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The Impact of Music and Memory on Resident Level Outcomes in California Nursing Homes

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Abstract

Objectives: To study the effects of a nonpharmacologic intervention, Music and Memory (M&M), on residents with dementia and/or behavioral problems living in nursing homes (NHs).

Design: This was a prospective, mixed-methods cohort study.

Setting and Participants: In total, 4107 residents in 265 California NHs and that reported data at least twice during the 3-year study period were enrolled.

Measures: We used a quarterly rolling enrollment process; participants provided data at baseline and quarterly via an online survey that included select resident level data from the Minimum Data Set (psychotropic drug use, cognition, behaviors, mood, pain, and falls), experience with the M&M program, and resident use of music. NHs were eligible if they were Medicare- and Medicaid-certified and had 15 residents with a diagnosis of dementia or cognitive impairment or exhibited significant behavioral symptoms.

Results: M&M was associated with reductions in psychotropic medication use, reduced behaviors, and improved mood. The odds of antipsychotic use declined by about 11%, of antianxiety medications by 17%, and antidepressants by 9% per quarter. Aggressive behaviors, depressive symptoms, pain, and falls also declined significantly over time. The odds of residents exhibiting aggressive behaviors declined by 20% per quarter, depressive symptoms by 16%, reported pain by 17%, and falls by 8%.

Conclusions and Implications: This is the largest study of M&M to date. We found clinically and statistically significant reductions in psychotropic medications and improved behaviors in residents using M&M. Although the study showed positive results overall, the lack of a control group was a significant limitation that precluded determining how much more improvement participating residents experienced compared with nonparticipants. Future studies should include a control group so that better conclusions can be drawn regarding the effectiveness of the M&M program.

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The authors declare no conflicts of interest.

Keywords

Dementia; nursing homes; antipsychotics; nonpharmacologic; psychotropics

Alzheimer's disease affects 1 in 10 Americans over the age of 65 years and 2.1 million (36%) 85 years of age and older; this number is expected to reach 7 million by 2050.[1] In 2018, the cost of dementia care was $236 billion on top of the 18.5 billion hours (estimated at $234 billion value) of unpaid time for personal or family care.[2] It was estimated that it would cost $290 billion to provide healthcare, long-term care, and hospice in 2019. Approximately 60% of nursing home (NH) residents have dementia, and a significant number are reported to have behavioral and neuropsychiatric symptoms.[2] A number of challenges exist in caring for this population that contribute to the high number of older adults who end up in NH care.

In 2010, the Centers for Medicare and Medicaid (CMS) initiated the National Partnership to Improve Dementia Care in Nursing Homes, a federal-state plan with a goal to reduce antipsychotic medication use by 30% by the end of 2016. After meeting that goal, the goal was reset at another 15% reduction in antipsychotic use by 2019.[3] Subsequently, greater emphasis has been placed on nonpharmacologic interventions to manage challenging behaviors and aggression in patients with dementia.

Although there are few proven nonpharmacologic interventions, activities and music therapy have been shown to decrease overall agitation in NH residents.[4,5] Interactive activities such as cooking[6] or use of a multisensory stimulation environment[7] have shown promise in reducing behavioral symptoms in older adults with dementia. However, these types of activities are time- and staff-intensive and can require specialized, dedicated spaces, all limited resources in NHs. In addition, a 2018 systematic review and meta-analysis found receptive music therapy, including listening to the participant's favorite music, was more effective at decreasing agitation and behavioral problems than was interactive music therapy.[8]

Music and Memory (M&M) is an innovative program that advocates the use of personalized music for older adults with dementia and other cognitive or behavioral symptoms with goals of improving their quality of life. Detailed program information is available at www.musicandmemory.org.

The M&M program has been previously studied in a few states but with mixed results. The Wisconsin Department of Health Services (WDHS) implemented M&M in 144 NHs (up to 10 residents per NH) and found that 52% of the NHs rated the program "effective" on a 5-point Likert scale from very effective to very ineffective. Effectiveness was defined as residents being calmer, relaxed, engaged, less anxious, and with improved mood. Despite generally positive response from residents, family and friends, and staff, only 13 of 144 NHs had 5 or more (out of 10) residents that decreased or stopped antipsychotics.[9] Even with these modest outcomes, NHs reported value in the program and, qualitatively, notable improvements in residents.[9] The University of Wisconsin, Milwaukee conducted a formal 4-part study of some of the NHs and residents in the WDHS.[10] One part was a crossover

design with 59 patients in 10 NHs, another part included a pre- and post-survey related to medication use on 1500 residents, a third part was a secondary analysis of MDS from the WDHS study, and the last part was a survey of administrators on implementation and sustainability of M&M. They reported little improvement in cognition, memory, agitation, or mood, but significant improvement in overall behaviors; they had mixed results related to psychotropic medication use with some reduction of anxiolytics.[10] The authors attribute the poor findings partially to lack of buy-in and challenges in implementation. A 2017 study by Thomas et al demonstrated a decrease in antipsychotic and antianxiety medication use in 98 NHs whose staffs were trained in the M&M program; however, the study found no difference for depressed mood.[11]

A primary purpose of this 3-year study was to study the effects of an M&M on residents with dementia and/or behavioral problems living in NHs. The study was a collaboration between California Association of Health Facilities (CAHF) and UC Davis (UCD) researchers, funded with CMS Civil Monetary Penalty funds and administered through the California Department of Public Health. CAHF was responsible for recruiting NHs, coordinating national M&M certification, and distributing equipment, which included a laptop for the staff and iPods for 15 residents. NHs were required to enroll in the UCD-led study.

Methods

Design

This was a prospective, mixed-methods cohort study conducted in 3 phases. Phase 1 was the pilot with 50 NHs to test feasibility and processes; phase 2 included 150 NHs as the main study; and phase 3 targeted 100 NHs to expand the use of M&M and to explore sustainability. NHs were eligible if they were Medicare- and Medicaid-certified and had up to 15 residents to participate in the study who would be appropriate to use the M&M program based on staff assessment. Residents who met inclusion criteria were only excluded if the NH staff did not see a benefit for that resident. There were 3 study aims: (1) To study the effects of M&M on reducing psychotropic medications, improving behaviors, reducing pain, and reducing falls; (2) To develop and study 2-3 evidence-based Quality Assurance Performance Improvement (QAPI) options to enhance the implementation of M&M; and (3) To study organizational factors that impacted the success or failure of the adoption and sustainment of M&M.

Nursing homes were randomized to control and intervention groups only for the purpose of aim 2, with the intervention group receiving a QAPI guideline that was developed by the UCD Study Team and designed to help NHs implement the M&M program (reported on separately). For aims 1 and 3, there were no differences in the groups as all 15 residents from each enrolled NH received the M&M intervention, which was consistent with the Civil Money Penalty funding goals of benefitting the maximum number of NHs and residents.

Intervention

For the purposes of this study, NHs selected up to 15 residents to participate in the program and reported on them at baseline and quarterly. If a resident transferred out of the facility or died, NHs could then substitute a new resident in their place. Because M&M is a personalized music program, the music content and use of music was different for each resident. Each resident received an iPod and earphones or a speaker to use while in the program. NH staff assessed residents for music preferences and individualized music was placed on the iPod for that resident's use only.

Data Collection

We used the Qualtrics Research Suite (Qualtrics, Provo, UT)[12] to create and disseminate a baseline survey and quarterly 4-part survey: part 1: questions about the NH's experience with M&M, QAPI training, leadership, etc; part 2: organizational processes (efforts to implement M&M, facilitators and barriers to implementation, etc); part 3: individual resident's use of M&M (frequency and length of use); and part 4: select Minimum Data Set (MDS) variables (psychotropic drug use, cognition, behaviors and mood, pain, and falls).

Nursing Home Compare 5-star data were downloaded quarterly for each NH from the CMS website,[13] which provides publicly available quality data for all CMS certified NHs and can be downloaded at https://www.medicare.gov/nursinghomecompare/search.html?. This article reports only on aim 1, the effects of M&M on resident level outcomes using the quantitative resident level data collected in Parts 3 and 4 of the quarterly survey.

Resident-Level Outcomes of Interest

We evaluated the effect of M&M on the following resident-level outcomes: psychotropic medication use, cognitive impairment, aggressive behavior, mood and depressive symptoms, presence of pain, and occurrence of a fall. Validated instruments were used to measure cognitive impairment,[14–16] aggressive behavior,[17] and mood and depressive symptoms[18] (tools are described in Supplementary Materials). We did not use a classic measure to assess quality of life such as the 24-item World Health Organization Quality of Life because of the significant burden this would add to NHs to collect data. We used behavior, mood, pain, and depressive symptoms (already collected through MDS) as a proxy for quality of life. This study was deemed "Exempt" by the local Institutional Review Board.[19]

Analytical Approach

We hypothesized that residents who used the M&M program would have reduced psychotropic medication use, improved mood and behaviors, verbalize less pain, and have fewer falls. We conducted 3 analyses to address these hypotheses. First, we evaluated change in each outcome over time since baseline. This analysis is similar to an intent-to-treat analysis as it only considers whether there was a change in the outcome for residents enrolled in the program regardless of the degree to which M&M was used. Second, we included use of M&M (Yes/No) by each resident as a time-varying predictor to investigate the extent to which documented participation in the program affected outcomes. Third, we integrated the level of M&M use as a time-varying predictor to evaluate if higher levels of use were associated with greater change.

All outcomes were dichotomized as described in the Supplementary Materials and we used logistic mixed-effect models to evaluate these hypotheses. The basic model for all outcomes except falls was:

outcome = time + resident + resident●time + facility

where time is the number of quarters each resident was enrolled in the program modeled as a quantitative variable; resident is a random intercept for each resident, resident●time is a random slope for each resident, and facility is a random intercept for each facility. For the second and third analyses, M&M use and level of use were added to this model as fixed effects, respectively, along with an interaction term with time. M&M use (music use) was "Yes" if the resident used the program at all in the previous seven days. Level of use (use*time) was estimated as the hours of use per week from the reported number of days and length of time the resident had used the program in the preceding week.

In evaluating medication use, aggressive behaviors, depressive symptoms, and pain, the analyses were restricted to residents reported with the outcome in at least one quarter. Analysis of antipsychotics was further limited to residents with dementia but who were not diagnosed with bipolar disorder, Tourette's syndrome, or schizophrenia.

Falls were evaluated at the facility level using the total number of residents experiencing a fall each quarter by the total number of residents. A mixed-effect logistic regression was used to model the change in the log odds of a fall over time with a random intercept included for each facility. M&M use was characterized as the average time of M&M use across all residents at a facility each quarter.

All analyses were conducted using SAS/STAT software v 9.4 (SAS Institute, Cary, NC).[20] Statistical tests were 2-sided and evaluated at a significance level of 0.05.

Results

A total of 4107 residents in 265 facilities reported data for at least 2 quarters. Characteristics of the residents at baseline are shown in Table 1. Only 1 NH reported briefly participating in M&M several years ago; none of the current residents participated in that activity.

Table 2 summarizes information for each analysis and provides the sample size for each of the analyses described above. Most analyses were restricted to residents ever having the characteristic of interest.

Changes Over Time

As indicated in Table 3, resident-level clinical outcomes improved over time, with the exception of cognitive impairment, which worsened over time. The odds of antipsychotic use declined by about 11%, antianxiety medications by 17%, and antidepressants by 9% per quarter. Aggressive behaviors, depressive symptoms, pain, and falls also declined significantly over time. The odds of residents exhibiting aggressive behaviors declined by 20% per quarter, depressive symptoms by 16%, reporting pain by 17%, and experience a fall by 8%. These improvements were even more notable considering that the odds of moderate/

severe cognitive impairment significantly increased at 10% per quarter. Additional information showing percentages of NHs reporting each quarter is in the Supplementary Tables 1 and 2.

Effect of Level of Music Use

The odds of depressive symptoms were 32% lower among residents using the M&M program and the odds of reported pain was 39% lower with M&M use (Table 4). However, the mean odds of residents being on medication, exhibiting aggressive behaviors, or having impaired cognition was not found to differ significantly with the level of M&M use. The change over time in the odds of any of traits investigated did not differ significantly with use of the M&M program.

The level of M&M use (average hours per week) by a resident did not result in a significant difference in the odds of a resident being on medications, exhibiting aggressive behaviors, having impaired cognition, reporting depressive symptoms, or pain (Table 5). The change in these traits over time also was not found to be influenced by the level of M&M use. Further, based on coefficients from the logistic regression, the odds of a fall were not significantly related to the level of M&M use (−0.02, standard error = 0.01, $P = .108$), and the level of use did not change the relationship between the odds of a fall and time (0.001, standard error = 0.004, $P = .687$).

Discussion

Resident-Level Findings

Of the 265 NHs that participated and reported data in this study, only 1 NH reported any experience with M&M in the past, and that was some years prior to this study, so we believe these findings to be associated with current M&M use. Our findings indicate that overall, M&M is associated with substantial improvements in NH residents and benefited them in a variety of ways. Of course, this is mediated by the lack of a control group; however, both quantitative and qualitative outcomes support these findings. Of specific importance is the reduction of antipsychotic use along with the decline in the number of residents using antipsychotics over the course of the study. These findings are clinically interesting, particularly because of the substantial reduction in overall antipsychotic use in California prior to the start of this study. California was a proactive participant in the Partnership to Improve Dementia Care in Nursing Homes campaign.[3,21] Prior to this study, the antipsychotic rate in California NHs was 13.6%,[18] and by the second quarter 2017, it dropped to 11.9%.[3,22] As this study was ramping up, residents who could easily have antipsychotics discontinued had likely already done so. In contrast, 21%–31% of this study's residents were on antipsychotics, well above the state and national averages, possibly indicating that these residents were the most difficult to take off antipsychotics. Our findings were in contrast with the 2018 Wisconsin study of M&M, which used a 10-week crossover design to examine a small subsample (n = 59) of NH residents to measure outcomes and found no significant effect on medication use.[6,7,23] It is possible that the shorter length of their study (12 weeks) and small sample size were insufficient to find differences in

medication use.[23] Within the NH, it often takes several months to achieve a meaningful gradual dose reduction.

At baseline, over one-third of residents in this study were reported as taking an antidepressant, and over one-quarter were on an anxiolytic. Although these classes of medications have had less focus on reduction than antipsychotics, both have potential adverse effects according to recent information.[24] A study of antidepressants in older adults has raised some doubts as to their safety (potentially higher rates of death, fractures, upper gastrointestinal bleed, and heart attacks).[24] Anxiolytics continue to be on the Beers list[25] as a class of drugs that should be avoided in older adults.

M&M may also improve physical and verbal aggression even as cognition declines. Resident Brief Interview for Mental Status scores declined steadily over the study as expected; yet, physical and aggression scores improved. Residents with behaviors and high antipsychotic use identified for the M&M program may have been the least likely to discontinue medication use given the significant reductions in California already, making the improvement in aggressive behavior scores clinically significant.

A relationship between the level of use (hours per day) of M&M and changes in any of the outcomes was not evident in this study. That we did not find a significant effect because of the level of use could be due to multiple reasons, such as (1) potentially inconsistent or erroneous reporting, (2) differences in impairment resulting in just enough music dose so that there is no change, and (3) potentially little variation in level of music use. In some cases, NHs reported that residents had unlimited use but that it may not have been properly documented; therefore, we may not have captured the true level of M&M use. Many NHs reported only documenting M&M use as part of the activities, although residents had access at other times; other NHs reported sporadic documentation.

M&M was frequently housed within the activities department with limited involvement from other departments. NHs had a variety of implementation strategies that either encouraged or discouraged other departments from accessing and distributing the iPods, including centralized vs decentralized storage, locked vs unlocked storage, and integration within nurse charting systems or lack thereof (data not shown). Depending on how NHs implemented M&M, there were varying degrees of success in improving nursing participation.

Encouraging other departments, especially nursing, to use M&M with residents could increase the frequency and duration of use and overall successful sustainment of the program. Similarly, early involvement of the medical director and prescribers could lead to better integration of M&M into the resident’s overall care plan, specifically for gradual dose reduction. The Halting Antipsychotic use in Long Term care study, which focused on antipsychotic deprescribing, had similar recommendations for improving education for nursing, physicians, and pharmacists.[26]

Turnover in project staff also presented significant challenges, such as new project leads not knowing how to use the system and M&M champions being replaced by someone who does

not make it a priority. Therefore, overall support for the program declined despite the best efforts of project team members.

Some policy changes should be considered. State Departments of Health could give guidance to NHs to offer M&M as a non-pharmacologic intervention for residents with dementia and/or behavior or mood challenges. NHs could be encouraged to establish a regular reporting system on residents using M&M during their quarterly QAPI meeting so that attending prescribers and/or consulting pharmacists can consider gradual dose reduction and ultimately discontinue psychotropic medications. The ability to integrate M&M use into the electronic health record, as one NH did in this study, could also be helpful.

Limitations

There were many limitations to this study. Although we randomized NHs for a different study aim, we did not randomize residents. The lack of a resident level control group limits differentiating program impacts from other long-term trends. We could not capture changes in medications or doses, which diminished the specificity of the medication findings. All survey data were self-reported and entered by NH staff with minimal training. This led to occasional data collection irregularities, such as scores out of the acceptable range, which meant that resident's data could not be included for analysis. In addition, not all NHs were able to submit data every quarter. Most NHs reported 2–4 times over the course of their involvement, and this may not have been enough to truly differentiate changes.

Besides the usual NH workload and staffing issues, facilities also reported delays in data submission due to CMS surveys, natural disasters (fire, landslides), and illness outbreaks (influenza, *C. difficile*) occurring when data was due. In some situations, this delayed submission, but more often, NHs skipped data submission that quarter completely. Having research assistants who could work directly with NHs may have helped response rates. There was also no way to capture the myriad environmental challenges, such as loss of the activity directors, M&M champions, Directors of Nursing, or NH administrators over the study period or the times when NHs were in survey, which certainly impacted the reporting.

Because the MDS is required to be completed quarterly for all residents, in future studies, data could be downloaded directly from the facility. We did not collect identifiable data to avoid the need to obtain consent from residents or families; however, direct data downloads would reduce or eliminate issues related to data entry errors, staffing, natural disasters, and illness outbreaks.

Conclusions and Implications

We found both clinically important and statistically significant reductions in antipsychotic, antianxiety, and antidepressant use; reductions in aggressive behaviors; less depression and pain; and reduced falls in residents. There was both a reduction in medication use as well as a reduction in the proportion of residents who were taking medications over the course of the study. The reduction in antipsychotics was particularly noteworthy, given the documented significant reduction in the use of antipsychotics statewide before the start of this study.[18]

Without a control group of similarly aged and impaired residents not using M&M, it is impossible to determine how much more improvement the participating residents saw compared with nonparticipants. Future studies should include a control group of residents who do not use M&M to draw better conclusions regarding the effectiveness of M&M in decreasing antipsychotic rates. One way might be to construct a crossover design, as was done in the Wisconsin study, but with a larger sample.[7] To also meet the goal of maximizing M&M use for all eligible residents, another possibility would be to shorten the study length to 6–9 months, collect data monthly, and at the end of the study period, provide M&M to the control group residents and measure their response. Alternatively, a matched group of NHs with similar residents might use a different music intervention such as “group” music that could be compared with NHs that are using the M&M program.

In conclusion, collaborating with CAHF, we successfully conducted a prospective multilevel, multiphased, mixed-methods intervention study that involved almost 300 California NHs. Despite the challenges and study limitations, we were successful in collecting data at multiple times from most NHs. In general, the use of M&M was associated with significant improvements in behavioral symptoms, reduction in psychotropic medications, decreased presence of pain, and fewer falls. M&M is a relatively low-cost, nonpharmacologic intervention that has a significant positive impact on NH residents.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1:

Characteristics of Residents (N = 4107) Enrolled in M&M Program at 265 NHs

Characteristics	Percentage
Female sex	65
Age (at time of admission to study), y	
<25	1
26–64	12
65–74	17
75–82	20
83–88	11
>89	39
With any type of dementia	70
On antipsychotics at baseline	23
On antianxiety medications at baseline	19
On antidepressants at baseline	38
Aggressive behavior reported at baseline	21
Impaired cognition at baseline	86
Depressive symptoms (PHQ-9 >0) at baseline	32
Presence of pain at baseline	16
Falls	19

PHQ-9, Patient Health Questionnaire-9.

Table 2:

Characteristics of Each Analytical Data Set

	Number of Residents	Number of NHs	% Female	% at Baseline
Analysis Dataset				
Antipsychotics, any diagnosis	1075	221	62	78
Antipsychotics, residents with dementia	476	165	66	
Antianxiety	1007	230	68	68
Antidepressants	1692	244	66	83
Aggressive behavior	1105	215	62	74
Impaired cognition	3715	258	65	86
Depressive symptoms *	1476	200	66	78
Presence of pain	861	193	65	67
Falls	3155	244	65	19

PHQ-9, Patient Health Questionnaire-9.

* Defined as PHQ-9 >0.

Table 3:

Estimated Change in Use of Antipsychotic, Antianxiety, or Antidepressant Medications, Aggressive Behaviors, Impaired Cognition, Depressive Symptoms, Presence of Pain, and Falls

Outcomes	Coefficient ± SE	*P* value
Medications		
Antipsychotic	−0.11 ± 0.03	<.001
Residents with dementia	−0.13 ± 0.05	.005
Antianxiety	−0.17 ± 0.03	<.001
Antidepressants	−0.09 ± 0.03	<.001
Aggressive behaviors	−0.20 ± 0.02	<.001
Impaired cognition	0.10 ± 0.02	<.001
Depressive symptoms	−0.16 ± 0.02	<.001
Presence of pain	−0.17 ± 0.03	<.001
Falls	−0.08 ± 0.02	<.001

SE, standard error.

The coefficient is the change in the log odds of the resident exhibiting the trait per quarter. Depressive symptoms were considered present for a PHQ-9 value greater than 0.

Table 4:

Effect of Reported Use of the M&M Program on Use of Antipsychotic, Antianxiety, or Antidepressant Medications, Aggressive Behaviors, Impaired Cognition, Depressive Symptoms, and Presence of Pain

Medications	Time		Music Use (Y/N)		Use*Time	
	Coef± SE	*P* value	Coef ± SE	*P* value	Coef ± SE	*P* value
Antipsychotic	−0.17 ± 0.08	.035	−0.011 ± 0.17	.947	0.09 ± 0.09	.345
With dementia	−0.14 ± 0.13	.296	−0.04 ± 0.22	.880	0.003 ± 0.140	.983
Antianxiety	−0.17 ± 0.08	.048	0.23 ± 0.16	.171	−0.02 ± 0.09	.823
Antidepressants	−0.12 ± 0.07	.079	−0.09 ± 0.15	.553	0.019 ± 0.075	.802
Aggressive behaviors	−0.07 ± 0.07	.303	−0.05 ± 0.13	.705	−0.11 ± 0.07	.154
Impaired cognition	−0.005 ± 0.06	.936	−0.18 ± 0.13	.156	0.13 ± 0.07	.056
Depressive symptoms	−0.21 ± 0.06	<.001	−0.32 ± 0.14	.025	0.04 ± 0.06	.537
Presence of pain	−0.22 ± 0.07	.005	−0.39 ± 0.16	.012	0.06 ± 0.08	.454

SE, standard error.

Coefficients under time are the change in log odds of the trait per quarter. Music use is the mean difference in the log odds of the trait between residents using the M&M program and those not using the program. Use*Time is the difference in the rate of change in the log odds of the trait between residents using the M&M program and those not using the program.

Table 5:

Effect of Reported Level Use of the M&M Program on Use of Antipsychotic, Antianxiety, or Antidepressant Medications, Aggressive Behaviors, Impaired Cognition, Depressive Symptoms, and Presence of Pain

Medications	Time		Music Level (h)		Level*Time	
	Coef± SE	*P* value	Coef ± SE	*P* value	Coef ± SE	*P* value
Antipsychotic	−0.08 ± 0.06	.219	0.014 ± 0.01	.135	−0.007 ± 0.004	.106
With dementia	−0.08 ± 0.07	.241	0.016 ± 0.010	.114	−0.008 ± 0.004	.074
Antianxiety	−0.20 ± 0.04	<.001	0.007 ± 0.007	.277	−0.002 ± 0.002	.475
Antidepressants	−0.15 ± 0.13	<.001	−0.005 ± 0.004	.231	0.001 ± 0.001	.308
Aggressive behaviors	−0.20 ± 0.03	<.001	0.002 ± 0.004	.632	0 ± 0.001	.988
Impaired cognition	0.13 ± 0.04	<.001	−0.005 ± 0.003	.159	−0.0002 ± 0.001	.887
Depressive symptoms	−0.15 ± 0.03	<.001	0.004 ± 0.004	.386	−0.001 ± 0.001	.364
Presence of pain	−0.16 ± 0.04	<.001	0.001 ± 0.006	.089	−0.001 ± 0.002	.456

SE, standard error.

Coefficients under time are the change in log odds of the trait per quarter. Music level is the mean change in the log odds of the trait per hour of M&M program use. Level*Time is the change in the rate of change in the log odds of the trait per hour use of the M&M program.