Utilizing an Individualized Music Playlist and a Receptive Music Approach to Improve Agitation in Hospitalized Dementia Patients

Research team

- Nurse(s) at the organization who is (are) the principal investigator(s) (PI), co-PI, or the site PI involved in the conduct of the study
  - Co-PI: Michelle Moreno-Lee, MN, RN, Clinical Nurse Brazos Intensive Care Unit (ICU)
  - Co-PI: Mary Harris, MSN, RN, NEA-BC, Director Clinical Education and Magnet

- **Other key personnel on research team**
  - Joseph Altamirano, BSN, RN, RN-BC, Professional Development Generalist Medical-Surgical
  - Alexis Arti, BSN, RN, Clinical Nurse Main 5 West
  - Victoria Pajos, MSN, RN, Clinical Nurse Main 5 West
  - Anaiese Esparza, BSN, RN, Clinical Nurse Main 5 East
  - Ashley Lundquist, MT-BC, Board Certified Music Therapist
  - Yan Shi, MPH, Statistician

Objective

This study evaluated whether an individualized music playlist using a receptive listening music approach decreased agitation in hospitalized patients with dementia as measured by the Agitated Behavior Scale (ABS).

Background

Dementia is a disease that causes cognitive deterioration often categorized in "severity" and progressively leads to a decreased ability to comprehend verbal language (Wall & Duffy, 2010). The greater the cognitive impairment, the lower the stress threshold and the more sensitive to environmental sensory stimuli (Gomez & Gomez, 2017). As a result, patients with dementia are more prone to experiencing agitation, especially in the hospital setting. Current treatment includes symptom management using antipsychotic or anxiolytic pharmacological interventions, which are associated with a three-fold increased risk of hospital mortality (Jackson et al., 2017). These medications worsen motor function, may be effective only at high doses and do not work in some cases (Gomez & Gomez, 2017). Studies have noted a positive correlation between high levels of agitation and the increased use of antipsychotic medications, ultimately leading to a low quality of life (Ridder et al., 2013).

Anxiety often precedes agitation, and the latter symptom is often studied in patients with dementia because it is one of the most common symptoms expressed in every stage of the disease (Wall & Duffy, 2010). In the person-centered approach theory, agitation has been described as an expression of unmet psychological needs; thus, it is a way in which patients with dementia cope and express these unmet needs in response to increasing stress (Ridder et al., 2013).

Therapeutic music assists to facilitate healing in a healthcare environment by using the power of sound, melody and rhythm to alleviate mental, physical or emotional distress (Leggieri, 2019). There are two branches of music used in healthcare: Music and Medicine (MM) and Music Therapy (MT). MM uses passive or receptive music that is pre-recorded without a therapeutic presence. MT is a systematic, therapeutic process requiring facilitation from a board-certified music therapist and often incorporates live music. MT addresses individualized goals over several sessions, with progress documented over time. Both modalities can address problems including pain, anxiety, mood and agitation (Bradt, et al. 2014). Musical interventions

can be applied using an active or receptive approach. The active approach uses musical instruments, the voice or body, and individuals are invited to participate by playing musical instruments or singing along. In the receptive approach, individuals listen to music that is live or recorded (Leggieri, 2019). In the context of dementia, studies have noted that the receptive approach is a method that most likely reduces neuropsychiatric symptoms (Aleixo et al., 2016). For patients with dementia, recognition of the emotions associated with music seems to also be preserved, which explains why these patients experience a rush of emotions and memories when they listen to familiar music.

Preferred, receptive music can induce a pleasant stimulus as it can elicit positive symptoms; it reduces brain plasticity and lessens the stress response, in turn promoting relaxation and thus decreasing anxiety and agitation (De La Rubia et al., 2018). It has also proved to be a successful alternative to physical restraints in managing behavior problems, and it acts as a stimulus for recall and language skills (Wall & Duffy, 2010). Therapeutic music is a safe, inexpensive, non-verbal technique that has been noted as an appropriate and effective intervention for patients with dementia, as receptive and expressive music abilities are preserved, even in later stages of the disease (Gomez & Gomez, 2017). Commonly, MM uses a more receptive approach with the presence of a music therapist. A study showing the impact of music on psychological outcomes and pain in cancer patients showed that both MM and MT had positive results on target areas (Bradt, et al. 2014).

Why the Study is Important to Nursing

According to the World Health Organization (WHO), dementia is a worldwide public health priority and there is a need for therapeutic nursing interventions and advocacy for this patient population and prioritization in research (World Health Organization WHO, 2015). Hospitalized patients with dementia experience more inpatient adverse events, principally mortality, falls and delirium, leading to increased costs of care. Admission to a hospital can be disorienting and stressful for patients with dementia and caregivers; a prolonged hospital stay is also associated with a deterioration in functional and physiological status (Mathews, Arnold, & Epperson, 2014).

Dementia requires a significant share of healthcare and social resources as it has a great affect on both patients and caregivers (Fang, Ye, Huangfu, & Calimag, 2017). Considering the growing population of patients with dementia and the harmfulness of pharmacological interventions to the patient's health, research suggests the benefit of shifting to non-pharmacological nursing interventions. Safely using a preferred music playlist and a receptive music approach for patients with dementia can ameliorate the quality of nursing care and improve quality of life for patients with dementia. Multiple studies have noted that caregivers identify agitated behaviors as a challenge when caring for those with dementia (Chang & Sung, 2005). Although much research has been centered on the effects of a variety of distinctively structured music therapy interventions on patients with dementia residing in nursing homes, there is a lack of research on the effects of receptive music therapy for an inpatient population of dementia patients and caregivers in the hospital setting.

Innovation

There is growing support in the scientific community to furthering research of non-pharmacological interventions for the management of neuropsychiatric symptoms experience by patients with dementia. There are great benefits to using a therapeutic music intervention as a

non-pharmacological and cost-effective approach to manage these behavioral symptoms, as most of the symptoms experienced by patients with dementia are treated using benzodiazepines and/or antipsychotics, which are associated with a three-fold increased risk of hospital mortality (Jackson et al., 2017). These medications worsen motor function, may be effective only at high doses and do not work in some cases (Gomez & Gomez, 2017). Studies have noted a positive correlation between high levels of agitation with the increased use of antipsychotic medications, ultimately leading to a lower quality of life (Ridder et al., 2013). The care for patients with dementia is also greatly associated with increased caregiver stress and a great challenge to nurses to care for these patients in the hospital setting. Bringing greater light through a safe, economical, pleasurable, non-pharmacological, therapeutic music intervention will be an innovative nursing initiative to manage behavioral symptoms and improve overall care, well-being, mood, quality of life and even mortality for hospitalized patients with dementia.

Study design

This study used mixed methods, including an analysis of quantitative, qualitative and correlational data. The researchers used consecutive sampling and invited all patients who met eligibility criteria to enroll in the study. Since consecutive sampling does not enroll randomly selected people from the target population, it is a type of nonprobability sampling. However, consecutive sampling is considered superior to convenience sampling, another form of nonprobability sampling, because all people from an accessible population are invited to enroll, rather than just people who are readily available to the researcher (Polit and Beck, 2012).

Sample

The location of this study took place in select medical-surgical units within Houston Methodist Sugar Land Hospital (HMSL). The sample included all persons with mild to moderate dementia experiencing an acute inpatient hospitalization without a current positive diagnosis or suspected COVID-19, who are objectively identified and assessed as alert by at least one member of the study team. Alertness was determined by the subject showing awareness of the examiner and being able to respond to the environment around them, open their eyes spontaneously and follow simple commands, e.g., track objects and answer questions (Farrell, 2020). According to the Alzheimer's Association (2020), people with mild dementia can function independently but experience mild memory lapses that affect daily life; common symptoms include loss of memory of recent events, personality changes, misplacement of objects and difficulty with problem solving tasks such as organizing or expressing thoughts. People with moderate dementia experience significant personality changes and need more assistance in daily life activities and self-care as the disease progresses. Common symptoms include greater memory loss and needing assistance with getting dressed, grooming and bathing (Alzheimer's Association, 2020). Regardless of the severity of dementia, agitation is often studied in patients with dementia because it is one of the most common symptoms expressed in every stage of the disease (Wall & Duffy, 2010).

Inclusion criteria: Alert; mild to moderate dementia patients (Quick Dementia Rating Scale score 2-20); dementia history or diagnosis; admitted to medical surgical units at Houston Methodist Sugar Land Hospital; English speaking; able to hear music.

Exclusion criteria: Inability to hear music; patients with suspected or positive COVID-19, Clostridium difficile or enteric infections; inability to listen to music for at least 10 minutes.

Sample size: The researchers enrolled 40 participants to determine whether a receptive therapeutic music intervention decreases scores on the Agitated Behavior Scale (ABS) using a paired t-test. Sample size was determined to be 40 participants as this was considered a pilot research study that may lead to further research. Any participants withdrawn from the study were not be included in the final study population of 40 participants. This number of participants enabled the researcher to correctly reject the null hypothesis that the intervention does not decrease scores on the ABS with power = 0.80, alpha (α) = 0.05, and a medium effect of the intervention significantly decreases scores on the ABS (Polit & Beck, 2012). The researchers used descriptive statistics to present a summary of the participants and enable an assessment of sample representativeness.

Study procedures

Week 1: Training Period

The study team, which included the principal investigators (PI), four CITI-trained clinical nurses, met with a music therapist to receive training on how to create a receptive music playlist. During the training session, the research study team was instructed to create an individualized music playlist, administer the Agitated Behavior Scale (ABS), Quick Dementia Rating Scale (QDRS), workflow process and management of materials, e.g., headphones, music player and infection control procedures for cleaning the materials.

Week 2: Start of Project:

The PIs and clinical nurse study team members collected demographic information daily from the Electronic Privacy Information Center (EPIC) chart review to select adult medical-surgical patients who met inclusion criteria with no exclusion criteria noted. Prior to obtaining informed consent, an assessment was completed using the QDRS to stage cognitive impairment with an individual who has frequent, long-term contact with the subject, such as a spouse, caretaker or adult child. Depending on cognitive status and availability, the subject/family were interviewed to complete an individualized receptive music playlist. The PI obtained informed consent from each subject or medical power of attorney. To prevent any factors that may contribute to either elimination or precipitation of agitation, the receptive music intervention took place when environmental disturbances and other stimulations could be diminished, e.g., during physician visits, testing and medication administration, and when the subject could listen to music for 10-30 minutes (Tsoi, K., et al., 2017).

Prior to the start of the therapeutic music intervention, a clinical nurse study team member and/or PI completed the pre-ABS. The clinical nurse study team member provided a music player and offered the option of using headphones to implement the intervention for 10-30 minutes. Subjects who were unable to listen to the music for at least 10 minutes were withdrawn from the study. Any changes in behavior were observed and noted on the post-intervention ABS. Subjects had the option to listen to music multiple times if requested. Study team members wrote down qualitative observations of the subject's response to the music.

Interrater reliability: to ensure appropriate establishment of interrater reliability, a clinical nurse study team member and/or PI completed the pre-intervention ABS assessment, and a second clinical nurse study team member or PI completed a second assessment and compared the assessments to ensure interrater reliability. This process was repeated once again post-intervention during the initial recruitment period.

Infection control: Disposable hypoallergenic sanitary headphone earcup covers were used for headphones. Each headphone was cleaned with disinfectant wipes between subjects to prevent

infection. Subjects with a potential or positive COVID-19 infection, Clostridium difficile or enteric infections were excluded from the study.

Week 3 to Study Completion

Once interrater reliability was established among the study team members, the PI obtained informed consent and the PI or clinical nurse study team member created the receptive music playlist with the patient or medical power of attorney. During the creation of the individualized music playlist, patients and families were asked to share favorite genres, artists, childhood music, religious denomination, predilection for specific themes (holiday music, church hymns), cultural songs and even disliked artists/genres to prevent potential negative effects from the music intervention. The patient's playlist was loaded into a tablet using a patient-specific code and was readily available for the PI or clinical nurse study team member to play once the pre-intervention ABS was obtained. After the patient listened to the music playlist, the PI or clinical nurse study team member completed the post-intervention ABS. Study team members also noted any qualitative observations on the post-ABS data collection form.

Data collection methods

Quick Dementia Rating Scale (QDRS): The QDRS is designed as an informant rating to provide a rating of the extent and severity of cognitive change and function from prior abilities. The QDRS is scored on a continuous scale with a range of 0-30. Higher scores suggest more impairment. The QDRS is insufficient to diagnose a dementing disorder, however, it is sensitive to detecting early cognitive changes associated with many common dementing illnesses (Calvin, 2013). Permission to use the QDRS was granted from James E. Galvin, MD, MPH and New York University (NYU) without modification or editing of any kind solely for non-commercial research, defined as investigator-initiated clinical research that is not funded or supported, in whole or in part, by any for-profit entity (Galvin, 2013). Patients scoring 2-20 are considered to have mild to moderate dementia and meet inclusion criteria. The QDRS questionnaire is completed by an individual who has frequent long-term contact with the patient, such as a spouse, caretaker or adult child.

Agitated Behavior Scale (ABS): Agitation, the dependent variable, was measured using the ABS, a 14-item scale completed by the PI or clinical nurse study team member. A rating of 1 is assigned when the behavior in the item is not present. A rating of 2 is assigned when the behavior is present but does not prevent the conduct of appropriate behavior. A rating of 3 is assigned when an individual may need to be redirected from an agitated to an appropriate behavior and is able to benefit from such cueing. A rating of 4 is assigned when the individual is not able to engage in appropriate behavior due to agitated behavior, even when external cueing or redirection is provided (Bogner, 2000). The total score is calculated by adding the ratings (from 1 to 4) on each of the 14 items. Raters are instructed not to leave blanks. The total score is from <22 (no agitation), to 22-28 (mild agitation), 29-25 (moderate agitation) or greater than 36 (extreme agitation). The ABS is an observational tool for which validation studies have shown that nurses can use the scale reliably and validly when based on 10 or 30-minute observation periods. In validation, nurses are trained sharing impressions and asking feedback during a pilot period (Bogner, 2000). The clinical nurse study team members received training on how to administer the ABS during the training period to ensure interrater reliability. Permission to use the ABS was granted by Jennifer Bogner, PhD, ABPP, FACRM Director, Division of Rehabilitation Psychology and Vice Chair of Research and Academic Affairs from the Department of Physical Medicine and Rehabilitation, Ohio State University.

Houston Methodist (HM) policies for Protected Health Information (PHI) were followed, including all requirements for physical and electronic data security, use of encrypted devices and HM Password protected servers. To keep data exposure to a minimum and maintain subject confidentiality, the chart review in EPIC was limited to the PIs and one clinical nurse study team member. No personal identifiable names were collected. A data collection tool in an encrypted computer spreadsheet was used to track subjects admitted/rejected/withdrawn from the research study, and limited demographic information was collected: age, gender and the QDRS and ABS scores pre- and post-intervention. Subjects are identified by a "subject identification number" in the data collection tool. Pre- and post-ABS assessment sheets and a copy of the individualized playlist are identified with the subject identification number and whether it is the pre- or post-ABS assessment. Subject number on the ABS assessments and playlist correspond with the subject identification number on the data collection tool. Procedures to protect anonymity of participants and confidentiality of data include coding of names and identities, and maintenance of data in password-protected and encrypted computers.

Results

Descriptive statistics were performed on the sample's demographics. Wilcoxon signed-rank tests were used to compare pre- and post-intervention ABS scores. The Wilcoxon signed-rank test is for non-parametric data; it tests the differences in median of two paired observations. Statistical significance is set at $p < 0.05$; thus, if pre-intervention ABS scores and post-intervention ABS scores are tested to be significantly at the $p < 0.05$, the researchers will conclude that there is an observed difference in patient's level of agitation between pre- and post-interventions. Wilcoxon signed-rank test and sign test were used to test interrater reliability and analyze whether the different raters scored the same patient differently using the ABS. Mann Whitney U tests were used to test whether participants' ABS scores were statistically different based on gender or QDRS scales. Kruskal-Wallis test was used to conduct comparisons of ABS scores among different age groups. Spearman's correlation tests were also performed to test whether there were any correlations between gender, QDRS and time of the session to gain pre- and post-intervention ABS scores. The inferential statistical analysis was conducted using STATA statistical software.

Sample descriptive statistics: The demographic data analysis shows that most of the sample participants are female (n=24, 60.00%), most of the participants were between the ages of 70-79 years (n=15, 37.50%) and 80-89 years (n=14, 35.00%), with the youngest participant at 62 years old and oldest participant at 97 years old. Most of the participants were identified to have "moderate" dementia based on their QDRS scores (n=29, 72.50%). Most of the sessions were conducted from 12PM- 6PM (pre-intervention n= 32.80%; post-intervention = 30, 75.00%).

Inferential Statistics: The Wilcoxon signed-rank test was used to test interrater reliability by comparing two raters' ABS score of each patient; two patients had the same scores between two raters, and these were excluded from this test. The final *p*-values were greater than 0.05 for each patient, which suggests no significant differences in ABS scoring between two different raters. The Sign test was also used to test interrater reliability, and the final *p*-values show the same conclusion as Wilcoxon signed-rank test (refer to Table 1).

Table 1 - Wilcoxon signed-rank test and Sign -test, interrater reliability

	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Patient 6	Patient 7	Patient 8	Patient 9
Wilcoxon signed-rank test p-value	0.3173	0.2568	0.3173	0.3173	0.1573	N/A all scored the same	N/A all scored the same	0.1573	0.5637
Sign test p-value	1.000	0.4531	1.000	1.000	0.500	1.000	1.000	0.500	1.000

Participants' ages were categorized into four groups:
Group 1: 60-69 years old
Group 2: 70-79 years old
Group 3: 80-89 years old
Group 4: 90-100 years old

Spearman's correlation tests were conducted between age groups and total ABS scores and found no significant correlations (pre-intervention rho = 0.0641, *p*-value = 0.6941; post-intervention rho = -0.1309, *p*-value = 0.4206. The Kruskal Wallis test was used to test whether the median ABS scores were different among these four age groups for each individual ABS question (pre- and post-intervention), respective totals and change of ABS scores from pre-intervention to post-intervention. Pre-intervention question #14, and post-intervention questions #4, #5, #7, #8, and #14 were excluded from Kruskal Wallis testing because participants had same ABS scores. The final test results found no significant difference in ABS scores among different age groups (refer to Table 2).

Table 2 - Kruskal-Wallis test among age groups

Question	p-value	Question	p-value
Pre Q1	0.5604	Post Q1	0.9903
Pre Q2	0.9573	Post Q2	0.8407
Pre Q3	0.7826	Post Q3	0.6026
Pre Q4	0.6026	Post Q4	N/A All scored the same
Pre Q5	0.5038	Post Q5	N/A All scored the same
Pre Q6	0.4703	Post Q6	0.6401
Pre Q7	0.5038	Post Q7	N/A All scored the same

Pre Q8	0.6026	Post Q8	N/A All scored the same
Pre Q9	0.8282	Post Q9	0.2825
Pre Q10	0.7276	Post Q10	0.6476
Pre Q11	0.3567	Post Q11	0.3312
Pre Q12	0.6277	Post Q12	0.4216
Pre Q13	0.6057	Post Q13	0.6444
Pre Q14	N/A All scored the same	Post Q14	N/A All scored the same
Pre-Total	0.7471	Post Total	0.5058
	Change from pre- to post-intervention	p-value = 0.6837	

Kruskal-Wallis test were also used to test whether total ABS scores and change of ABS scores from pre-intervention to post-intervention were significantly different among different session times. The session times were categorized into five groups: Group 1, 12am-6am; Group 2, 6am-12pm; Group 3, 12pm-6pm; Group 4, 6pm-12am; and Group 5, unknown session time. The tests found no significant differences in ABS scores by different session times. However, Spearman's correlation found a very slight but not significant positive correlation between session times and total ABS scores for both pre-intervention and post-intervention (pre-intervention rho = 0.2135, p-value = 0.1859; post-intervention rho = 0.1986, p-value = 0.2693). It can be deduced from the data that, contrary to literature, noting that patients with dementia experience increased anxiety and agitation during dusk and later in the day, the intervention was slightly more successful when it was implemented during the day. However, a greater sample size could yield more meaningful results.

Mann Whitney U tests were performed to test whether the ABS scores were significantly different by participants' QDRS (mild vs. moderate dementia) or gender (male vs. female) for each individual question (pre- and post-intervention), the respective totals and change in total ABS scores from pre-intervention to post-intervention. The tests found no significant differences in ABS scores by gender and QDRS. Although the test did show ABS scores are significantly different for pre-intervention question #5 by QDRS (p-value = 0.02), but due to data limitations, this test result is skewed and needs further investigation (Refer to Table 3).

Table 3 – Mann Whitney U test for Gender and QDRS

Question	p-value (by Gender)	p-value (by QDRS)	Question	p-value (by Gender)	p-value (by QDRS)
Pre Q1	0.3871	0.6843	Post Q1	0.3403	0.8312
Pre Q2	0.4706	0.3859	Post Q2	0.8324	0.7908
Pre Q3	0.2206	0.5413	Post Q3	0.4142	0.538

Pre Q4	0.2207	0.1044	Post Q4	N/A all scored the same	N/A all scored the same
Pre Q5	0.0793	0.02	Post Q5	N/A all scored the same	N/A all scored the same
Pre Q6	0.4306	0.5198	Post Q6	0.8561	0.2738
Pre Q7	0.2421	0.4703	Post Q7	N/A all scored the same	N/A all scored the same
Pre Q8	0.4142	0.5308	Post Q8	N/A all scored the same	N/A all scored the same
Pre Q9	0.2911	0.2685	Post Q9	0.2421	0.3776
Pre Q10	0.6919	0.5379	Post Q10	0.4278	0.317
Pre Q11	0.0796	0.8612	Post Q11	0.7699	0.3776
Pre Q12	0.1832	0.1383	Post Q12	0.5239	0.2942
Pre Q13	0.3645	0.8423	Post Q13	0.2207	0.1044
Pre Q14	N/A all scored the same	N/A all scored the same	Post Q14	N/A all scored the same	N/A all scored the same
Pre-Total	0.7378	0.8784	Post Total	0.8001	0.7609
			Change from pre- to post-intervention	0.4748	0.9265

The Mann White U tests were also performed to test whether there is a significant difference in pre- and post-intervention total ABS scores and changes of total ABS scores from pre-intervention to post-intervention by the session times. The session times were categorized into two groups; sessions conducted at or after 5pm were categorized as “at dawn” group, and sessions conducted otherwise were categorized as “other” group. The test results found the ABS scores and the change of ABS scores from pre-intervention to post-intervention are not significantly different by session times (pre-intervention p-value = 0.3595; post-intervention p-value = 0.3313; change in ABS p-value = 0.5490).

The Wilcoxon signed-rank tests were used to compare the pre-intervention and post-intervention ABS scores per individual question and the respective total. Question #14 was eliminated due to no change of ABS scores from pre-intervention to post-intervention. The tests found ABS scores were significantly different from pre-intervention to post-intervention for questions # 1, # 2, # 3, # 6, # 9, # 10, # 11, and total ABS scores (Refer to Table 4). Sign tests were also conducted and found same results. The Spearman’s correlation test was used and found as pre-intervention ABS score increases, there is a significant higher decrease in ABS scores from pre-intervention to post-intervention (rho = 0.9132, p-value = 0.0000). These test results validate that therapeutic music intervention had a significant effect in reducing agitation in patients with dementia in the acute setting.

Table 3 – Wilcoxon signed-rank test, and Sign test pre/post ABS score comparison

	Wilcoxon signed-rank test p-value	Sign-Test p-value
Q1	0.0000	0.0000
Q2	0.0005	0.0005
Q3	0.0254	0.0625
Q4	0.3173	1.0000
Q5	0.1573	0.5000
Q6	0.0027	0.0039
Q7	0.1573	0.5000
Q8	0.3173	1.0000
Q9	0.0001	0.0000
Q10	0.0167	0.0391
Q11	0.0143	0.0313
Q12	0.1520	0.2891
Q13	0.1573	0.5000
Q14	N/A	1.0000
Total Scores	0.0000	0.0000

Limitations

A significant limitation was the size of the data set, as the ABS scoring of the patients can be relatively subjective. Qualitative analysis results should be considered for a better understanding of the research results.

Results

Dementia is a disease that causes cognitive deterioration leading to a decrease in the stress threshold and a decreased ability to comprehend verbal language (Wall & Duffy, 2010). Regardless of the type/severity of dementia, caring for these patients is not only difficult for familial caretakers, but poses challenges for clinical nurses and medical personnel to properly care for these patients, especially those admitted to hospitals.

This pilot study enrolled a total of 40 subjects in the acute care setting medical-surgical units to determine whether a receptive music approach using an individualized music playlist reduced agitation as evidenced by the ABS. Cognitive level of impairment or severity of dementia was measured using the Quick Dementia Rating Scale (QDRS). Inclusion criteria included patients ranging mild-moderate dementia severity. From the subjects recruited, 28% or eleven patients had a QDRS 12 or less (mild) 73% or 29 patients had a QDRS 13-20 (moderate); subject ages ranged from 62-97 years old; gender distribution allocated 60% (24) female; 40% (16) male. Only two patients requested to stop the intervention within 10 minutes, which excluded them from statistical analysis and study subject group. More than half of the subjects requested the music to be played without the use of headphones.

Statistical analysis of individual pre- and post-intervention ABS scores and respective total ABS scores demonstrated significantly lower scores post-intervention, validating that the therapeutic music intervention had a significant effect in reducing agitation in patients with dementia in the medical-surgical units. Further analysis of independent pre- and post-intervention ABS scores showed that scores were higher at the end of the day (after 5pm); however, the difference between pre and post ABS scores are lower. It can be assumed that contrary to literature noting patients with dementia experience increased anxiety and agitation during dusk and later in the day, the intervention was more effective when implemented during earlier times of the day.

Although there were hospital visitor restrictions enforced due to the Covid-19 pandemic, families available at the time of the intervention requested to be placed on speakerphone during the intervention, and some requested to have a copy of the individualized music playlist created for their hospitalized family member to use post-discharge. Most families expressed positive sentiments toward the therapeutic music approach to reduce agitation and improve mood. During the creation of the individualized music playlist, patients and families were asked to share favorite genres, artists, childhood music, religious denomination, predilection for specific themes (holiday music, church hymns), cultural songs and even disliked artists/genres to prevent potential negative effects from the music intervention.

Since a limitation of the study in the clinical acute setting was the inability for the study research team to be available at the exact times the subjects manifested agitation, clinical nurse study team members and PIs were encouraged to note any observations in addition to administering the ABS pre- and post-intervention. Qualitative data gathered from the observations showed five common themes:

- Theme 1: *Music elicited positives emotions*, e.g., smiling, getting excited, appearing happy
- Theme 2: *Music elicited an evident kinesthetic connection*, e.g., snapping and tapping fingers, wiggling/moving to the beat, dancing moves in bed, waving arms, humming and singing along with the songs. During an encounter, a multilingual patient started to sing to Bollywood 1970-1980s songs while smiling and waving arms to the music. A family member explained that the patient and spouse used to listen to this genre together as they cooked, and the kitchen would be filled with the aroma of home-cooking and spices.
- Theme 3: *Music promoted relaxation*, e.g., the patients looked relaxed as the music played, closed their eyes, even noted to appear to fall asleep.
- Theme 4: *Music promoted reminiscence about the past*, e.g., specific songs/artists elicited distinctive memories about childhood, loved ones, and specific memories. This often led to more emotional responses from patients such as becoming tearful. One subject shared a memory the song elicited when her husband revealed he had cancer while they sat at their kitchen table. This was a therapeutic release of emotions for this subject. Others shared the song brought them back to a time when they danced at a wedding or family event.
- Theme 5: *Connection between the music and the subject's past positive experiences*, e.g., comments that the music uplifted the spirit; one subject commented how much gospel music means to him; connected the subject to the past and elicited positive memories.

This study demonstrated that using a simple, cost effective, non-pharmacological approach reduced agitation in patients with mild to moderate dementia, and qualitative data further showed that subjects and family members attested to having a positive experience with this nursing-led intervention.

Discussion

The number of patients with dementia admitted to acute care hospitals is increasing worldwide. Prolonged hospital stays are associated with a deterioration in cognitive, functional and physiological status (Mathews, Arnold, & Epperson, 2014). The greater the cognitive impairment, the lower the stress threshold, and the more sensitive the patient with dementia is to environmental sensory stimuli (Gomez & Gomez, 2017). As a result, patients with dementia are more prone to experience distress and manifest behavioral symptoms, the most common being agitation. Receptive music is a safe, non-verbal intervention because receptive music abilities are preserved in later stages of the disease (Gomez & Gomez, 2017). It is also an effective, cost-effective, non-pharmacological intervention to reduce neuropsychiatric symptoms that increase distress for patients with dementia, caregivers and nurses (Aleixo, Santos, & Dourado, 2017).

Using a therapeutic music intervention and an individualized music playlist reduced agitation and improved overall mood and behavior for patients with mild and moderate dementia admitted to the medical-surgical units in the acute setting. The concept of entrainment, "the coordination of synchronization of different rhythms" was used for the creation of the individualized music playlist. Rhythmic entrainment refers to the synchronization which occurs where neural activity in the brain and /or heart affected by a rhythm, melody or tempo, which may evoke or induce a powerful emotion mechanism. At the motor level, entrainment can enable movements made on melodies or rhythms (Vuilleumier & Trost 2015). This is a music therapy technique facilitated by a board-certified music therapist providing live music that can be adapted to assist the participant in entraining to the music. Entrainment is more difficult with recorded music since it cannot be changed in beat or tempo. Thus, the individualized music playlist was adapted and organized methodically using initially high upbeat melodies with the gradual reduction in the tone/melodies of the songs, leading to a promotion in relaxation and even sleep in a great number of patients with dementia who experienced the stress of healing in the acute care environment.

Although there were intrinsic and extrinsic factors which challenged the research team to implement the intervention during exact active times of agitation, qualitative data demonstrated most patients experienced an overall great improvement of mood and relaxation with the music. Intrinsic factors include, but are not limited to, inability to predict times of agitation as patients were admitted to the hospital with inherently distinctive cognitive levels of function defined by the QDRS and different medical diagnosis. Extrinsic factors include, but are not limited to, times of availability by the research team to visit the patients to implement the intervention and patient unavailability due to scheduled procedures or visitations by physicians or medical personnel.

Current knowledge and literature show that patients with dementia experience agitation and behavioral symptoms more commonly during "sundowners," a time in the afternoon or late evening (Canevelli et al., 2016). Various factors can aggravate such symptoms and a patient's condition, such as lack of sleep, changes in circadian rhythms, break in routines, fatigue and mental exhaustion. Although the therapeutic music intervention statistically showed an overall improvement in neuropsychiatric symptoms, it was noted to be more effective during its implementation during earlier times in the day rather than later in the day when this patient population is noted in the literature to experience these symptoms. This could have been attributed to the fact that there may be an imbalance of symptoms for patients with dementia when they are admitted to the hospital. This is a potential area to conduct further research to test music intervention in the acute setting, as supporting literature has noted a correlation between time of day and manifestation of neuropsychiatric symptoms.

Implications of the findings and recommendations to the organization

Various studies note using music as an intervention to reduce agitation in patients diagnosed with dementia in long-term care and nursing rehabilitation facilities; however, there is a limited number of studies focused on using a music intervention for hospitalized patients with dementia. Patients with dementia have been noted to experience a great amount of distress in unfamiliar environments. Studies have also noted their preference for a set routine to alleviate and prevent their discomfort and potential distress. In the hospital setting, patients with dementia experience the discomfort of their physiological medical conditions and are expected to adjust to a new environment while undergoing scheduled medical procedures/tests and numerous unexpected visits from medical personnel throughout their healing. As accommodating as a hospital setting may be, these patients still experience a great amount of distress. This demonstrates the great need in the field of medicine to further study non-pharmacological interventions to improve the medical care for this patient population.

The implications of this study demonstrate that using a receptive music playlist as a therapeutic intervention in the acute setting greatly reduced agitation for the study population patients with dementia. The cost of implementing a receptive music nursing intervention is minimal; it includes purchasing earphones and earphone covers for infection prevention purposes, purchasing devices that can download a music app to create the playlist and creating a protocol for nurses to follow when implementing a receptive music playlist for patients with dementia. Houston Methodist Sugar Land Hospital has a licensed music therapist available for consultation who is also a trained clinician if a patient has a negative experience with a song. The HMSL researchers recommend offering patients and/or families the option to implement the therapeutic music intervention, and utilizing a scale integrated to the patient EHR to measure mood and/or behavior to measure the impact of the therapeutic music intervention. The researchers recommend training clinical nurses to identify the appropriate patients for the intervention, and offer the availability to consult a Music Therapist to aid in the creation of an individualized music playlist to use this successful innovative nursing intervention to reduce/ prevent agitation and improve the quality of care for this vulnerable inpatient population.

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