%
Quiet	11%
Agitated	11%
Aggressive	3%

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Participants' mood varied across sessions, but observers described participants as happy (36%) or cheerful (26%) most of the time. Conversely less than 15% of the time, participants' mood was described as angry, nervous, bored, sad, or grieving. Participants were described as having a flat affect about 24% of the time (refer to Table 10 below).

Table 10. Phase 2 Findings: Mood when Listening to Music

Mood	Average Percentage of time
Happy	36%
Cheerful	26%
Flat	24%
Angry	5%
Nervous	4%
Bored	3%
Sad	2%
Grieving	<1%

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Observers were also asked to indicate whether they believed the music sessions changed participants' mood or behavior, and to rate participants' overall enjoyment with the session. On average, observers reported that participants' behaviors and moods improved as a result of the music sessions (average scores of 0.49 and 0.52, respectively, with -1 reflecting behavior or mood worsened, 0 reflecting no change, and 1 reflecting behavior or mood improved; refer to Table 11 on the next page). On average, observers also reported that participants generally enjoyed the music sessions. On a scale of 1 to 5, with 1 meaning they hated the music session and 5 meaning they loved the music session, the average response was a favorable 4.1.

Table 11. Phase 2 Findings: Responses to the Music Log

Measure	Average	Description of Scale
Change in Behavior	0.49	-1 Worsened 0 No Change 1 Improved
Change in Mood	0.52	-1 Worsened 0 No Change 1 Improved
Overall Enjoyment	4.1	5 Loved 4 Okay with use 3 Take it or leave it 2 Did not like 1 Hated

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

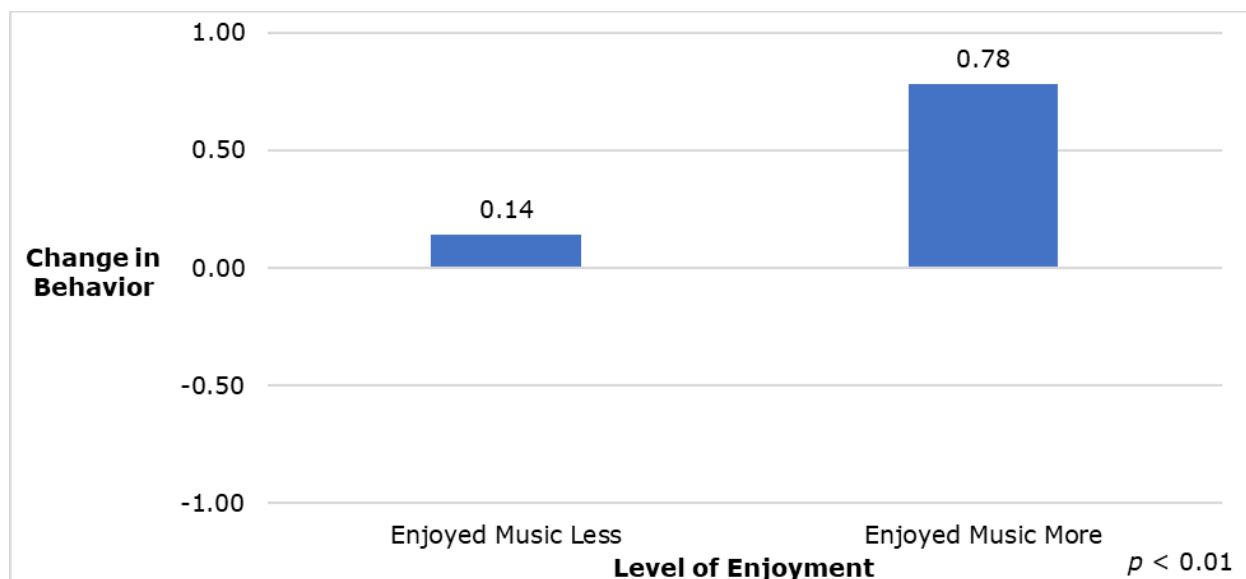
Effects of Level of Enjoyment and Percent of Times Listening on Response to Music

As with Phase 1, researchers examined the impact of enjoyment on time spent listening to music, behavior, and mood. To conduct these analyses, researchers divided participants into two groups based on whether they fell above or below the median of each predictor,^j and then compared differences in outcome variables between the two groups. Researchers used Mann-Whitney U tests to compare outcomes across the two groups for each predictor because the predictors were not normally distributed.

The more a participant seemed to enjoy music, the more likely their behavior improved ($U = 11359.0$, $p < 0.01$; refer to Figure 11 on the next page). On a scale from -1 (behavior worsened) to +1 (behavior improved), the median change in behavior for participants who enjoyed music more was 0.78. Among participants who enjoyed music less, the median was 0.14.

^j The median is the value that falls exactly in the middle of everyone's responses to a question. On any measure, half of the responses will fall below the median, and half of the responses will fall above the median.

Figure 11. Phase 2 Findings: Degree Behavior Improved by Level of Enjoyment

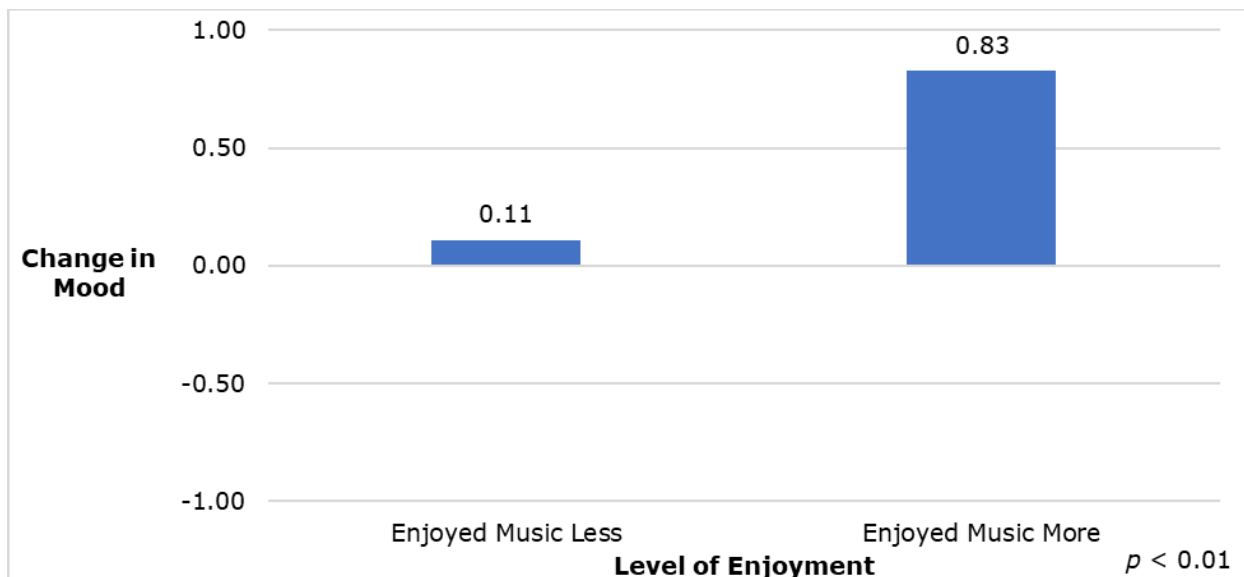


Notes. Median scores range from -1 to 1, with -1 reflecting worse behavior, 0 reflecting no change, and 1 reflecting improved behavior.

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Mood also improved as a function of how much participants enjoyed listening to music (refer to Figure 12 on the next page). The more they seemed to enjoy the music, the more likely they were to demonstrate improved mood ($U = 10317.5$, $p < 0.01$). On a scale from -1 (mood worsened) to +1 (mood improved), the median change in behavior for participants who enjoyed music more was 0.83. For participants in the lower quantile, the median was 0.11.

Figure 12. Phase 2 Findings: Degree Mood Improved by Level of Enjoyment

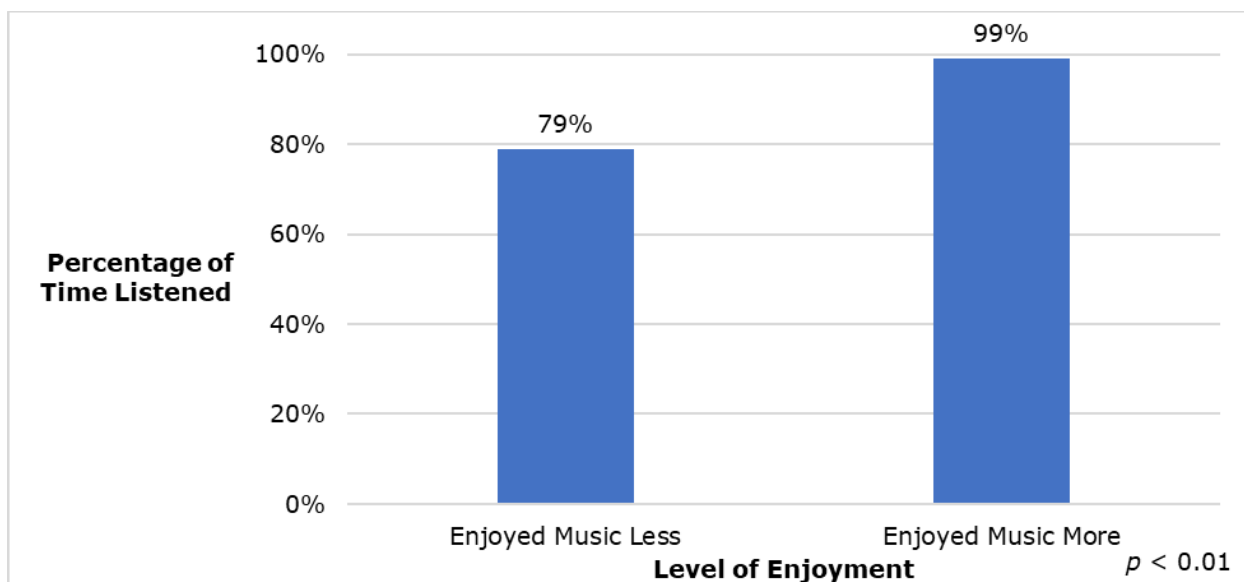


Notes. Median scores range from -1 to 1, with -1 reflecting worse mood, 0 reflecting no change, and 1 reflecting improved mood.

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

The degree to which participants enjoyed music significantly affected the percentage of times they chose to listen ($U = 17876.0$, $p < 0.01$). Participants in the upper quantile listened 99% of the time compared to lower quantile participants who listened an average of 79% of the time (refer to Figure 13 below).

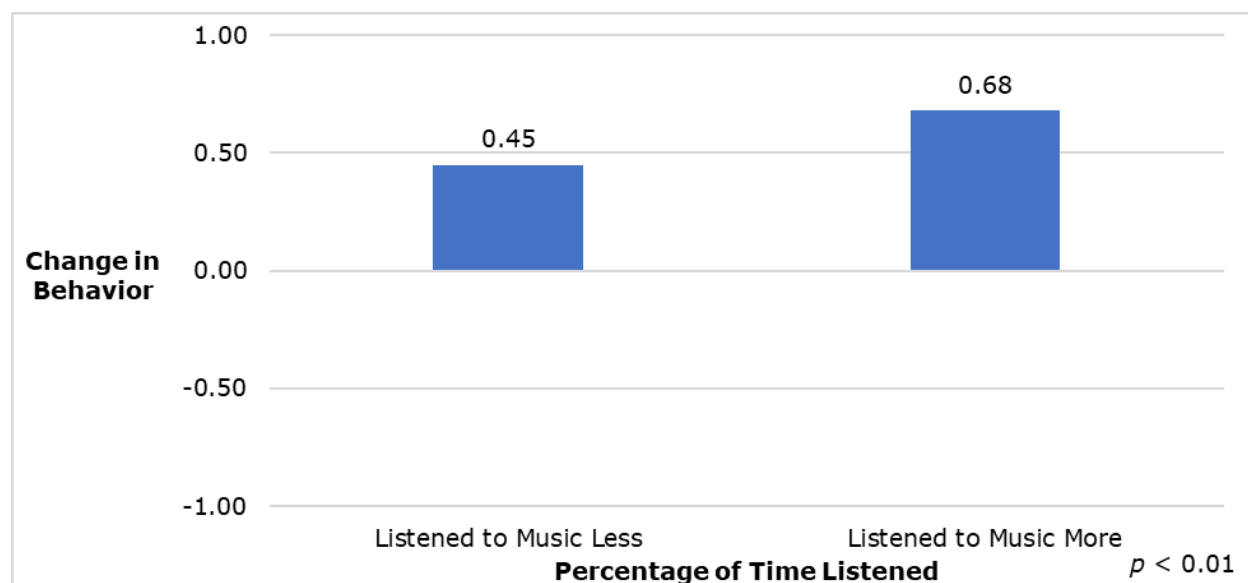
Figure 13. Phase 2 Findings: Percent of Time Listening to Music by Level of Enjoyment



Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

As with level of enjoyment, behavior improved with higher percentages of music use. The median change in behavior for participants in the upper quantile was 0.68. The median change among lower quantile participants was 0.45 ($U = 22872.5$, $p < 0.01$; refer to Figure 14 below).

Figure 14. Phase 2 Findings: Degree Behavior Improved by Percentage of Music Use

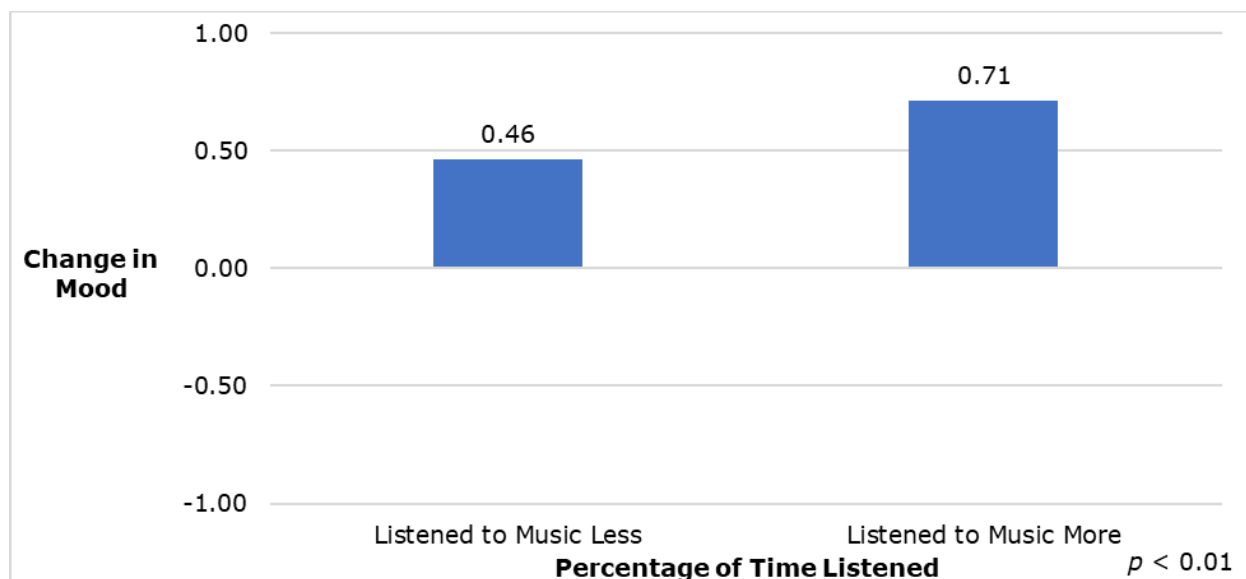


Notes. Median scores range from -1 to 1, with -1 reflecting worse behavior, 0 reflecting no change, and 1 reflecting improved behavior.

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Mood also improved with higher percentage of music use. The median mood improvement among upper quantile participants was 0.71 and 0.46 among lower quantile participants ($U = 22615.5$, $p < 0.01$; refer to Figure 15 on the next page).

Figure 15. Phase 2 Findings: Degree Mood Improved by Percentage of Music Use

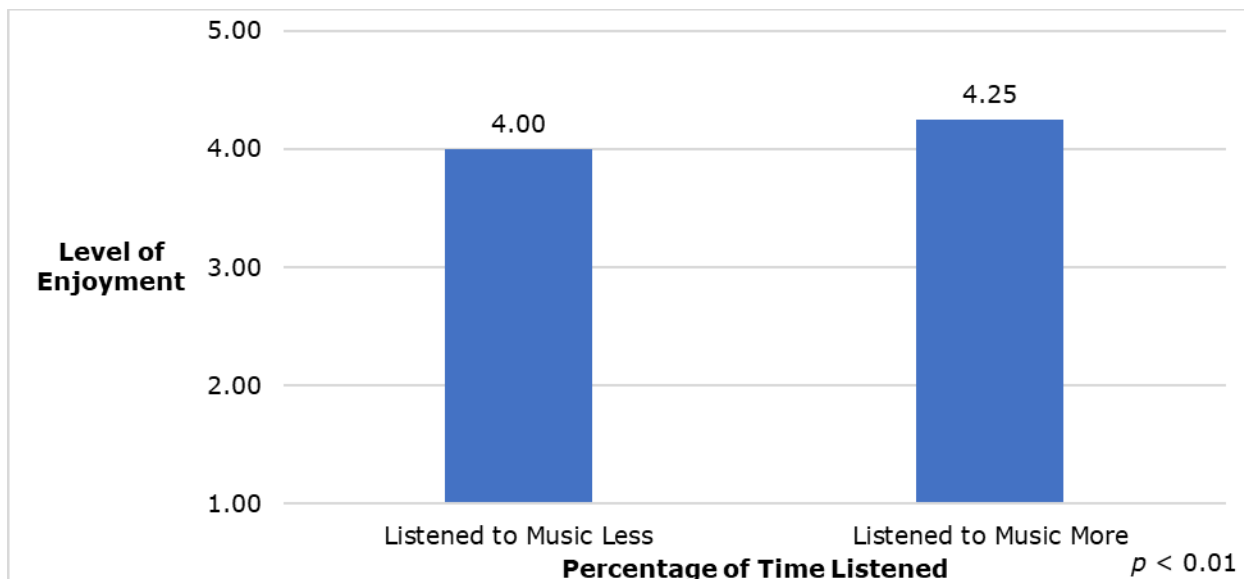


Notes. Median scores range from -1 to 1, with -1 reflecting worse mood, 0 reflecting no change, and 1 reflecting improved mood.

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Lastly, the more participants listened to music, the more they enjoyed it ($U = 19088.5$, $p < 0.01$; refer to Figure 16 on the next page). Participants who listened to music more had an enjoyment score of 4.25. Participants who listened to music less had an enjoyment score of 4.00.

Figure 16. Phase 2 Findings: Level of Enjoyment by Percentage of Music Use



Notes. Median scores range from 1 to 5, with 1 reflecting participants hated the music, and 5 reflecting participants loved the music.

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Nursing Facility Staff Findings

Human Resources personnel completed the Staff Retention Form for 2,277 staff members across 25 distinct nursing facilities, and 545 nursing facility staff members responded to the Staff Satisfaction Questionnaire. Staff respondents were most likely to be between 30 and 60 years old, female, and either a certified nursing assistant or licensed practical nurse (refer to Table 12 on the next page).

Table 12. Phase 2 Findings: Staff Demographics

Measure	Staff Retention Form	Staff Satisfaction Questionnaire
Sample Size	2,277	545
Age (in years)	39 (Average)	--
17 or younger	1%	<1%
Between 18 and 21	7%	3%
Between 22 and 29	21%	18%
Between 30 and 39	26%	21%
Between 40 and 49	20%	27%
Between 50 and 59	16%	20%
Between 60 and 64	4%	7%
65 or older	5%	2%
Percent Female	87%	87%
Position		
Certified nursing assistants	43%	29%
Licensed practical nurse	20%	13%
Registered nurse	6%	3%
Assistant Director of Nursing	1%	3%
Director of Nursing	1%	4%
Activities Director	1%	9%
Administrator	1%	5%
Social Worker	1%	5%
Other	27%	28%

Source: Staff Retention Form; Staff Satisfaction Questionnaire. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Staff Retention

According to the Staff Retention Forms, the average tenure of nursing facility staff was 30 months, and approximately 33% of staff employed between July 2015 and June 2017 had been terminated. Researchers attempted to examine whether staff tenure and turnover varied based on aspects of Music & Memory® implementation, but too few nursing facilities provided both Music Logs and Staff Retention Forms (N = 21) to conduct these comparisons. However, researchers were able to examine differences in staff agreement with potential reasons for leaving their current job across Music & Memory® Program participation using the Staff Satisfaction Questionnaire.

Mann-Whitney U tests were used to examine differences in the percentage of staff indicating agreement with a potential reason for leaving across Music & Memory® Program participation as responses were not normally distributed. Mann-Whitney U tests are a median-based test, however because the median response for all potential reasons was zero (i.e., most respondents did not select as a potential reason for leaving job), averages are described and presented below.

Generally speaking, staff who participated in Music & Memory® were less likely to agree items listed were potential reasons for leaving their job than those who did not (refer to Table 13 on the next page). However, only one item was statistically significant. Staff who participated in the Music & Memory® Program were significantly less likely to indicate finding a job at another nursing facility may be a reason they leave their current job ($U = 28495$, $p = 0.018$).

Table 13. Phase 2 Findings: Potential Reasons for Leaving Job by Music & Memory® Participation

Potential Reason for Leaving Job	Participated in Music & Memory® (N = 349) ¹	Did not Participate in Music & Memory® (N=178)
The work is too hard	0%	0%
The job is too stressful	18%	19%
The pay is too low	31%	36%
Lack of health insurance	6%	5%
No paid sick and/or vacation leave	6%	7%
Personal health concerns	12%	16%
Lack of benefits (like dental insurance, retirement, etc.)	6%	8%
Lack of opportunities to advance	15%	16%
I have found a job in another field	16%	11%
I have found another job at a different nursing facility*	12%	20%
I never intended to do this for the rest of my life or as a career	11%	9%
Other reason	22%	24%

Notes. Mean scores reflect the percentage of respondents who indicated item was a potential reason for leaving their job.

¹ Table 13 excludes 18 staff with incomplete Staff Satisfaction Questionnaires. The number of responses to individual items may vary.

* Statistically significant difference ($p < 0.05$).

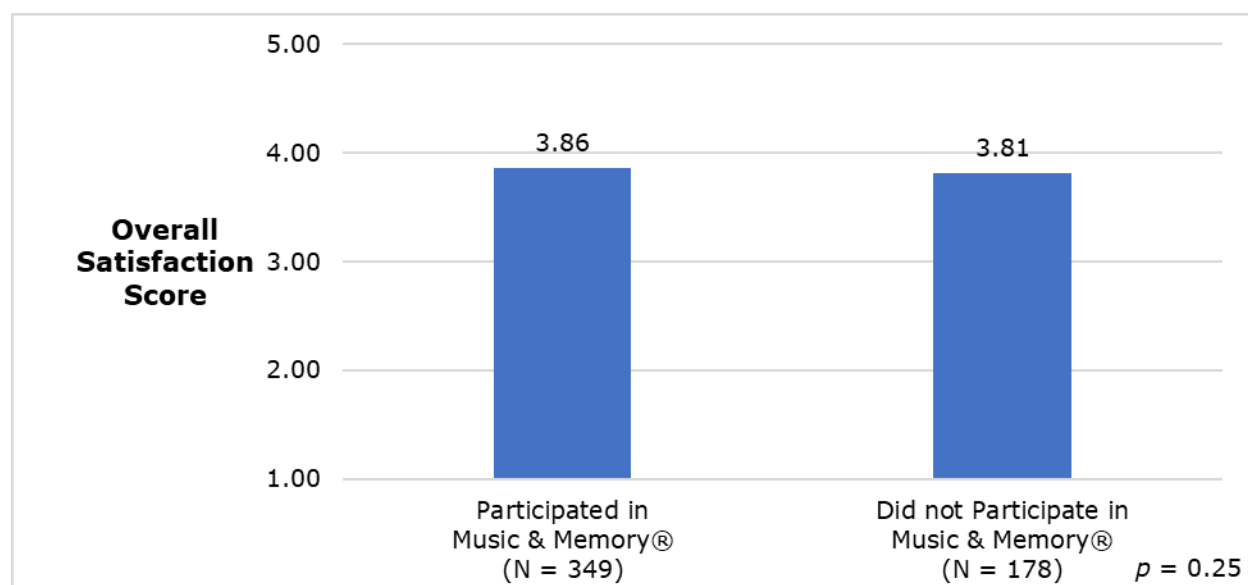
Source: Staff Satisfaction Questionnaire. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Staff Satisfaction

Of the 545 nursing facility staff members who responded to the Staff Satisfaction Questionnaire, only 31 completed the questionnaire prior to and after implementation of the Music & Memory® Program. As a result, pre- and post-implementation comparisons could not be made. Instead, researchers examined differences in staff satisfaction across Music & Memory® Program participation. Mann-Whitney U tests were used to examine differences in staff satisfaction across Music & Memory® Program participation as responses were not normally distributed. Mann-Whitney U tests is a median-based test, however median scores for individual items did not vary as medians were limited to specific Likert values (e.g., 1, 2, etc.). For the purposes of understanding changes in responses, averages are described and presented below.

Staff who participated in the Music & Memory® Program were slightly more satisfied with their job compared to those who did not participate, but this difference was not statistically significant (refer to Figure 17 below).

Figure 17. Phase 2 Findings: Overall Staff Satisfaction by Music & Memory® Participation



Notes. Mean scores range from 1 to 5, with higher scores reflecting greater satisfaction. Negatively worded items were reverse-coded. Figure excludes 18 staff with incomplete Staff Satisfaction Questionnaires.

Source: Staff Satisfaction Questionnaire. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Item-level differences reflected a similar pattern; for most satisfaction item staff who participated in the Music & Memory® Program indicated more favorable responses than those who did not (refer to Table 14 below). However, these differences were only statistically significant for two items. Staff who participated in the Music & Memory® Program were significantly more likely to indicate their relationship with residents is rewarding ($U = 26437$, $p = 0.002$), and significantly less likely to indicate it is too much to involve themselves with every resident (reverse-coded; $U = 26271$, $p = 0.012$).

Table 14. Phase 2 Findings: Staff Satisfaction Items by Music & Memory® Participation

Staff Satisfaction Measure	Participated in Music & Memory® (N = 349)¹	Did not Participate in Music & Memory (N=178)¹
Our staff work well together	4.00	3.94
We often discuss ways of improving the care we give	4.22	4.16
I get little sense of accomplishment from doing my job ²	2.91	2.89
My colleagues value what I do at work	3.99	3.96
I often find that I do not complete everything that I should in my job ²	2.48	2.31
My relationships with residents are rewarding, I would choose this job again*	4.65	4.48
I just hate to get up in the morning to go to work ²	2.12	1.99
There are enough opportunities at work to discuss the psychological stress of the job	3.12	3.01
Employee morale is generally good	3.61	3.61
I am in a dead end job ²	1.96	2.07
Most days I find my job to be extremely satisfying	4.05	4.05
I have the power to make changes	3.68	3.58
I often wish I had a different job ²	2.20	2.26
My work is important and worthwhile	4.45	4.41
It is too much to expect that I can involve myself with every resident ^{2*}	2.52	2.79

Staff Satisfaction Measure	Participated in Music & Memory® (N = 349)¹	Did not Participate in Music & Memory (N=178)¹
After a day's work, I really feel like I have accomplished something	4.07	4.08

Notes. Mean scores range from 1 to 5, with 1 reflecting strongly disagree, and 5 reflecting strongly agree.

¹ Table 14 excludes 18 staff with incomplete Staff Satisfaction Questionnaires. The number of responses to individual items may vary. ² Negatively worded items (lower scores are desirable).

* Statistically significant difference ($p < 0.05$).

Source: Staff Satisfaction Questionnaire. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Phase 3: Resident Mood and Behavior, Revisited

Phase 3 focused on the implementation of the Music & Memory® Program across 34 nursing facilities between June 2017 and December 2017. Participating nursing facilities were located across the state and ranged in size from 72 beds to 197 beds. The purpose of Phase 3 of the study was to obtain additional information on the impact of the Music & Memory® Program on residents' moods and behaviors. Subsequent sections describe study methods and key results for Phase 3.

Methods

Study Design

Similar to Phase 1, the Phase 3 study used a randomized delayed-start control group design. Nursing facilities nominated 15 residents who might benefit from the program. HHSC staff assigned eight of them into one of two groups: a 'Music Group' and a 'Comparison Group'. The remaining seven residents were "held in reserve" as potential replacements for the Music or Comparison Groups. HHSC staff randomly selected four residents to begin participating in the Music & Memory® Program immediately (Music Group), and then randomly assigned four additional residents, who were similar in age, gender, and perceived receptivity to the Music Group, to have their participation in the Music & Memory® Program delayed for six months (Comparison Group). This study design allowed researchers to control for factors that might affect results, such as aging and disease progression from the effects of the Music & Memory® Program.

Analytic Sample

A total of 157 facilities expressed interest in Phase 3, but only 34 implemented the program and submitted at least partial study materials. Altogether, 555 nursing residents participated in the Phase 3 study of the Music & Memory® Program: 153 in the Music Group and 402 in the Comparison Group. Forty-two participants left the study early.^k They were replaced primarily by nominated participants held in

^k The number of participants who left the study early was too small for analysis (n=42), but the percentage who were female and the percentage who had dementia were comparable to the music and comparison groups; those who left, however, did appear to be older than participants in the two study groups.

reserve, although in a few cases facilities replaced participants in the Music Group with the Comparison Group. These participants were re-categorized as Music Group members.

Residents who participated in the Phase 3 study averaged 79 years of age. Sixty-seven percent of the participants were female, and 85% were diagnosed with dementia. Participant demographics did not significantly vary across the Music and Comparison Groups (refer to Table 15 below).

Table 15. Phase 3 Findings: Participant Demographics

Measure	Music Group (N=145) ¹	Comparison Group (N=402)	Total Study Population (N=547) ¹
Average Age	79	79	79
Percent Female	69%	67%	67%
Presence of Dementia Diagnosis	91%	86%	87%

Note: ¹ Demographic information was missing for eight individuals who participated in the Music & Memory® Program. These individuals are excluded from Table 15.

The study population includes available data for participants who left the study early as well as participants from the reserve group who served as replacements.

Source: Minimum Data Set. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Data Sources

Phase 3 leveraged the same primary data sources previously used in Phase 1: Music Logs, MARs, and the MDS Nursing Assessments. Additional details on these data sources can be found on page 9.

Analytic Methods

Phase 3 relied on descriptive and inferential statistics to compare outcomes across two different perspectives. First, participants in the Music & Memory® Program were divided into two groups based on responses to their playlists; groups with more favorable responses were compared to groups of participants with less favorable responses. Second, the analysis compared people who participated in the Music & Memory® Program during the study and those whose participation was delayed until after the study was complete.

Phase Three Findings

Response to Music among Music Group

All Phase 3 participants had completed Music Logs. Although the Music & Memory[®] Program is a six-month program, Phase 3 participants only stayed in the program for just over three months, on average. Lower than designed participation may be due to participants starting the program late, opting out of the program early, or leaving the nursing facility. Participants who left the study were replaced by residents in the reserve group. On average, participants were offered music just over 3 days per week and listened just under 3 days per week. On average, participants listened to music 80% of the time it was offered (refer to Table 16 below).

Table 16. Phase 3 Findings: Overall Individual Time Listening to Music

Measure (Average per Person)	Average
Number of Months Participating in the Music & Memory [®] Program	3.27
Days in the Week Music was Offered	3.39
Days in the Week Listened to Music	2.76
Percentage of Times Listened to Music	80%

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Overall, participants had favorable behaviors (e.g., calm, talkative, or quiet) when listening to music. Participants were described as calm when listening to music about 68% of the time (refer to Table 17 below), talkative about 13% of the time, and quiet about 12% of the time. Less often, they were described as agitated (5%) or aggressive (2%).

Table 17. Phase 3 Findings: Behavior when Listening to Music

Behavior	Average Percentage of Time
Calm	68%
Talkative	13%
Quiet	12%
Agitated	5%
Aggressive	2%

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Observers were also asked to indicate whether they believe the music sessions changed participants' mood or behavior, and participants' overall enjoyment with the session. On average, observers reported that participants' behaviors and moods improved as a result of the music sessions (average scores of 0.50 and 0.51, respectively, with -1 reflecting behavior or mood worsened, 0 reflecting no change, and 1 reflecting behavior or mood improved (refer to Table 18 below). Observers also reported that participants, on average, generally enjoyed music sessions. On a scale of 1 to 5, with 1 meaning they hated the music session and 5 meaning they loved the music session, the average response was a favorable 4.2.

Table 18. Phase 3 Findings: Responses to the Music Log

Measure	Average	Description of Scale
Change in Behavior	0.50	-1 Worsened 0 No Change 1 Improved
Change in Mood	0.51	-1 Worsened 0 No Change 1 Improved
Overall Enjoyment	4.2	5 Loved 4 Okay with use 3 Take it or leave it 2 Did not like 1 Hated

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Effects of Level of Enjoyment and Percent of Times Listening on Response to Music

Researchers ran two sets of analyses to examine the impact of the Music & Memory® Program on behavior, mood, and program participation. Researchers examined the impact of the amount of time spent listening to music had on enjoyment, behaviors, and mood. In addition, researchers examined the impact of enjoyment on time spent listening to music, behavior, and mood (refer to Table 19 on the next page). To conduct these analyses, researchers divided participants into two groups based on whether they fell above or below the median of each

predictor,^l and then compared differences in outcome variables between the two groups. Researchers used Mann-Whitney U to compare outcomes across the two groups for each predictor because the predictors were not normally distributed.^m Additional details on the analyses are provided in Appendix D.

Table 19. Phase 3 Predictors and Outcome Variables

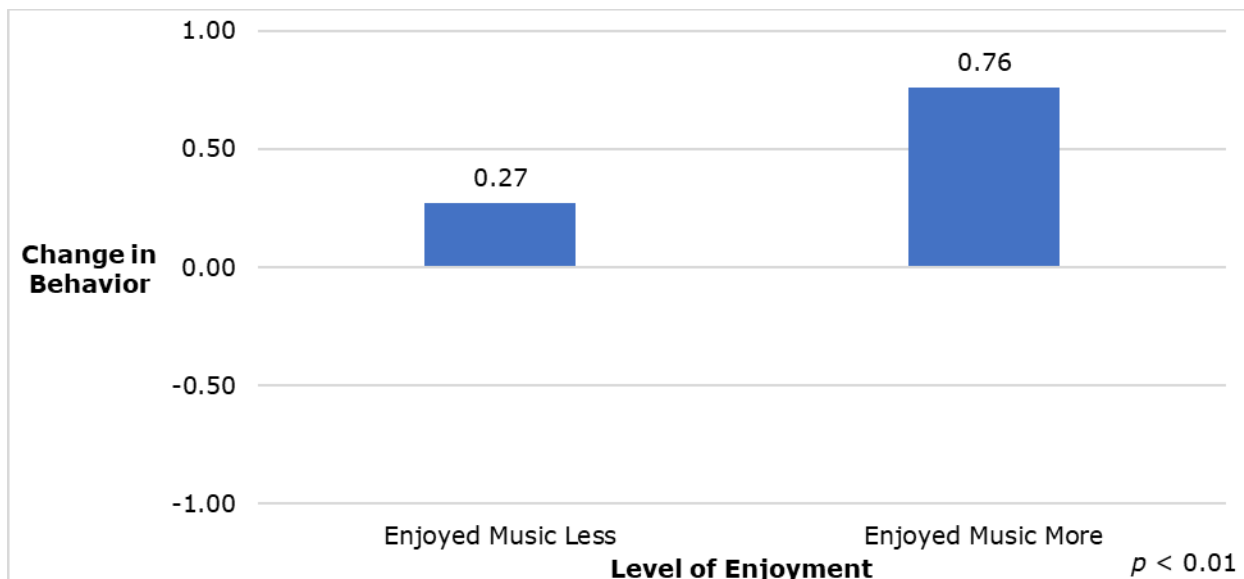
Analysis Set 1 Predictor	Analysis Set 1 Outcome	Analysis Set 2 Predictor	Analysis Set 2 Outcome
Level of Enjoyment	Change in Behavior Change in Mood Percentage of Times Listened to Music	Percentage of Times Listened to Music	Change in Behavior Change in Mood Level of Enjoyment

As shown in the subsequent figures, these analyses suggested greater enjoyment and more time spent listening to music lead to improved outcomes. The more a participant seemed to enjoy music, the more likely they were to demonstrate improved behavior ($U = 1240.5$, $p < 0.01$; refer to Figure 18 on the next page). On a scale from -1 (behavior worsened) to +1 (behavior improved), the median change in behavior for participants who enjoyed music more was 0.76. Among participants who enjoyed music less, the median was 0.27.

^l The median is the value that falls exactly in the middle of everyone's responses to a question. On any measure, half of the responses will fall below the median, and half of the responses will fall above the median.

^m In statistical tests, assumptions are made about how responses are distributed. In a normal distribution, most responses center around the mean, and with roughly equal numbers of responses falling above and below the mean. A non-normal distribution means that responses are not necessarily centered around the mean and the number that are higher or lower than the mean are skewed, or lopsided. When this happens, the assumption that the responses are normally distributed is not met, and alternative statistical tests that do not rely on this assumption must be used. This report relies on Mann-Whitney U tests, which do not rely on an assumption of normally distributed responses.

Figure 18. Phase 3 Findings: Degree Behavior Improved by Level of Enjoyment

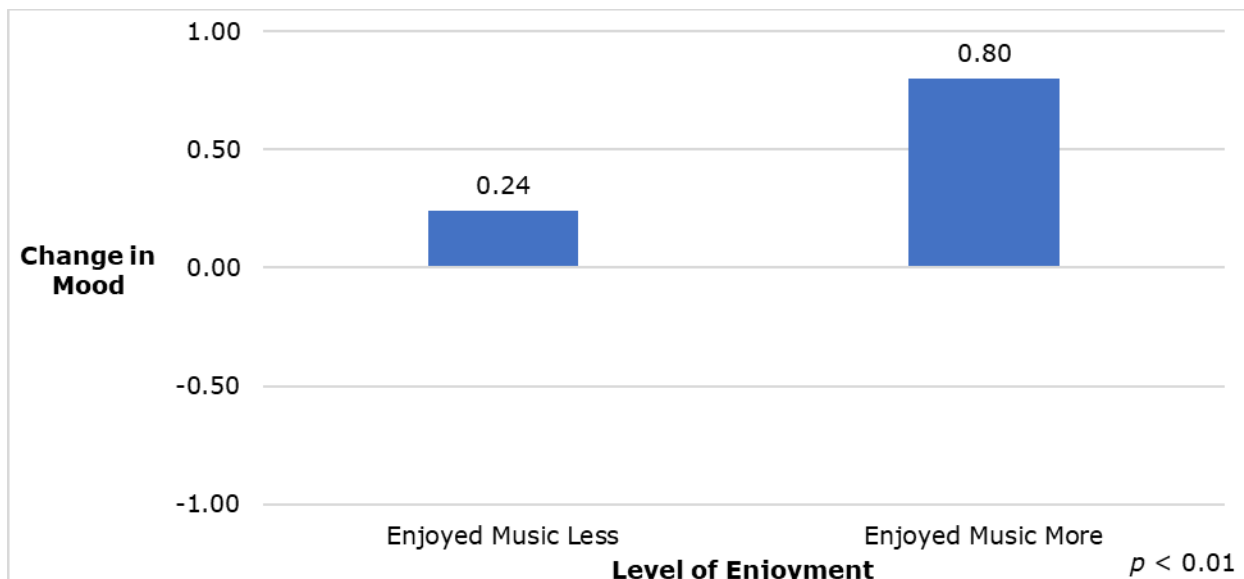


Notes. Median scores range from -1 to 1, with -1 reflecting worse behavior, 0 reflecting no change, and 1 reflecting improved behavior.

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Mood also improved as a function of how much participants enjoyed listening to music (refer to Figure 19 on the next page). The more they seemed to enjoy the music, the more likely they were to demonstrate improved mood ($U = 895.5$, $p < 0.01$). On a scale from -1 (mood worsened) to +1 (mood improved), the median change in mood for participants who enjoyed music more was 0.80. For participants in the lower half, the median was 0.24.

Figure 19. Phase 3 Findings: Degree Mood Improved by Level of Enjoyment

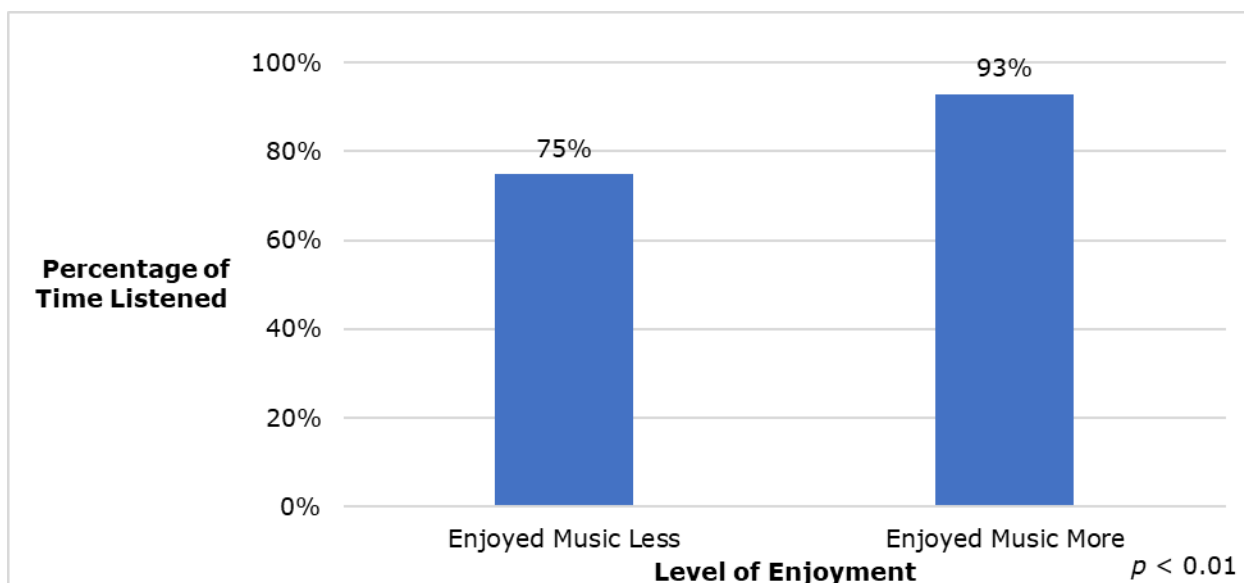


Notes. Median scores range from -1 to 1, with -1 reflecting worse mood, 0 reflecting no change, and 1 reflecting improved mood.

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

The degree to which participants enjoyed music significantly affected the percentage of times they chose to listen ($U = 1738.5$, $p < 0.01$). Participants in the upper half listened 93% of the time compared to lower half of participants who listened a median of 75% of the time (refer to Figure 20 below).

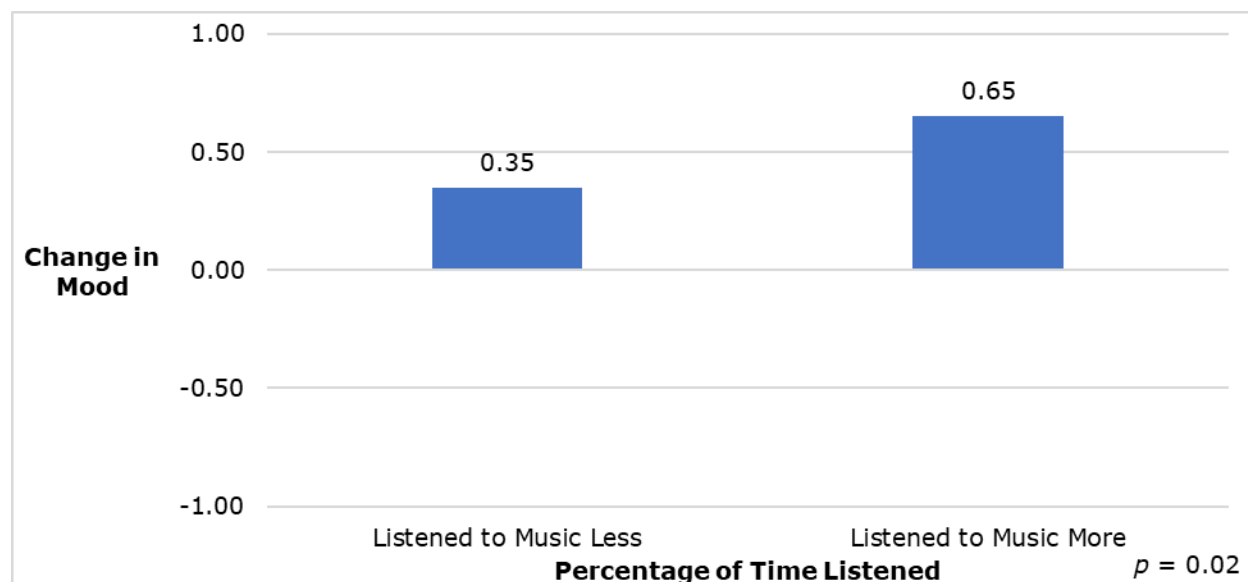
Figure 20. Phase 3 Findings: Percent of Time Listening to Music by Level of Enjoyment



Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Mood improved with higher percentage of music use. The median for mood improvement was 0.65 among upper half participants and 0.35 among lower half participants ($U = 2047.5$, $p < 0.05$; refer to Figure 21 below).

Figure 21. Phase 3 Findings: Change in Mood by Level of Enjoyment

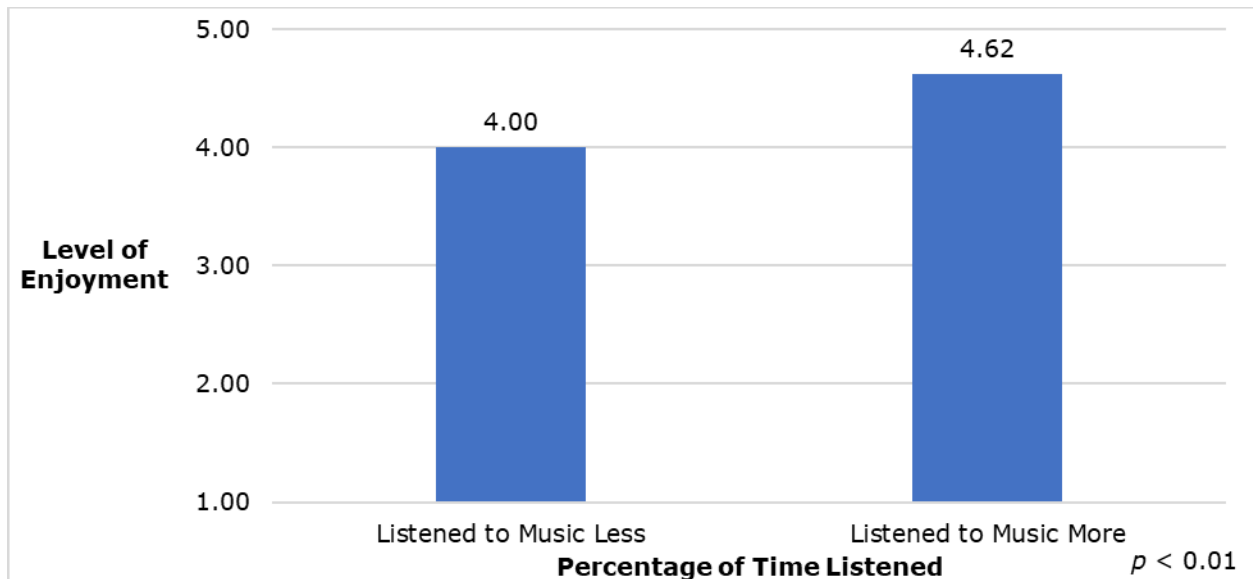


Notes. Median scores range from -1 to 1, with -1 reflecting worse mood, 0 reflecting no change, and 1 reflecting improved mood.

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Level of enjoyment increased with higher percentage of music use. The median for level of enjoyment was 4.62 among upper half participants and 4.00 among lower half participants ($U = 1610.0$, $p < 0.01$; refer to Figure 22 on the next page).

Figure 22. Phase 3 Findings: Level of Enjoyment by Percentage of Time Listened



Notes. Median scores range from 1 to 5, with 1 reflecting least enjoyment and 5 reflecting most enjoyment.

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Lastly, individuals who listened to music more reported greater changes in behavior than those who listened less (0.60 versus 0.40, respectively), however that difference was not statistically significant.

Analyses Comparing Music Group Participants Before and After Starting Music & Memory®

Differences in MDS-related outcomes were examined prior to and after participants began the Music & Memory® Program. In addition, changes in MDS and MAR-related measures after the Music & Memory® Program were examined across two key predictors (percentage of music use and level of enjoyment). Similar to Phase 1, all participants' MAR data were included regardless of their duration of participation, as long as they had pre- and post-music measures.

Wilcoxon signed-rank tests were used to compare MDS measures prior to and after the Music & Memory® Program, and Mann-Whitney U tests were used to examine changes in MDS and MAR-related outcome scores after the Music & Memory® Program across percentage of music use and level of enjoyment. These nonparametric tests were used because MDS and MAR outcomes were not normally distributed.

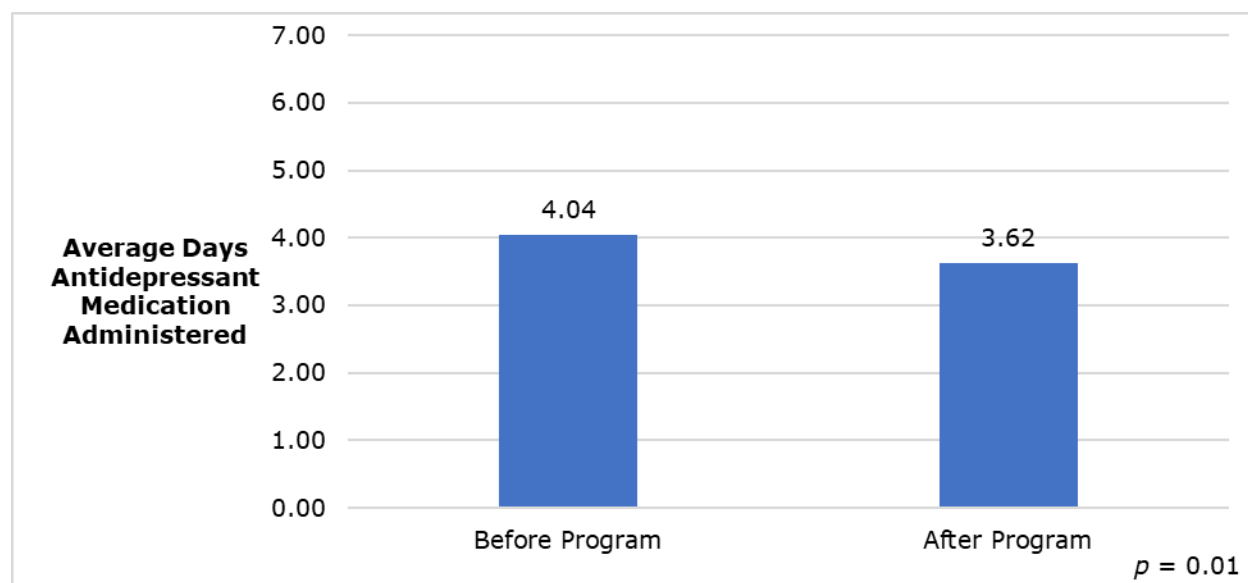
Wilcoxon signed-rank and Mann-Whitney U tests are median-based tests. However, for almost all outcomes compared, the medians were zero. The averages take into account specific values among all participants and are more sensitive to the distribution of those values. Therefore, to provide a more informative measure of the differences between groups, averages are presented in the figures instead of medians. Additional details on the analyses, as well as medians for all MDS and MAR-related outcomes are provided in Appendix D.

MDS Measures

MDS measures were available prior to, after prior to, and after the Music & Memory® Program for 150 individuals. Among those participants, percentage of music use was available for 143, and level of enjoyment was available for 146. After the Music & Memory® Program, there were significant changes in antidepressant and antianxiety medications, wandering, and reception of scheduled pain medications.

Participants were more likely to take antidepressant medication in the prior seven days before the Music & Memory® Program (average = 4.04) than after (average 3.62; $Z = -2.532$, $p = 0.01$; refer to Figure 23 below).

Figure 23. Phase 3 Findings: Change in Antidepressant Medications Before and After the Music & Memory® Program

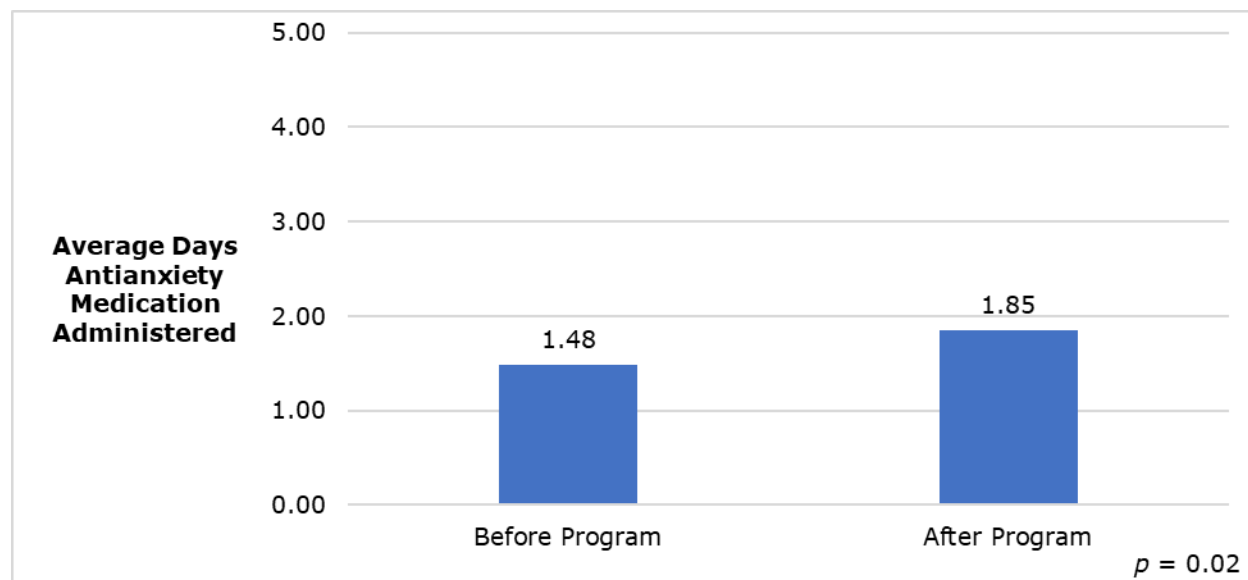


Notes. Mean scores reflect the number of days antidepressant medications were administered in the seven days prior to the assessment.

Source: Minimum Data Set. Prepared by the Office of Data, Analytics, and Performance, HHSC.

However, participants were more likely to take antianxiety drugs in the prior seven days after starting the Music & Memory® Program (average = 1.85) than before (average = 1.48; $Z = -2.374$, $p = 0.02$; refer to Figure 24 below).

Figure 24. Phase 3 Findings: Change in Antianxiety Medications Before and After the Music & Memory® Program

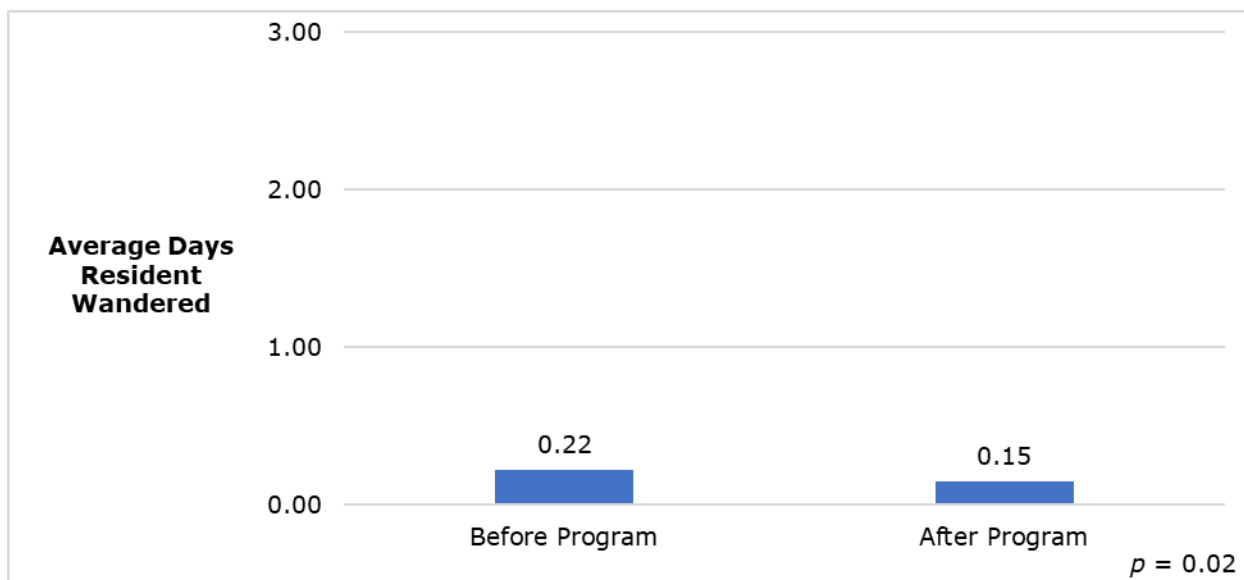


Notes. Mean scores reflect the number of days antidepressant medications were administered in the seven days prior to the assessment.

Source: Minimum Data Set. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Participants were less likely to have wandered seven days after the Music & Memory® Program (average = 0.15) than before (average 0.22; $Z = -2.378$, $p = 0.02$; refer to Figure 25 below).

Figure 25. Phase 3 Findings: Change in Wandering Before and After the Music & Memory® Program

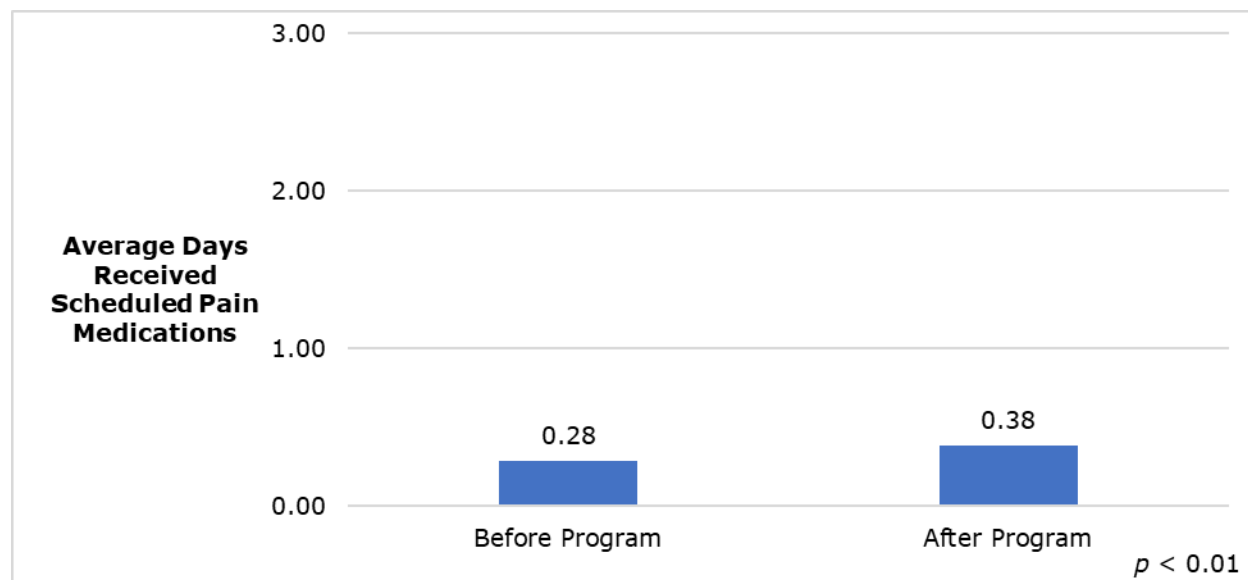


Notes. Mean scores reflect the number of days resident wandered in the seven days prior to the assessment.

Source: Minimum Data Set. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Lastly, participants were more likely to have received scheduled pain medications in prior five days after the Music & Memory® Program (average = 0.38) than before (average 0.28; $Z = -2.847$, $p < 0.01$; refer to Figure 26 below).

Figure 26. Phase 3 Findings: Change in Scheduled Pain Medications Before and After the Music & Memory® Program



Notes. Mean scores reflect the number of days resident received scheduled pain medications in the five days prior to the assessment.

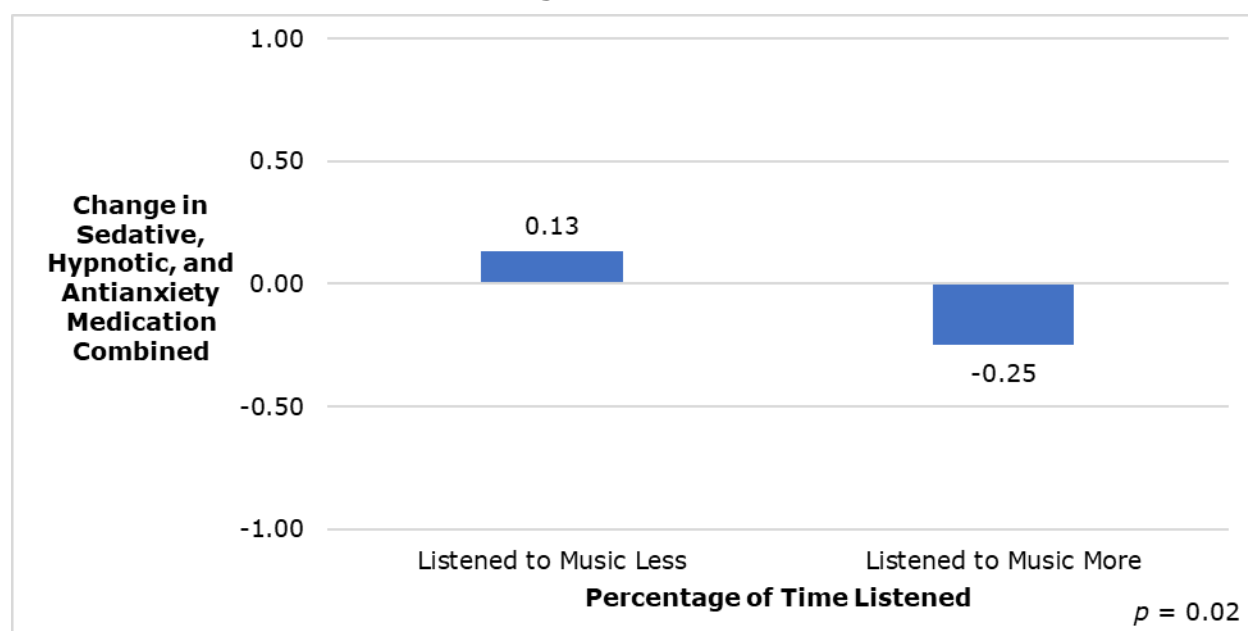
Source: Minimum Data Set. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Changes in some MDS measures after the Music & Memory® Program significantly varied across percentage of music use or level of enjoyment. Specifically, participants who listened to music more reported reductions in physical behavior symptoms (average change = -0.03), while those who listened to music less did not (average change = 0.06; $U = 2119.5$, $p = 0.03$). However, participants who enjoyed music more reported fewer reductions in pain than those who enjoyed music less (average change = -0.01 and -0.11, respectively; $U = 1923.5$, $p < 0.01$). Furthermore, participants who enjoyed music more reported an increase in PRN pain medications (average change = 0.06), while those who enjoyed music less reported a small reduction (average change = -0.09; $U = 1915.05$, $p < 0.01$). Detailed findings on all of the pre/post differences examined are presented in Appendix D.

MAR Measures

MAR measures were available prior to, after prior to, and after the Music & Memory® Program for 264 individuals. Among those participants, percentage of music use was available for 74, and level of enjoyment was available for 75. Percentage of music use was associated with significantly different changes in combination of sedatives, hypnotics, and antianxiety medications. Specifically, participants who listened to music more frequently experienced reductions in sedatives, hypnotics, and antianxiety medications (average change = -0.25) while participants who listened to music less frequently experienced an increase (average change = 0.13; $U = 490.0$, $p = 0.02$; refer to Figure 27 below).

Figure 27. Phase 3 Findings: Change in Sedative, Hypnotic, and Antianxiety Medication Combined and Percentage of Music Use



Notes. Mean scores range from -1 to 1, with -1 reflecting less medication, 0 reflecting no change, and 1 reflecting more medication.

Source: Music Logs; Monthly Medication Administration Records. Prepared by the Office of Data, Analytics, and Performance, HHSC.

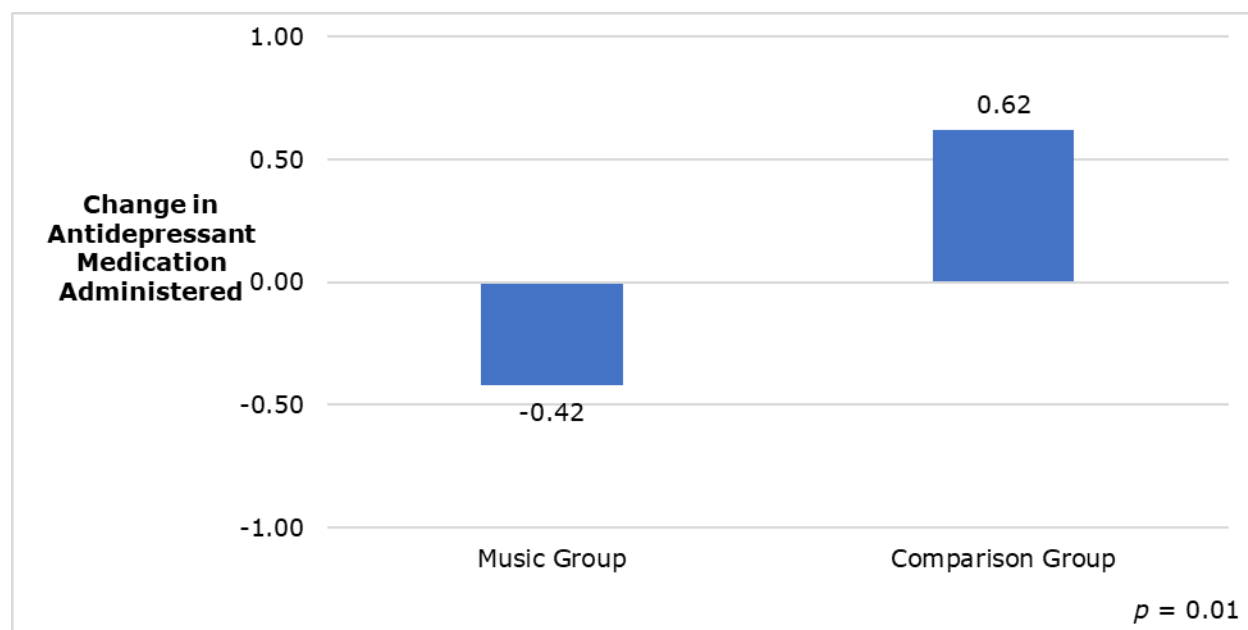
Additionally, although not statistically significant, participants who listened to music more reported greater reductions in antidepressants, and sleep aids. However, although not statistically significant, participants who enjoyed music more reported increases in pain medications (0.27) while those who enjoyed music less reported decreases (-0.12). Detailed findings on all changes in MARs measure differences by percentage of music use and level of enjoyment are presented in Appendix D.

Analyses Comparing the Music Group with the Comparison Group

Differences in MDS and MAR outcomes were compared between the Music Group and the Comparison Group. Changes in MDS and MAR-related measures after the Music & Memory® Program were compared to changes within a similar timeframe for the Comparison Group. MDS measures were available for 150 Music & Memory® Program participants and 118 individuals in the Comparison Group, while MAR measures were available for 76 Music & Memory® Program participants and 188 individuals in the Comparison Group. Mann-Whitney U tests were used to examine changes between the two groups as MDS and MAR outcomes were not normally distributed. Mann-Whitney U test is a median-based test, however because the medians for almost all outcomes were zero, averages are described and presented below. Additional details on the analyses, as well as medians for all MDS and MAR-related outcomes are provided in Appendix D.

Participants in the Music Group experienced a reduction in antidepressant medications after the Music & Memory® Program (average change = -0.42), while those in the Comparison Group experienced an increase (average change = 0.62; $U = 7312.0$, $p = 0.01$; refer to Figure 28 below).

Figure 28. Phase 3 Findings: Change in Antidepressant Medications by Group

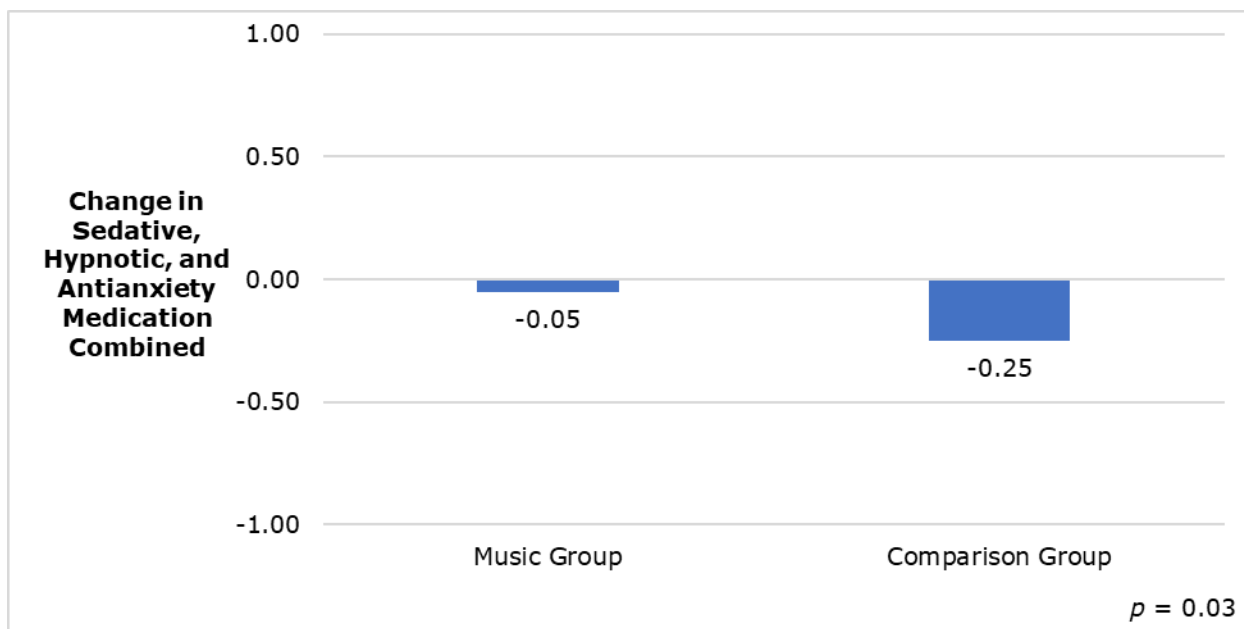


Notes. Mean scores range from -1 to 1, with -1 reflecting less medication, 0 reflecting no change, and 1 reflecting more medication.

Source: Minimum Data Set. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Participants in the Music Group had a smaller reduction in sedative, hypnotic, or antianxiety medication use after the Music & Memory® Program (average change = -0.05) than individuals in the Comparison Group (average change = -0.27; $U = 6075.0$, $p = 0.03$; refer to Figure 29 below).

Figure 29. Phase 3 Findings: Change in Sedative, Hypnotic, and Antianxiety Medication Combined by Group

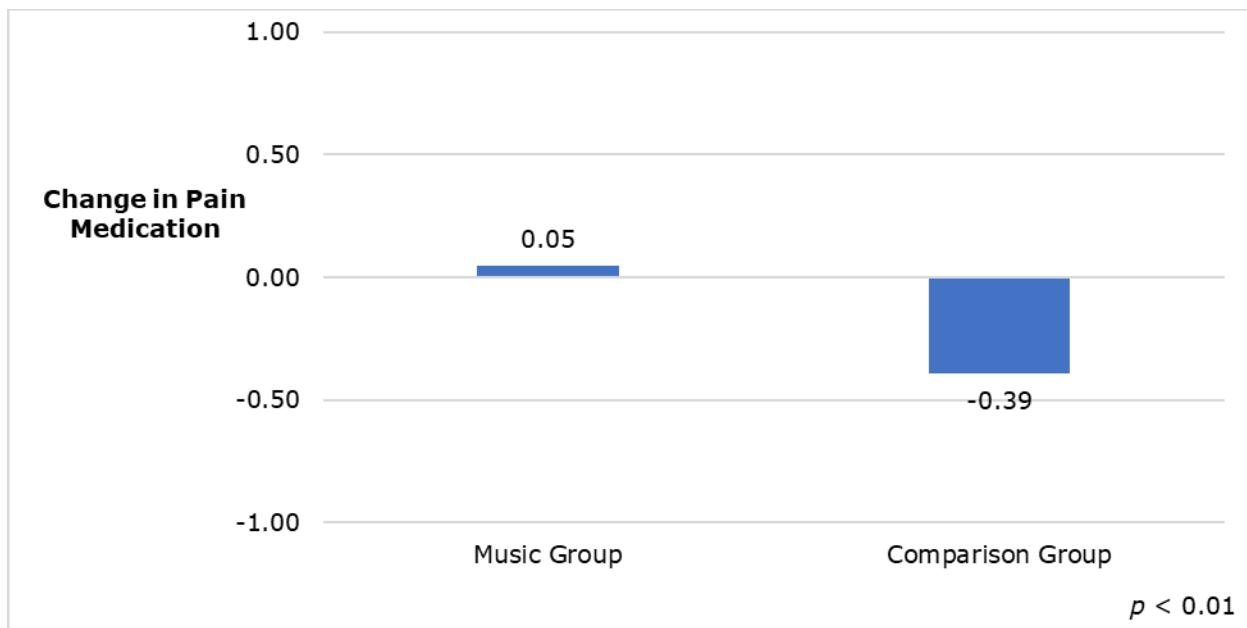


Notes. Mean scores range from -1 to 1, with -1 reflecting less medication, 0 reflecting no change, and 1 reflecting more medication.

Source: Monthly Medication Administration Records. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Participants in the Music Group had a small increase in pain medications after the Music & Memory® Program (average change = 0.05), while individuals in the Comparison Group experienced a reduction (average change = -0.39; $U = 5119.0$, $p = 0.03$; refer to Figure 30 on the next page).

Figure 30. Phase 3 Findings: Change in Pain Medication by Group



Notes. Mean scores range from -1 to 1, with -1 reflecting less medication, 0 reflecting no change, and 1 reflecting more medication.

Source: Monthly Medication Administration Records. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Detailed findings on all changes in MDS and MARs measures by group are presented in Appendix D.

Limitations

The findings of this study should be interpreted along several key limitations. First, exposure to the Music & Memory® Program was not standardized; one person may have listened to music for 30 minutes one week, while another listened continuously for days. The current study had access to exposure to the Music & Memory® Program (e.g., days spent listening to music), but not the duration of that exposure (e.g., time spent listening). As a result, the current study could not examine the impact of the time spent listening to music on outcomes, or whether an optimal duration of music exposure exists.

A second limitation is that the critical study instrument, the Music Log, was observational and no standard qualifications were developed for the observer. As a result, the quality of observations likely varied among participants and facilities due to differing levels of observer experience. Additionally, Music Logs may be subject to confirmation bias, in which observers' ratings align with their expectations of the impact on residents. Despite these limitations, consistency in findings across various data sources provided support that the Music Logs were reliable.

Third, nursing facilities did not always comply with the random assignment of participants to the Music Group and the Comparison Group, especially in Phase 1. This increased the likelihood that differences in outcomes reflected differences between the groups themselves rather than the effects of the Music & Memory® Program. However, this concern was mitigated somewhat by the lack of significant differences between the two groups on age, gender, and presence of a dementia diagnosis. Additionally, findings from Phase 3 (which had a greater emphasis on compliance with random assignment) were similar to those in Phase 1, further mitigating concerns that outcomes were due to differences in the group themselves.

Lastly, too few nursing facilities provided both Music Logs and Staff Retention Forms to examine the impact of Music & Memory® implementation on staff retention outcomes (Phase 2). Similarly, too few nursing facilities had staff complete the Staff Satisfaction Questionnaire both before and after Music & Memory® program was implemented. As a result, the effect of Music & Memory® on staff satisfaction could not be fully explored (Phase 2). Future studies should focus on gathering more robust measures of staff satisfaction and retention.

Conclusion

The Music & Memory® Program uses individualized selections of music (playlists) to help a person reconnect with the world through music-triggered memories. Music & Memory® aims to improve the quality of life for individuals with cognitive and physical conditions, improve relationships between staff and residents, and ease staff burden. HHSC's DAP has conducted three phases of a study exploring the impacts of the Music & Memory® Program on resident and staff outcomes.

Collectively, findings from Phases 1, 2 and 3 indicate that Music & Memory® is associated with improvements in residents' behavior and mood, especially with increased enjoyment and/or exposure to music. The Music & Memory® Program was also associated with reductions in medication use and pain among residents. Additionally, Music & Memory® was associated with improvements in staff relationship with residents. Table 20 below provides a summary of key findings across all phases of the study.

Table 20. Summary of Key Findings

Phase	Purpose	Key Findings
Phase 1: June 2016 to December 2016	Additional explorations on the impact of the Music & Memory® Program on residents' mood, behavior, and use of psychotropic using a pre/post randomized design.	<ul style="list-style-type: none"> Participants listened to music most of the time it was offered. The more people enjoyed their music, the more often they listened, and the more the music improved their behavior and mood. Participants who listened to music more experienced greater reductions in medications. When compared to the Comparison Group, residents who participated in the Music & Memory® Program reported decreases in hypnotic medications, reduced pain, and fewer falls.

Phase	Purpose	Key Findings
Phase 2: January 2017 to June 2017	Continued exploration on the impact of the Music & Memory® Program on residents, plus additional explorations of the impacts the on staff retention and satisfaction.	<ul style="list-style-type: none"> • Confirmation of Phase 1 findings on music's positive impact on residents' behavior and mood. • Staff who participated in the Music & Memory® Program were more satisfied with their job, especially in regard to their relationship and involvement with residents.
Phase 3: June 2017 to December 2017	Additional explorations on the impact of the Music & Memory® Program on residents' mood, behavior, and use of psychotropic using a pre/post randomized design.	<ul style="list-style-type: none"> • Confirmation of prior findings on music's positive impact on residents' behavior and mood. • Participants in the Music & Memory® Program experienced reductions in antidepressant medications, as well as reductions in wandering, but increases in antianxiety medications and scheduled pain medicines. • Increased use of music was associated with greater reductions in sedative, hypnotic, and antianxiety medications. • When compared to the Comparison Group, residents in the Music & Memory® Program had a smaller reduction in use of sedative, hypnotic, or anti-anxiety medications, and antidepressant medications, and a slight increase in pain medications after the Music & Memory® Program.

The successes of the Music & Memory® Program should be interpreted alongside a few key limitations, such as measurement biases associated with the Music Log, and differences between the Music Group and the Comparison Group (Phase 1) due to challenges randomly assigning individuals to groups. Efforts to improve random assignment of participants were taken in Phase 3, with findings comparable to Phase 1. Despite these limitations, findings provide preliminary support that Music & Memory® is achieving the aims of the program.

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Appendix A. Music Log

Facility Name: _____

Music & Memory Music Use Log for: _____

Week	Amount iPod Used	Overall Feeling about Listening	Overall Behavior while Listening	Change in Behavior as a Result of Listening	Overall Mood while Listening	Change in Mood as a Result of Listening	Notes
Week 1 (1st - 7th)	# of days offered _____ # of days used _____	Loved _____ OK with use _____ Take it or leave it _____ Did not like _____ Hated _____	Calm _____ Aggressive _____ Agitated _____ Talkative _____ Quiet _____	No Change _____ Improved _____ Worsened _____	Happy _____ Cheerful _____ Bored _____ Flat _____ Nervous _____ Sad _____ Grieving _____ Angry _____	No Change _____ Improved _____ Worsened _____	
Week 2 (8th - 14th)	# of days offered _____ # of days used _____	Loved _____ OK with use _____ Take it or leave it _____ Did not like _____ Hated _____	Calm _____ Aggressive _____ Agitated _____ Talkative _____ Quiet _____	No Change _____ Improved _____ Worsened _____	Happy _____ Cheerful _____ Bored _____ Flat _____ Nervous _____ Sad _____ Grieving _____ Angry _____	No Change _____ Improved _____ Worsened _____	
Week 3 (15th - 21st)	# of days offered _____ # of days used _____	Loved _____ OK with use _____ Take it or leave it _____ Did not like _____ Hated _____	Calm _____ Aggressive _____ Agitated _____ Talkative _____ Quiet _____	No Change _____ Improved _____ Worsened _____	Happy _____ Cheerful _____ Bored _____ Flat _____ Nervous _____ Sad _____ Grieving _____ Angry _____	No Change _____ Improved _____ Worsened _____	
Week 4 (22nd - 27th)	# of days offered _____ # of days used _____	Loved _____ OK with use _____ Take it or leave it _____ Did not like _____ Hated _____	Calm _____ Aggressive _____ Agitated _____ Talkative _____ Quiet _____	No Change _____ Improved _____ Worsened _____	Happy _____ Cheerful _____ Bored _____ Flat _____ Nervous _____ Sad _____ Grieving _____ Angry _____	No Change _____ Improved _____ Worsened _____	
Week 5 (28th - End of Month)	# of days offered _____ # of days used _____	Loved _____ OK with use _____ Take it or leave it _____ Did not like _____ Hated _____	Calm _____ Aggressive _____ Agitated _____ Talkative _____ Quiet _____	No Change _____ Improved _____ Worsened _____	Happy _____ Cheerful _____ Bored _____ Flat _____ Nervous _____ Sad _____ Grieving _____ Angry _____	No Change _____ Improved _____ Worsened _____	

Appendix B. Staff Retention Log

MUSIC & MEMORY Final Staff Retention Profile

Please tell us a little bit about yourself.

Date Completed: ____/____/____

Name of the nursing facility: _____

Your initials: ____

Date of Birth: ____/____/____

What is your gender?

☐ Male ☐ Female

What is your position at the nursing facility? (Please choose only one.)

☐ Administrator

☐ Director of Nursing

☐ Assistant Director of Nursing

☐ Other (please specify): _____

Please tell us about your nursing facility's staff.

Please provide the following information for every person filling the following staff positions since July 1, 2015:
Administrator, Director of Nursing, Asst. Director of Nursing, Activities Director, RN, CNA, LVN, and Social Worker.

Employee's Initials: ____

Employee's Date of Birth: ____/____/____

Employee's Gender:

☐ Male ☐ Female

Position at the nursing facility? (Please choose only one.)

☐ Administrator

☐ CNA

☐ Activities Director

☐ Director of Nursing

☐ LVN

☐ Social Worker

☐ Assistant DON

☐ RN

Date started working at this facility: ____/____/____

Date started working at this facility in this position: ____/____/____

Severance date: (if applicable) ____/____/____

Appendix C. Staff Satisfaction Questionnaire

1. What is your age?ⁿ
 - A. 17 or younger
 - B. Between 18 and 21
 - C. Between 22 and 29
 - D. Between 30 and 39
 - E. Between 40 and 49
 - F. Between 50 and 59
 - G. Between 60 and 64
 - H. 65 or older
2. What is your gender?
 - A. Female
 - B. Male
3. What is your position at the nursing facility?
 - A. Administrator
 - B. Director of Nursing
 - C. Assistant Director of Nursing
 - D. Certified Nurse Aide (CNA)
 - E. Licensed Vocational Nurse (LVN)
 - F. Registered Nurse (RN)
 - G. Activities Director
 - H. Social Worker
 - I. Other _____
4. What is your marital status?
 - A. Married
 - B. Single
 - C. Single, but living with partner
5. What race/ethnicity do you most closely identify with (Please choose only one.)
 - A. White or Caucasian (non-Hispanic)
 - B. Black or African-American (non-Hispanic)
 - C. Hispanic or Latino
 - D. Asian
 - E. Other _____

ⁿ Survey questions exclude the first 6 items were used to create a unique id so that the same people who responded before and after the implementation of the program could be linked. It included questions like the last 3 digits of their zip code and the first letter of their mother's first name.

6. What is your primary language?
- A. English
 - B. Spanish
 - C. Other
7. What is the highest education level you have completed? (Please check only one.)
- A. 1st-8th grade
 - B. Some high school, 9th-12th grade
 - C. Graduated from high school
 - D. G.E.D.
 - E. Vocational diploma or technical degree
 - F. 1-3 years of college or technical school
 - G. 2 year Associate's degree
 - H. College graduate
 - I. Post-graduate degree or higher (Master's degree, etc.)
8. Do you work directly with a resident participating in the Music & Memory® program?
- A. Yes
 - B. No
9. How long have you worked at a nursing facility? Please count your time at all of the nursing facility jobs you have had.
- A. Fewer than 6 months
 - B. Between 6 months and a year
 - C. Between 1 and 2 years
 - D. Between 2 and 5 years
 - E. More than 5 years
10. How long have you worked at your current nursing facility?
- A. Fewer than 6 months
 - B. Between 6 months and a year
 - C. Between 1 and 2 years
 - D. Between 2 and 5 years
 - E. More than 5 years
11. How likely is it that you will still be working at a nursing facility – either for the facility you currently work for or a different facility – a year from now? (Check only one.)
- A. Very likely
 - B. Somewhat likely
 - C. Not likely at all
 - D. I don't know

Please tell us how strongly you agree or disagree with the statements below by checking the appropriate answer. (Please check one answer for each statement – 12 through 27)

12. Our staff work well together.

13. We often discuss ways of improving the care we give.

14. I get little sense of accomplishment from doing my job.

15. My colleagues value what I do at work.

16. I often find that I do not complete everything that I should in my job.

17. My relationships with residents are rewarding, I would choose this job again.

18. I just hate to get up in the morning to go to work.

19. There are enough opportunities at work to discuss the psychological stress of the job.

20. Employee morale is generally good.

21. I am in a dead end job.

22. Most days I find my job to be extremely satisfying.

23. I have the power to make changes.

24. I often wish I had a different job.

25. My work is important and worthwhile.

26. It is too much to expect that I can involve myself with every resident.

27. After a day's work, I really feel like I have accomplished something.

A. Strongly agree

D. Disagree

B. Agree

E. Strongly disagree

C. Undecided

28.If you were to leave this job, what would be the reason?

- | | |
|---|---|
| A. The work is too hard | Lack of opportunities to advance |
| B. The job is too stressful | |
| C. The pay is too low | H. I have found a job in another field |
| D. Lack of health insurance | I. I have found another job at a different nursing facility |
| E. No paid sick and/or vacation leave | J. I never intended to do this for the rest of my life or as a career |
| F. Personal health concerns | |
| G. Lack of benefits (like dental insurance, retirement, etc.) | K. Other _____ |

Appendix D. Supplemental Findings

Phase 1 Supplemental Findings

Effects of Level of Enjoyment and Percentage of Time Listening on Response to Music

Table 21. Phase 1 Findings: Response to Music, by Level of Enjoyment

Measure	Enjoyed Music Less: N	Enjoyed Music Less: Mean / Median	Enjoyed Music More: N	Enjoyed Music More: Mean / Median	p-value
Change in Behavior	111	0.26 / 0.20	111	0.65 / 0.71	< 0.01
Change in Mood	111	0.29 / 0.25	112	0.71 / 0.80	< 0.01
Percentage of Times Listened to Music	108	79% / 89%	110	92% / 100%	< 0.01

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Table 22. Phase 1 Findings: Response to Music, by Percentage of Music Use

Measure	Listened to Music Less: N	Listened to Music Less: Mean / Median	Listened to Music More: N	Listened to Music More: Mean / Median	p-value
Change in Behavior	112	0.38 / 0.35	107	0.54 / 0.60	< 0.01
Change in Mood	112	0.41 / 0.41	108	0.61 / 0.74	< 0.01
Level of Enjoyment	111	3.95 / 4.00	107	4.45 / 4.62	< 0.01

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Analyses Comparing Music Group Participants Before and After Starting Music & Memory®

Table 23. Phase 1 Findings: Change in MDS Measures Before and After Music & Memory® Program

Measure	Pre/Post Pairs N	Pre/Post Pairs, Before Program Mean / Median	Pre/Post Pairs, After Program Mean / Median	Pre/Post Pairs p-value
Physical Behavioral Symptoms	222	0.11 / 0.00	0.11 / 0.00	0.64
Verbal Behavioral Symptoms	222	0.19 / 0.00	0.15 / 0.00	0.13
Other Behavioral Symptoms	222	0.06 / 0.00	0.10 / 0.00	0.03
Antipsychotic Medications	222	2.05 / 0.00	1.90 / 0.00	0.11
Antianxiety Medications	222	1.75 / 0.00	1.75 / 0.00	0.76
Antidepressant Medications	222	4.32 / 7.00	4.45 / 7.00	0.34
Hypnotic Medications	222	0.12 / 0.00	0.15 / 0.00	0.35
Restraint Use	222	0.05 / 0.00	0.04 / 0.00	1.00
Wandering	222	0.24 / 0.00	0.21 / 0.00	0.48
Pain	215	0.18 / 0.00	0.16 / 0.00	0.35
Received Scheduled Pain Medications	222	0.34 / 0.00	0.37 / 0.00	0.07
Received PRN ¹ Pain Medications	222	0.23 / 0.00	0.22 / 0.00	0.64

Measure	Pre/Post Pairs N	Pre/Post Pairs, Before Program Mean / Median	Pre/Post Pairs, After Program Mean / Median	Pre/Post Pairs p-value
Received Non-Medication Pain Intervention	222	0.08 / 0.00	0.10 / 0.00	0.32
Falls	222	0.23 / 0.00	0.23 / 0.00	0.91
Unplanned Weight Loss	222	0.05 / 0.00	0.07 / 0.00	0.43

Notes. ¹ PRN is a Latin term that stands for “pro re nata,” or as needed. Definitions vary across items, but scores generally reflect the number of occurrences in days prior to assessment.

Source: Minimum Data Set. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Table 24. Phase 1 Findings: Change in MDS Measures Before and After Music & Memory® Program, by Percentage of Music Use

Measure	Listened to Music Less: N	Listened to Music Less: Mean / Median Change	Listened to Music More: N	Listened to Music More: Mean / Median Change	p-value
Antipsychotic Medication	107	-0.11 / 0.00	108	-0.21 / 0.00	0.51
Antianxiety Medication	107	0.21 / 0.00	108	-0.23 / 0.00	0.37
Antidepressant Medication	107	0.05 / 0.00	108	0.24 / 0.00	0.82
Hypnotic Medication	107	0.03 / 0.00	108	0.02 / 0.00	0.37
Physical Behavior Symptoms	107	0.01 / 0.00	108	0.00 / 0.00	0.72
Verbal Behavior Symptoms	107	-0.05 / 0.00	108	-0.04 / 0.00	0.69
Other Behavior Symptoms	107	0.05 / 0.00	108	0.03 / 0.00	0.61
Restraint Use	107	-0.01 / 0.00	108	0.01 / 0.00	0.70

Measure	Listened to Music Less: N	Listened to Music Less: Mean / Median Change	Listened to Music More: N	Listened to Music More: Mean / Median Change	p-value
Wandering	107	-0.01 / 0.00	108	-0.06 / 0.00	0.62
Pain	105	-0.04 / 0.00	104	0.00 / 0.00	0.50
Received Scheduled Pain Medications	107	0.05 / 0.00	108	0.03 / 0.00	0.33
Received PRN¹ Pain Medications	107	0.00 / 0.00	108	-0.01 / 0.00	0.97
Received Non-Medication Pain Intervention	107	0.02 / 0.00	108	0.01 / 0.00	0.99
Falls	107	0.04 / 0.00	108	-0.02 / 0.00	0.08
Unplanned Weight Loss	107	0.00 / 0.00	108	0.04 / 0.00	0.49

Notes. ¹ PRN is a Latin term that stands for “pro re nata,” or as needed. Scores range from -1 to 1, with -1 reflecting fewer occurrences prior to assessment, 0 reflecting no change, and 1 reflecting more occurrences.

Source: Music Logs; Minimum Data Set. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Table 25. Phase 1 Findings: Change in MDS Measures Before and After Music & Memory[®] Program, by Level of Enjoyment

Measure	Enjoyed Music Less: N	Enjoyed Music Less: Mean / Median Change	Enjoyed Music More: N	Enjoyed Music More: Mean / Median Change	p-value
Antipsychotic Medication	106	-0.15 / 0.00	108	-0.17 / 0.00	0.93
Antianxiety Medication	106	0.19 / 0.00	108	-0.14 / 0.00	0.15
Antidepressant Medication	106	0.30 / 0.00	108	-0.01 / 0.00	0.31
Hypnotic Medication	106	0.02 / 0.00	108	0.03 / 0.00	0.76

Measure	Enjoyed Music Less: N	Enjoyed Music Less: Mean / Median Change	Enjoyed Music More: N	Enjoyed Music More: Mean / Median Change	p-value
Physical Behavior Symptoms	106	0.01 / 0.00	108	-0.01 / 0.00	0.82
Verbal Behavior Symptoms	106	-0.04 / 0.00	108	-0.05 / 0.00	0.76
Other Behavior Symptoms	106	0.03 / 0.00	108	0.07 / 0.00	0.10
Restraint Use	106	0.02 / 0.00	108	-0.02 / 0.00	0.70
Wandering	106	-0.01 / 0.00	108	-0.07 / 0.00	0.39
Pain	102	-0.04 / 0.00	106	0.00 / 0.00	0.20
Received Scheduled Pain Medications	106	0.05 / 0.00	108	0.02 / 0.00	0.71
Received PRN¹ Pain Medications	106	-0.02 / 0.00	108	0.00 / 0.00	0.70
Received Non-Medication Pain Intervention	106	0.01 / 0.00	108	0.03 / 0.00	0.70
Falls	106	-0.04 / 0.00	108	0.04 / 0.00	0.20
Unplanned Weight Loss	106	0.04 / 0.00	108	0.00 / 0.00	0.24

Notes. ¹ PRN is a Latin term that stands for “pro re nata,” or as needed. Scores range from -1 to 1, with -1 reflecting fewer occurrences prior to assessment, 0 reflecting no change, and 1 reflecting more occurrences.

Source: Music Logs; Minimum Data Set. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Table 26. Phase 1 Findings: Change in MAR Measures Before and After Music & Memory® Program, by Percentage of Music Use

Measure	Listened to Music Less: N	Listened to Music Less: Mean / Median Change	Listened to Music More: N	Listened to Music More: Mean / Median Change	p-value
Antianxiety	60	0.03 / 0.00	52	-0.17 / 0.00	0.05
Antipsychotic	60	-0.05 / 0.00	52	-0.23 / 0.00	0.04
Pain Medications	60	-0.22 / 0.00	52	-0.40 / 0.00	0.14
Mood Stabilizers	60	-0.13 / 0.00	52	-0.12 / 0.00	0.86
Antidepressants	60	-0.05 / 0.00	52	-0.27 / 0.00	0.06
Sleep Aids (Hypnotics)	60	0.03 / 0.00	52	-0.13 / 0.00	0.13
Any combination of Sedatives, Hypnotics, and Antianxiety Medications	60	-0.05 / 0.00	52	-0.29 / 0.00	0.05

Notes. Scores range from -1 to 1, with -1 reflecting less medication, 0 reflecting no change, and 1 reflecting more medication.

Source: Music Logs; Monthly Medication Administration Records. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Table 27. Phase 1 Findings: Change in MAR Measures Before and After Music & Memory® Program, by Level of Enjoyment

Measure	Enjoyed Music Less: N	Enjoyed Music Less: Mean / Median Change	Enjoyed Music More: N	Enjoyed Music More: Mean / Median Change	p-value
Antianxiety	47	0.00 / 0.00	64	-0.09 / 0.00	0.39
Antipsychotic	47	-0.13 / 0.00	64	-0.14 / 0.00	0.91
Pain Medications	47	-0.30 / 0.00	64	-0.27 / 0.00	0.86
Mood Stabilizers	47	0.15 / 0.00	64	-0.08 / 0.00	0.48

Measure	Enjoyed Music Less: N	Enjoyed Music Less: Mean / Median Change	Enjoyed Music More: N	Enjoyed Music More: Mean / Median Change	p-value
Antidepressants	47	-0.15 / 0.00	64	-0.14 / 0.00	0.98
Sleep Aids (Hypnotics)	47	-0.02 / 0.00	64	-0.05 / 0.00	0.83
Any combination of Sedatives, Hypnotics, and Antianxiety Medications	47	-0.15 / 0.00	64	-0.16 / 0.00	0.97

Notes. Scores range from -1 to 1, with -1 reflecting less medication, 0 reflecting no change, and 1 reflecting more medication.

Source: Music Logs; Monthly Medication Administration Records. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Analyses Comparing the Music Group with the Comparison Group

Table 28. Phase 1 Findings: Differences in MDS Measures between Music Group and Comparison Group

Measure	Music Group N	Music Group Mean / Median Change	Comparison Group N	Comparison Group Mean / Median Change	p-value
Antipsychotic Medication	222	-0.15 / 0.00	162	0.08 / 0.00	0.39
Antianxiety Medication	222	-0.01 / 0.00	162	0.00 / 0.00	0.54
Antidepressant Medication	222	0.12 / 0.00	162	-0.20 / 0.00	0.15
Hypnotic Medication	222	0.02 / 0.00	162	0.07 / 0.00	0.62
Physical Behavior Symptoms	222	-0.00 / 0.00	161	-0.03 / 0.00	0.63
Verbal Behavior Symptoms	222	-0.04 / 0.00	161	-0.04 / 0.00	0.25

Measure	Music Group N	Music Group Mean / Median Change	Comparison Group N	Comparison Group Mean / Median Change	p-value
Other Behavior Symptoms	222	0.04 / 0.00	161	0.05 / 0.00	0.51
Restraint Use	222	-0.00 / 0.00	162	-0.02 / 0.00	0.41
Wandering	222	-0.03 / 0.00	161	-0.04 / 0.00	0.79
Pain	215	-0.02 / 0.00	160	-0.04 / 0.00	0.97
Received Scheduled Pain Medications	222	0.04 / 0.00	162	0.02 / 0.00	0.53
Received PRN¹ Pain Medications	222	-0.01 / 0.00	162	-0.03 / 0.00	0.57
Received Non-Medication Pain Intervention	222	0.02 / 0.00	160	-0.02 / 0.00	0.34
Falls	222	0.00 / 0.00	162	-0.02 / 0.00	0.85
Unplanned Weight Loss	222	0.01 / 0.00	160	0.02 / 0.00	0.55

Notes. ¹ PRN is a Latin term that stands for “pro re nata,” or as needed. Scores range from -1 to 1, with -1 reflecting fewer occurrences prior to assessment, 0 reflecting no change, and 1 reflecting more occurrences.

Source: Minimum Data Set. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Table 29. Phase 1 Findings: Change in MAR between Music Group and Comparison Group

Measure	Music Group N	Music Group Mean / Median Change	Comparison Group N	Comparison Group Mean / Median Change	p-value
Antianxiety	114	-0.06 / 0.00	86	-0.15 / 0.00	0.27
Antipsychotic	114	-0.13 / 0.00	86	-0.13 / 0.00	0.94

Measure	Music Group N	Music Group Mean / Median Change	Comparison Group N	Comparison Group Mean / Median Change	p-value
Pain Medications	114	-0.30 / -0.50	86	-0.31 / 0.00	0.83
Mood Stabilizers	114	-0.12 / 0.00	86	-0.06 / 0.00	0.31
Antidepressants	114	-0.15 / 0.00	86	-0.07 / 0.00	0.24
Sleep Aids (Hypnotics)	114	-0.04 / 0.00	86	-0.17 / 0.00	0.11
Any combination of Sedatives, Hypnotics, and Antianxiety Medications	114	-0.16 / 0.00	86	-0.27 / 0.00	0.31

Notes. Scores range from -1 to 1, with -1 reflecting less medication, 0 reflecting no change, and 1 reflecting more medication.

Source: Monthly Medication Administration Records. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Phase 3 Supplemental Findings

Effects of Level of Enjoyment and Percentage of Time Listening on Response to Music

Table 30. Phase 3 Findings: Response to Music, by Level of Enjoyment

Measure	Enjoyed Music Less: N	Enjoyed Music Less: Mean / Median	Enjoyed Music More: N	Enjoyed Music More: Mean / Median	p-value
Change in Behavior	72	0.30 / 0.27	78	0.68 / 0.76	< 0.01
Change in Mood	72	0.27 / 0.24	78	0.73 / 0.80	< 0.01
Percentage of Times Listened to Music	69	73% / 75%	77	87% / 93%	< 0.01

Source: Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Table 31. Phase 3 Findings: Response to Music, by Percentage of Music Use

Measure	Listened to Music Less: N	Listened to Music Less: Mean / Median	Listened to Music More: N	Listened to Music More: Mean / Median	p-value
Change in Behavior	72	0.44 / 0.40	74	0.56 / 0.60	0.05 ¹
Change in Mood	72	0.43 / 0.35	74	0.59 / 0.65	0.02
Level of Enjoyment	73	4.01 / 4.00	73	4.23 / 4.62	< 0.01

Source: ¹ The p-value for Mann-Whitney U test was rounded down to 0.05, but since the probability of this difference occurring due to chance is greater than 5% ($p > 0.050$), this difference is not considered statistically significant.

Music Logs. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Analyses Comparing Music Group Participants Before and After Starting Music & Memory®

Table 32. Phase 3 Findings: Change in MDS Measures Before and After Music & Memory® Program

Measure	Pre/Post Pairs N	Pre/Post Pairs, Before Program Mean / Median	Pre/Post Pairs, After Program Mean / Median	Pre/Post Pairs p-value
Physical Behavioral Symptoms	149	0.05 / 0.00	0.08 / 0.00	0.36
Verbal Behavioral Symptoms	149	0.12 / 0.00	0.10 / 0.00	0.54
Other Behavioral Symptoms	149	0.16 / 0.00	0.13 / 0.00	0.31
Antipsychotic Medications	150	1.70 / 0.00	1.64 / 0.00	0.70
Antianxiety Medications	150	1.48 / 0.00	1.85 / 0.00	0.02
Antidepressant Medications	150	4.04 / 5.83	3.62 / 4.09	0.01
Hypnotic Medications	150	0.24 / 0.00	0.24 / 0.00	0.92
Restraint Use	104	0.00 / 0.00	0.01 / 0.00	0.068
Wandering	149	0.22 / 0.00	0.15 / 0.00	0.02
Pain	146	0.23 / 0.00	0.18 / 0.00	0.08
Received Scheduled Pain Medications	150	0.28 / 0.00	0.38 / 0.00	< 0.01
Received PRN Pain Medications	150	0.25 / 0.00	0.24 / 0.14	0.64

Measure	Pre/Post Pairs N	Pre/Post Pairs, Before Program Mean / Median	Pre/Post Pairs, After Program Mean / Median	Pre/Post Pairs p-value
Received Non-Medication Pain Intervention	150	0.10 / 0.00	0.12 / 0.00	0.15
Falls	150	0.17 / 0.00	0.21 / 0.11	0.15
Unplanned Weight Loss	149	0.04 / 0.00	0.07 / 0.00	0.07

Notes. ¹ PRN is a Latin term that stands for “pro re nata,” or as needed. Definitions vary across items, but scores generally reflect the number of occurrences in days prior to assessment.

Source: Minimum Data Set. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Table 33. Phase 3 Findings: Change in MDS Measures Before and After Music & Memory® Program, by Percentage of Music Use

Measure	Listened to Music Less: N	Listened to Music Less: Mean / Median Change	Listened to Music More: N	Listened to Music More: Mean / Median Change	p-value
Antipsychotic Medication	71	-0.15 / 0.00	72	0.07 / 0.00	0.45
Antianxiety Medication	71	0.37 / 0.00	72	0.31 / 0.00	0.90
Antidepressant Medication	71	-0.60 / 0.00	72	-0.17 / 0.0	0.23
Hypnotic Medication	71	-0.06 / 0.00	72	0.04 / 0.00	0.61
Physical Behavior Symptoms	71	0.06 / 0.00	71	-0.03 / 0.00	0.03
Verbal Behavior Symptoms	71	-0.01 / 0.00	71	-0.03 / 0.00	0.39
Other Behavior Symptoms	71	0.04 / 0.00	71	-0.11 / 0.00	0.08

Measure	Listened to Music Less: N	Listened to Music Less: Mean / Median Change	Listened to Music More: N	Listened to Music More: Mean / Median Change	p-value
Restraint Use	71	0.01/ 0.00	72	0.01/ 0.00	0.31
Wandering	71	-0.02 / 0.00	71	-0.15 / 0.00	0.82
Pain	71	-0.03 / 0.00	68	-0.05 / 0.0	0.63
Received Scheduled Pain Medications	71	0.04 / 0.00	72	0.07 / 0.00	0.44
Received PRN¹ Pain Medications	71	0.02 / 0.00	72	-0.03 / 0.00	0.70
Received Non-Medication Pain Intervention	71	0.02 / 0.00	72	0.01 / 0.00	0.42
Falls	71	0.03 / 0.00	72	0.03 / 0.00	0.49
Unplanned Weight Loss	71	0.02 / 0.00	71	0.04 / 0.00	0.92

Notes. ¹ PRN is a Latin term that stands for “pro re nata,” or as needed. Scores range from -1 to 1, with -1 reflecting fewer occurrences prior to assessment, 0 reflecting no change, and 1 reflecting more occurrences.

Source: Music Logs; Minimum Data Set. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Table 34. Phase 3 Findings: Change in MDS Measures Before and After Music & Memory® Program, by Level of Enjoyment

Measure	Enjoyed Music Less: N	Enjoyed Music Less: Mean / Median Change	Enjoyed Music More: N	Enjoyed Music More: Mean / Median Change	p-value
Antipsychotic Medication	70	-0.07 / 0.00	76	-0.04 / 0.00	0.66
Antianxiety Medication	70	0.55 / 0.00	76	0.22 / 0.00	0.47

Measure	Enjoyed Music Less: N	Enjoyed Music Less: Mean / Median Change	Enjoyed Music More: N	Enjoyed Music More: Mean / Median Change	p-value
Antidepressant Medication	70	-0.48 / 0.00	76	-0.47 / 0.00	0.56
Hypnotic Medication	70	-0.02 / 0.00	76	0.00 / 0.00	0.99
Physical Behavior Symptoms	70	0.01 / 0.00	75	0.02 / 0.00	0.30
Verbal Behavior Symptoms	70	-0.03 / 0.00	75	-0.02 / 0.00	0.25
Other Behavior Symptoms	70	0.00 / 0.00	75	-0.08 / 0.00	0.85
Restraint Use	70	0.00/0.00	76	0.01/0.00	0.96
Wandering	70	-0.02 / 0.00	75	-0.13 / 0.00	0.37
Pain	68	-0.11 / 0.00	74	-0.01 / 0.00	0.01
Received Scheduled Pain Medications	70	0.05 / 0.00	76	0.05 / 0.00	0.47
Received PRN¹ Pain Medications	70	-0.09 / 0.00	76	0.06 / 0.00	< 0.01
Received Non-Medication Pain Intervention	70	0.03 / 0.00	76	0.01 / 0.00	0.80
Falls	70	0.03 / 0.00	76	0.04 / 0.00	0.71
Unplanned Weight Loss	69	0.03 / 0.00	76	0.02 / 0.00	0.64

Notes. ¹ PRN is a Latin term that stands for “pro re nata,” or as needed. Scores range from -1 to 1, with -1 reflecting fewer occurrences prior to assessment, 0 reflecting no change, and 1 reflecting more occurrences.

Source: Music Logs; Minimum Data Set. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Table 35. Phase 3 Findings: Change in MAR Measures Before and After Music & Memory® Program, by Percentage of Music Use

Measure	Listened to Music Less: N	Listened to Music Less: Mean / Median Change	Listened to Music More: N	Listened to Music More: Mean / Median Change	p-value
Antianxiety	38	0.05 / 0.00	36	-0.14 / 0.00	0.23
Antipsychotic	38	0.08 / 0.00	36	-0.03 / 0.00	0.32
Pain Medications	38	0.00 / 0.00	36	0.08 / 0.00	0.67
Mood Stabilizers	38	-0.03 / 0.00	36	-0.06 / 0.00	0.82
Antidepressants	38	-0.03 / 0.00	36	-0.17 / 0.00	0.37
Sleep Aids (Hypnotics)	38	-0.03 / 0.00	36	-0.19 / 0.00	0.18
Any combination of Sedatives, Hypnotics, and Antianxiety Medications	38	0.13 / 0.00	36	-0.25 / 0.00	0.02

Notes. Scores range from -1 to 1, with -1 reflecting less medication, 0 reflecting no change, and 1 reflecting more medication.

Source: Music Logs; Monthly Medication Administration Records. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Table 36. Phase 3 Findings: Change in MAR Measures Before and After Music & Memory® Program, by Level of Enjoyment

Measure	Enjoyed Music Less: N	Enjoyed Music Less: Mean / Median Change	Enjoyed Music More: N	Enjoyed Music More: Mean / Median Change	p-value
Antianxiety	42	-0.05 / 0.00	33	-0.06 / 0.00	0.94
Antipsychotic	42	0.07 / 0.00	33	-0.03 / 0.00	0.35
Pain Medications	42	-0.12 / 0.00	33	0.27 / 0.00	0.05 ¹

Measure	Enjoyed Music Less: N	Enjoyed Music Less: Mean / Median Change	Enjoyed Music More: N	Enjoyed Music More: Mean / Median Change	p-value
Mood Stabilizers	42	-0.02 / 0.00	33	-0.09 / 0.00	0.58
Antidepressants	42	-0.07 / 0.00	33	-0.09 / 0.00	0.85
Sleep Aids (Hypnotics)	42	-0.17 / 0.00	33	-0.06 / 0.00	0.42
Any combination of Sedatives, Hypnotics, and Antianxiety Medications	42	-0.02 / 0.00	33	-0.12 / 0.00	0.57

Notes. ¹ The p-value for Mann-Whitney U test was rounded down to 0.05, but since the probability of this difference occurring due to chance is greater than 5% ($p > 0.050$), this difference is not considered statistically significant. Scores range from -1 to 1, with -1 reflecting less medication, 0 reflecting no change, and 1 reflecting more medication.

Source: Music Logs; Monthly Medication Administration Records. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Analyses Comparing the Music Group with the Comparison Group

Table 37. Phase 3 Findings: Differences in MDS Measures between Music Group and Comparison Group

Measure	Music Group N	Music Group Mean / Median	Comparison Group N	Comparison Group Mean / Median	p-value
Antipsychotic Medication	150	-0.05 / 0.00	118	0.30 / 0.00	0.11
Antianxiety Medication	150	0.37 / 0.00	118	0.10 / 0.00	0.66
Antidepressant Medication	150	-0.42 / 0.00	118	0.62 / 0.00	0.01
Hypnotic Medication	150	-0.01 / 0.00	118	0.01 / 0.00	0.55
Physical Behavior Symptoms	149	0.02 / 0.00	118	0.00 / 0.00	0.30

Measure	Music Group N	Music Group Mean / Median	Comparison Group N	Comparison Group Mean / Median	p-value
Verbal Behavior Symptoms	149	-0.02 / 0.00	118	0.02 / 0.00	0.30
Other Behavior Symptoms	149	-0.04 / 0.00	118	0.03 / 0.00	0.57
Restraint Use	150	0.01 / 0.00	119	-0.00 / 0.00	0.14
Wandering	149	-0.08 / 0.00	118	-0.05 / 0.00	0.44
Pain	146	-0.05 / 0.00	117	-0.02 / 0.00	0.65
Received Scheduled Pain Medications	150	0.06 / 0.00	118	0.06 / 0.00	0.48
Received PRN¹ Pain Medications	150	-0.01 / 0.00	118	0.01 / 0.00	0.95
Received Non-Medication Pain Intervention	150	0.02 / 0.00	118	-0.01 / 0.00	0.42
Falls	150	0.04 / 0.00	118	0.05 / 0.00	0.89
Unplanned Weight Loss	149	0.03 / 0.00	119	0.04 / 0.00	0.69

Notes. ¹ PRN is a Latin term that stands for “pro re nata,” or as needed. Scores range from -1 to 1, with -1 reflecting fewer occurrences prior to assessment, 0 reflecting no change, and 1 reflecting more occurrences.

Source: Minimum Data Set. Prepared by the Office of Data, Analytics, and Performance, HHSC.

Table 38. Phase 3 Findings: Change in MAR between Music Group and Comparison Group

Measure	Music Group N	Music Group Mean / Median Change	Comparison Group N	Comparison Group Mean / Median Change	p-value
Antianxiety	76	-0.04 / 0.00	188	-0.21 / 0.00	0.05 ¹

Measure	Music Group N	Music Group Mean / Median Change	Comparison Group N	Comparison Group Mean / Median Change	p-value
Antipsychotic	76	0.03 / 0.00	188	-0.06 / 0.00	0.16
Pain Medications	76	0.05 / 0.00	188	-0.39 / 0.00	< 0.01
Mood Stabilizers	76	-0.04 / 0.00	188	-0.05 / 0.00	0.86
Antidepressants	76	-0.09 / 0.00	188	-0.15 / 0.00	0.54
Sleep Aids (Hypnotics)	76	-0.11 / 0.00	188	-0.21 / 0.00	0.20
Any combination of Sedatives, Hypnotics, and Antianxiety Medications	76	-0.05 / 0.00	188	-0.27 / 0.00	0.03

Notes. ¹ The p-value for Mann-Whitney U test was rounded down to 0.05, but since the probability of this difference occurring due to chance is greater than 5% ($p > 0.050$), this difference is not considered statistically significant. Scores range from -1 to 1, with -1 reflecting less medication, 0 reflecting no change, and 1 reflecting more medication.

Source: Monthly Medication Administration Records. Prepared by the Office of Data, Analytics, and Performance, HHSC.