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Preferred Music Listening Intervention in Nursing Home Residents with Cognitive Impairment: A Randomized Intervention Study

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Abstract.
Background: The current trend in addressing symptoms of dementia comprises non-pharmacological strategies such as music interventions for the management and improvement of cognitive function, memory, agitation, depression, or anxiety.
Objective: To determine the impact of a preferred music listening group intervention upon the functional, cognitive, and emotional dimensions in nursing home residents.
Methods: A randomized intervention study was carried out. The study was conducted from June to August 2015, and involved a preferred music listening group intervention lasting 60 minutes, 5 days/week during 8 weeks. A total of 119 adults aged ≥65 years, with annual permanent residence in the nursing home (Málaga, Spain) were included in the study. 47 (39.5%) subjects were randomized to the music group intervention. The nurses and physiotherapists were blinded to the assessments.
Results: The sample had a mean age of 80.52 (SD7.44) years, with female predominance. The subjects presented dependency in Barthel, and cognitive impairment as determined by the MMSE. The Tinetti scores yielded fall risk and depression as evidenced by the Yesavage scale. The Cornell scores evidenced no depression in elderly people with dementia. Following the intervention, function improved significantly with a medium effect size, as did emotional state, with a large effect size. Cognitive function was seen to worsen in the control group, but remained stable in the intervention group, with a large effect size.
Conclusions: A preferred music listening group intervention among elderly people in nursing homes is effective, resulting in improvements in functional and emotional condition.

Keywords: Care activities, dementia, elderly people, music, nursing homes

INTRODUCTION

Increased life expectancy is associated with increased comorbidity, drug use, and loss of function [1]. Anxiety, depression, and dementia are highly prevalent among the elderly population [2]. Neuropsychiatric disorders are all characterized by a chronic course and associated loss of physical function. The increase in dependency and the presence of disruptive behaviors induce changes in family roles. These chronic disorders have a strong impact upon the family, and in many cases the decision is made to send the elderly relative to a nursing home [3]. As a result, approximately 50% of all people aged 65

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years or older and admitted to residential aged care facilities suffer dementia [4].

Drug treatment or physical restraint measures have been the options of choice for dealing with depression and dementia until a few years ago. These treatments are not without risks for the elderly, and in the case of drug treatment can cause high risk of adverse events in this populations (gastrointestinal problems, dry mouth, or dysuria), with no clear improvement in disruptive behavior and should be prescribed with caution [5].

Non-pharmacological interventions such as sensory stimulation, cognitive training, or music therapy are useful for addressing both cognitive deterioration and the associated behavioral changes [6]. Music has an exceptional capacity to evoke memories, associations and feelings, and to influence physiological responses and mood state [7].

Background

In the geriatric setting, music stimulation is understood as the specialized use of music in elderly people who need physical-motor, cognitive, and/or social-emotional support. The aim is to help these individuals to achieve and maintain optimum function [8].

Music therapy includes individual or group therapy provided by a qualified therapist who evaluates and determines the needs, skills and experiences of the patients, and programs activities according to their preferences and personal history, at both individual and group level. Active music therapy is a strategy in which the patient can sing and play music, in contrast to passive music therapy, which simply focuses on listening to music [5].

Different studies have designed possible alternative therapies for managing the neuropsychiatric changes in dementia patients [6], correlating music therapy to improvements in cognitive function and in autobiographic and semantic memory capacity, as well as to substantial changes in patient symptoms, with improvements referred to agitation, apathy, depression, anxiety, mood state, and relational skills [9–14].

Music offers these patients important behavioral, cognitive and social functional benefits, and serves as a complement to pharmacological treatment [15]. In addition, positive outcomes are observed in terms of group participation and interaction, affectivity, group belonging and identity, mood state and spiritual wellbeing, by combining music therapy with pharmacological therapy—this being clearly important for ensuring good personal health perception and therefore quality of life [16, 17].

On the other hand, a number of reviews have been made to assess the effects of music-based interventions upon anxiety and depression in elderly persons with mild dementia. In this regard, the results obtained have not confirmed the efficacy of music intervention in managing anxiety and depression, the duration of the effects after the intervention, or the influence of individual or group intervention modalities [11, 12, 18].

Music-based interventions are defined as systematic listening to music chosen according to the preferences of the patients and personal history known by family members in case of dementia [19]. Interventions of this kind have been found to be effective in managing agitation in elderly adults with dementia [20].

A preferred music listening intervention lessens anxiety and agitation in elderly people with dementia, and may be an alternative to physical and drug treatments [5, 21, 22]. In addition, it can be used to introduce or enhance the feeling of familiarity in a new environment, as well as improve functional abilities [23].

Listening to preferred music is economically more accessible to nursing homes, since not all of them are able to cover the cost of qualified therapist sessions, despite the demonstrated benefits this would offer [9–14]. The hypothesis explored in the present study is that a preferred music listening intervention targeted to elderly people in nursing homes could result in improvements in the functional, cognitive and emotional dimensions.

METHODS

Design

A randomized intervention study was carried out in a nursing home in Málaga (Spain). The aim of the study was to determine the impact of a preferred music listening group intervention upon the functional, cognitive, and emotional dimensions in elderly people living in nursing homes.

Data collection

The inclusion criteria were: subjects aged 65 years or older with dementia (diagnosed by the geriatrician or recovered from medical history), place of

residence in the nursing home in Málaga (Spain), and each subject or person in charge (in the case of patient dementia or disability) consent to participate in the study. Exclusion criteria were: terminally ill patients and/or refusal to participate or sign the informed consent document.

The recruitment period was in the month of June 2015, and the intervention was conducted during July and August of that same year.

Sample size and procedure

A sample size of 40 individuals per group was calculated, considering a difference of 1.5 points on the Geriatric Depression Scale (GDS) between the groups (SD 1.84) [22], with an estimated study power of 95% and an alpha error of 5%. We increased the sample size by an additional 5% to compensate for losses to follow-up, hospital admissions or mortality. The resulting sample size was 42 subjects per group.

The room in which the intervention was carried out allowed an increase in the intervention group size to 47 subjects. These individuals were randomly selected for inclusion in the intervention group using an MS Excel 2010 spreadsheet. The randomization process was performed immediately after baseline data collection using a concealed sequence procedure by external researchers not involved in the study. The remaining subjects (controls) received standard care. Each subject was assigned a code with two purposes: 1) to ensure anonymization; and 2) to uniquely identify each subject. The results of random allocation of the subjects were delivered directly to the nurses. This sampling strategy allowed matching home setting and music therapy conditions without controlling other factors such as diagnosis, gender or severity of dementia.

A comprehensive geriatric assessment was conducted to collect sociodemographic, clinical (comorbidity), functional, psychological, and emotional variables from all the subjects meeting the inclusion criteria.

The functional assessment tools used were the Barthel Index of activities of daily living (BI) [24] and the Tinetti Balance and Gait Scale [25]. Regarding psychological assessment, use was made of the Mini-Mental State Examination (MMSE) of Folstein [26], while for emotional evaluation both the Yesavage Geriatric Depression Scale (GDS) [27] and the Cornell Scale [28] were used.

The BI [24] consists of 10 items that measure daily functioning, particularly activities of daily living (ADL). The items include feeding, transfers (from bed to chair and back, and to and from the toilet), grooming and toileting, walking on a level surface, going up and down the stairs, dressing, and bowel and bladder continence. The total score ranges from 0 (dependent) to 100 (independent). The Cronbach's Alpha is 0.92.

The Tinetti Scale [25] in turn consists of two parts: the first seeks to assess balance and has 9 items totaling 16 points, while the second corresponds to gait assessment and comprises 8 items totaling 12 points. In total, the index has 17 items totaling up to 28 points. A total score lower than 19 points indicates a 5-fold increase in the risk of falls, so the lower the total score the higher the risk of falls. The Cronbach's Alpha is 0.98.

The MMSE [26] in turn is a dementia screening test for monitoring the progression of dementias. The items are grouped into 5 sections that assess orientation, fixation of knowledge in memory, concentration and calculation, deferred memory, and language and construction. The cut-off point for dementia is usually set at under 24 points. People suffering from illiteracy, blindness, hemiplegia, etc., cannot be assessed in some aspects of the MMSE, and recalculation is required proportionally following the instructions of the test. The Cronbach's Alpha is 0.91.

The Short Form Yesavage [27] comprises 15 questions. Ten questions indicate the presence of depression when answered positively, while the rest (questions 1, 5, 7, 11, and 13) are indicative of depression when answered negatively. A score of 0–4 is considered normal, depending on age, education, and complaints; 5–8 indicates mild depression; 9–11 indicates moderate depression; and 12–15 indicates severe depression. The Cronbach's Alpha is 0.94.

Lastly, the Cornell Scale [28] for depression in dementia is a clinical test used to determine the symptoms and signs of depression in people suffering from dementia. It comprises 5 parts: patient mood, behavioral alteration, physical signs including loss of weight or appetite, cyclic changes such as sleep disturbances, and disturbances with possible suicidal thoughts. The instrument consists of 19 questions, and a score of over 12 indicates that depression is most likely to occur. The Cronbach's Alpha is 0.87.

Intervention

The intervention group had an extra 60-minute session of musical stimulation, 5 times a week during 8

weeks, in addition to the usual occupational therapy (OT) programs of the center, while the control group received only the occupational therapy programs with no music-based intervention.

The OT program comprised training activities for maintaining the activities of daily living (drawing a graded picture by changing the size of the paper, folding clothes (washcloths, socks), ADL board (button, zippers, bra hooks, etc.), opening containers (toothpaste, lotion), clothes pins, rainbow rings for crossing the middle line, Velcro board, keys and locks, therapy, digiflex, beaded handicrafts). Both groups performed the OT in the morning.

Patients and their relatives were asked about the type of music and songs that had pleased them throughout their lives and also during their childhood and youth, in order to program the group music sessions according to their choices and introducing the songs they had previously indicated [21, 29, 30].

A list of free-access songs for all group was elaborated and made available to the staff of the residence. Family members and residents chose songs from the list in order of preference. A playlist of the preferred music was compiled according to the following criteria: a minimum of two songs selected by each older person, with a playlist length that could not exceed 60 minutes for each session. Due to the number of songs selected, two lists of 60 minutes each were created, with alternation of these lists (Supplementary Material).

An active music-based intervention was used: the music was played using an MP3 player and loudspeakers to all residents at once in the same room, allowing them to interact, sing, dance, clap, etc. [5].

The intervention took place in the morning, since the afternoon is characterized by an increase in the neuropsychiatric symptoms associated with dementia [31]. Visits by relatives and nursing techniques, such as care of wounds or blood tests, were not allowed—both these activities being scheduled outside the intervention hours in order to prevent them from interfering with the effects of the intervention.

Subsequently to the intervention, the daily OT session was held in the morning. For the OT session, each group was in a different room in the nursing home. The initial and final assessments were made by nurses and physiotherapists unrelated to the study and blinded to its objectives. These professionals had over 5 years of experience with data compilation, and had participated in a previous fall prevention study. The intervention was carried out by volunteer nurses not employed in the nursing home.

Statistical analysis

The variables were reported as proportions and/or means and standard deviations. The Kolmogorov-Smirnov test was used to assess normality and Levene's test was applied to explore homogeneity of variances for continuous variables (age, Barthel Index, Tinetti Scale, MMSE, Yesavage Scale, Cornell Scale). There were no significant outliers. The data met the main assumptions of the unrelated samples *t*-test, so parametric testing (Student *t*-test for unrelated samples) was used for the comparison of means referred to age, while nonparametric tests (chi-squared test) were used for the comparison of proportions (gender, educational level, and comorbidity). In order to know the effect of the intervention, the analysis of the Barthel Index, Tinetti Scale, MMSE, Yesavage Scale, and Cornell Scale data was based on two-tailed mixed-effect (between-within) analysis of variance (ANOVA) including two groups (intervention group and control group) x 2 times (pre- and post-test), with repeated measurement of the last factor using 95% confidence intervals (95%CI). The data met the main assumptions of ANOVA, independence of cases, normality and equality. Effect sizes (eta squared) for ANOVA were also calculated, with values of >0.01 being considered small,>0.058 moderate, and >0.138 large [32].

The study data were entered in MS Excel spreadsheets, followed by statistical analysis using the SPSS® version 23.0 statistical package (IBM SPSS Statistics).

Ethical considerations

The data obtained were processed in abidance with Spanish legislation referred to personal data protection (LOPD 15/1999 of 13 December) and to the regulation of patient autonomy, rights and obligations, clinical information and documentation (Act 14/2002 of 14 November).

The study complied with the ethical principles for research cited in the Declaration of Helsinki, and was approved by the Research Ethics Committee of the Catholic University of Valencia (UCV/2015-2016/64). Each subject or person in charge (in the case of patient dementia or disability) signed an informed consent document prior to inclusion in the study and statistical processing of the collected data.

The Consort Guidelines and checklist has been reviewed to ensure the manuscript meets the

standards required for submission to high-quality peer-reviewed journal.

RESULTS

The sample of 119 subjects comprised 47 elderly adults in the intervention group (39.5%) and 72 controls (60.5%) (Fig. 1). The baseline characteristics of the sample of elderly adults around 80 years of age showed predominance of the female gender in the intervention group compared with the control group (65.96%, $n=31$ versus 41.67%, $n=30$; $p=0.011$). Most elderly adults had primary education, with a low prevalence of illiterate subjects. The most prevalent diseases were arterial hypertension, hyperlipidemia and diabetes mellitus, while the least prevalent were heart disease and chronic obstructive pulmonary disease (Table 1).

The patients showed a preference for popular music of the 1950s and 1960s (67.2%, $n=32$), as well as for songs for children from the 1970s (15.6%, $n=7$) and radio and television advertisements from the 1980s (17.2%, $n=8$). Classical music, jazz, or relaxing music was not chosen in any case.

Table 2 shows the mean and standard deviation (SD) corresponding to the variables assessing function referred to activities of daily living (Barthel Index) and the gait and balance scores (Tinetti Scale). Cognition as rated by the MMSE and mood state assessed with the Yesavage and Cornell scales are also reported. The table likewise presents the results of the 2 (group) × 2 (time) ANOVA, in which the interaction effect between these variables and the group can be seen.

The relationship between age and sex was analyzed on the scales included in the Comprehensive Geriatric Assessment. No correlation was found between age and any scale, nor by age group (<75 years and ≥75 years).

The subjects showed scores consistent with dependency in the assessment of function in relation

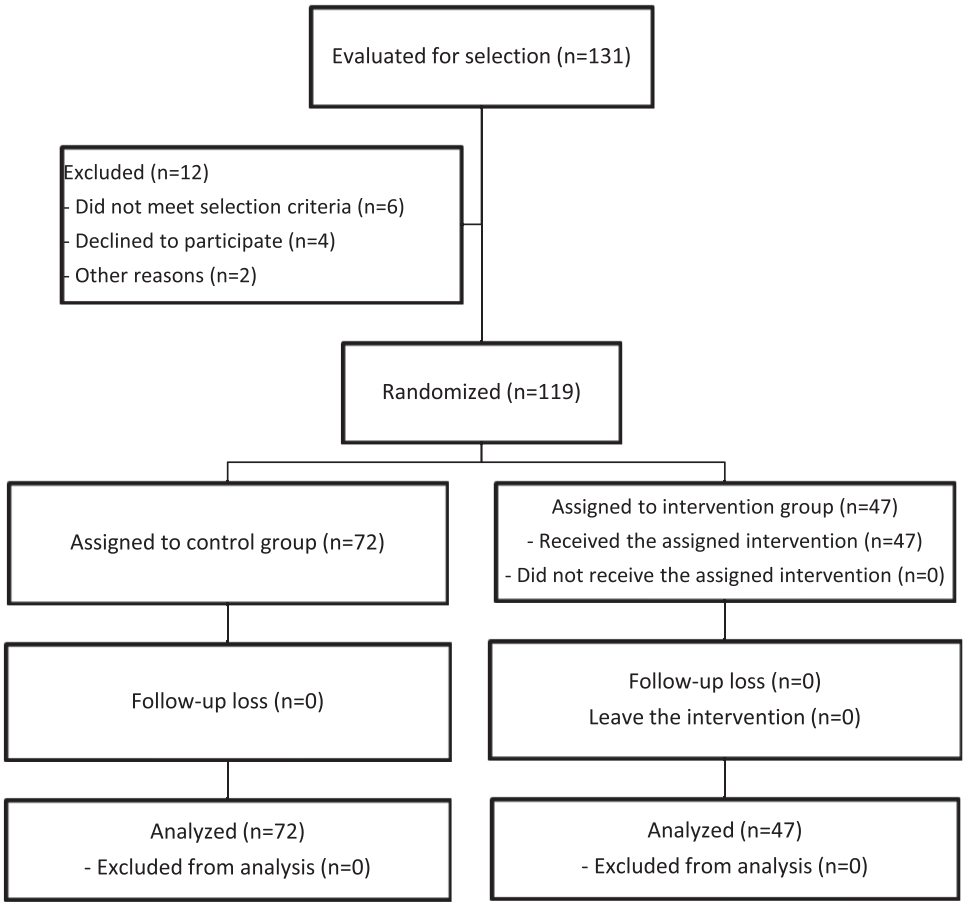

Fig. 1. Study flowchart.

Table 1
Sociodemographic and clinical characteristics of the study sample

	TOTAL	Intervention group	Control group	Sig‡
Age (n/Mean (SD)†)	119/80.52 (7.44)	47/80.06 (7.63)	72/80.80 (7.36)	>0.05‡
Gender, *n* (%)				
Female	61 (51.26)	31 (65.96)	30 (41.67)	0.011
Male	58 (48.74)	16 (34.04)	42 (58.33)	
Educational level, *n* (%)				
Illiterate	28 (23.53)	7 (14.89)	21 (29.17)	>0.05
Primary education	47 (39.50)	18 (38.30)	29 (40.28)	
Secondary education	44 (36.97)	22 (46.81)	22 (30.55)	
Comorbidity, *n* (%)				
Arterial hypertension	69 (57.98)	23 (48.94)	46 (63.89)	>0.05
Hyperlipidemia	52 (43.70)	20 (42.55)	32 (44.44)	>0.05
Diabetes mellitus	25 (21.01)	14 (29.79)	11 (15.28)	>0.05
Heart Failure	2 (1.68)	2 (4.26)	0 (0.00)	>0.05
Ischemic heart disease	13 (10.92)	6 (12.77)	7 (9.72)	>0.05
COPD	10 (8.40)	9 (19.15)	1 (1.39)	0.001

†SD, standard deviation; ‡Student *t*-test on age; Chi-squared test on gender, education level, and comorbidity and intervention/control group; Secondary education: specialized professional training or university education. COPD, chronic obstructive pulmonary disease.

Table 2
Interaction effects of group and time in relation to each of the dependent function variables (Barthel Index and Tinetti Scale), cognition variable (Mini-Mental State Examination) and mood variables (Yesavage and Cornell Scales)

	Group	n	Pre-intervention Mean (SD)†	Post-intervention Mean (SD)†	Mean differences (95% CI)	F‡	η^2
Barthel Index positive change; higher scores means lesser disability	CG	72	53.03 (41.92)	52.61 (41.36)	–0.68(–1.69:0.33)	5.69*	0.06
	IG	47	55.85 (33.99)	57.34 (33.21)	1.48(–0.01:2.98)		
Tinetti Scale high scores means lower risk of falls	CG	72	12.52 (1.59)	13.84 (1.6)	0.31 (0.07:0.56)*	0.81	0.009
	IG	47	14.42 (1.55)	15.02 (1.54)	0.59 (0.04:1.15)*		
Mini-Mental State Examination high scores means lesser cog impairment	CG	72	18.75 (12.41)	16.41 (11.66)	–2.33 (–2.89:–1.77)**	41.34**	0.262
	IG	47	17.17 (9.31)	17.25 (9.32)	0.08 (–0.27:0.44)		
Yesavage Scale higher scores means more depression	CG	72	9.77 (6.98)	11.55 (6.56)	1.77 (0.99:2.56)**	23.63**	0.224
	IG	47	8.31 (5.78)	8.27 (5.86)	–0.04 (–0.15:0.06)		
Cornell Scale no change; high scores means more depression	CG	72	8.03(5.89)	7.36 (5.07)	–0.66 (–2.31:0.97)	1.43	0.022
	IG	47	5.00 (4.53)	5.29 (4.63)	0.29 (0.09:0.49)**		

The Barthel Index assesses function referred to activities of daily living based on a score of 0–100. The Tinetti Scale evaluates gait and balance based on a score of 0–28. The Mini-Mental State Examination assesses cognitive function based on a score of 0–30. The Yesavage evaluates depression based on a score of 0–15, and the Cornell Scale assessed depression in the elderly based on a score of 0–38. †SD, standard deviation; Significant at *$p<0.05$, **$p<0.01$; ‡F two-way ANOVA (repeated measures) η^2, eta squared (effect size). Thresholds for η^2: >0.01, small; >0.059, moderate; >0.138, large

to activities of daily living (Barthel Index). The Tinetti Scale for the evaluation of gait and balance yielded scores indicative of a risk of falls. The interaction effects are descriptively shown in Fig. 2. The intervention group yielded improved scores versus the control group referred to both the Barthel Index (mean difference = 1.49, 95%CI: 0.1 to 2.98; $p = 0.049$) and the Tinetti Scale (mean difference = 0.59, 95%CI: 0.04 to 1.15; $p = 0.031$).

There were no differences between by gender in any other than the Tinetti scale. Differences were found only in the intervention group. The male sex yielded higher scores both at the beginning (18.81 versus 12.16) and at the end of the intervention (20.43 versus 13.00). Males increased the score (mean difference = 1.62, 95%CI: 0.68 to 2.56; $p < 0.001$; $\eta^2 = 0.231$) with greater effect size than females (mean difference = 0.84, 95%CI: 0.16 to 1.51; $p = 0.016$; $\eta^2 = 0.123$).

In relation to the MMSE, both groups yielded scores under 24 points, indicating cognitive impairment. The interaction effects are descriptively shown in Fig. 2. However, while the controls showed a lower score at the end of the study (mean difference = –2.33, 95%CI: –2.89 to –1.77; $p < 0.001$) than at the beginning, the score in the intervention group remained stable over time. A large effect size was observed (Table 2).

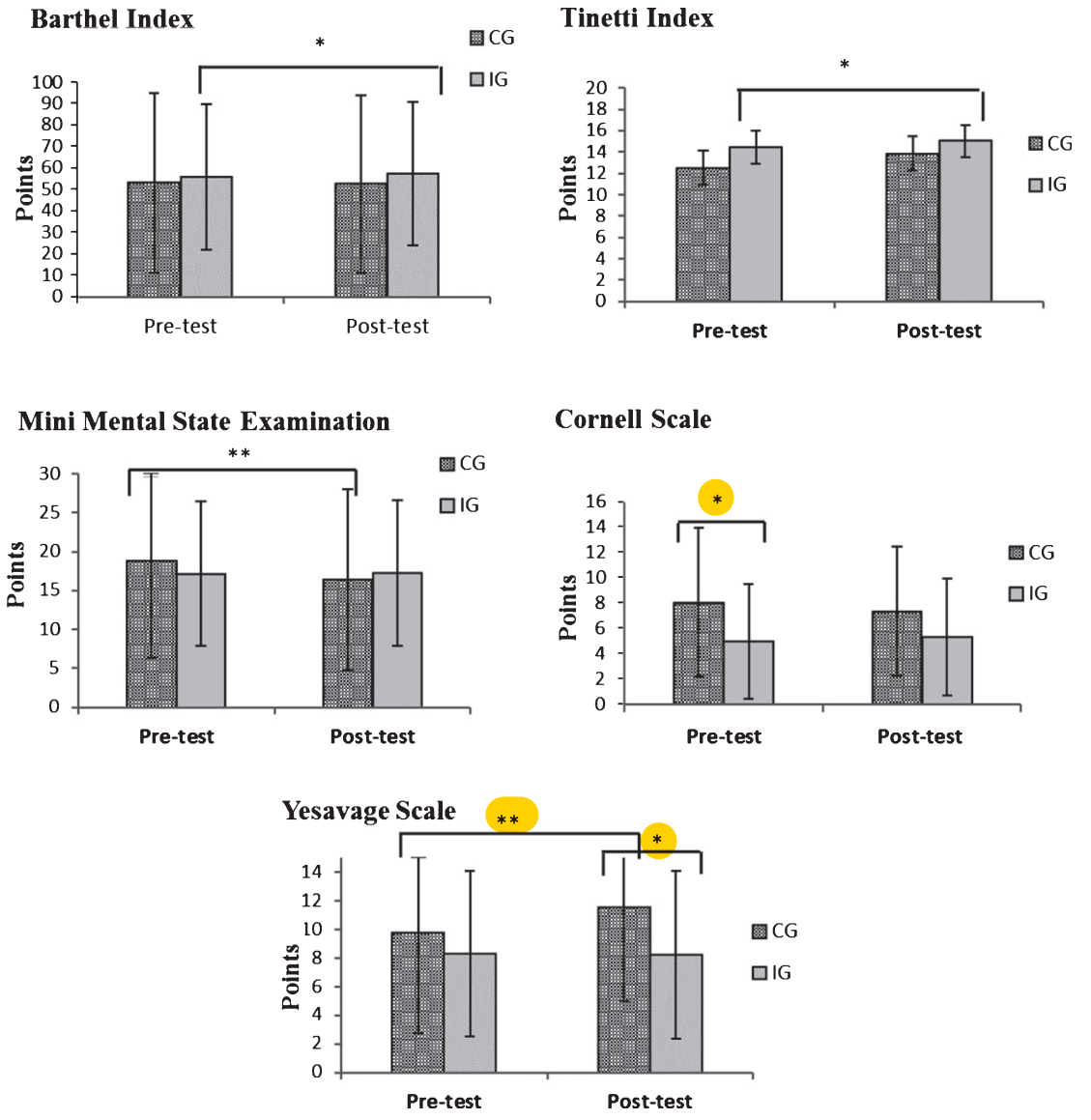

Fig. 2. Results of the group x time comparative analysis, showing the effects of the music-based intervention. Barthel Index, Tinetti Scale, Mini-Mental State Examination, Cornell Scale, and Yesavage Scale. *$p<0.05$, **$p<0.001$.

With regard to mood state assessed with the Cornell and Yesavage scales, the differences in Cornell score recorded between the two groups at baseline (mean difference = 3.14, 95%CI: 0.64 to 5.64; $p=0.015$) were no longer found at the end of the study. In contrast, the Yesavage score was found to increase in the control group (mean difference = 1.77, 95%CI: 0.99 to 2.56; $p<0.001$), and differences were noted between the two groups at the end of the study (mean difference = 3.27, 95%CI: 0.58 to 5.97; $p=0.018$) (Table 2 and Fig. 2).

DISCUSSION

Non-pharmacological strategies are the current tendency for dealing with the symptoms of dementia. Although some studies have pointed out the lack of proof of their purported effects [33], the fact is that these techniques are still undergoing development. One such strategy is music-based intervention to improve cognitive function, memory, agitation, depression, or anxiety [9–14].

The present study was designed to measure the capacity of a listening to preferred music-based inter-

vention in nursing home residents to improve their functional, psychological, and emotional dimensions. The group intervention showed listening to preferred music to improve functional condition and mood state, while cognitive function did not worsen.

The functional profile of our study sample was comparable to that of most studies in nursing home residents: female predominance, individuals close to 80 years of age, and primary education as the highest education level completed. The existing comorbidities were similar to those recorded in other studies in analogous Spanish populations [34]. The functional characteristics of the elderly adults at baseline were consistent with dependency as determined by the Barthel Index, and with falling risk as rated by the Tinetti Scale. Few studies have evaluated possible functional improvement as a result of a music-based intervention [21]. Our results indicate improvement in activities of daily living, with a moderate effect size—this possibly being due to the type of music intervention involved. The intervention allowed the patients to dance alone, in couples or in groups, and this could be comparable to the increase in physical activity among the elderly subjects during the study period. There is evidence that improvement in physical function is further accentuated if exercise is accompanied by music [35]. Other studies [36-37] have reported consistent positive results after applying music activities to therapy designed to improve rigidity and motor ability (gait and balance), enhancing patient quality of life and emotional functions, and minimizing the risk of falls. The gait improvement was greater in males than in females as the literature indicates. The aging process seems to be affecting men and women differently [38].

The MMSE yielded scores indicative of cognitive deterioration, with levels similar to those found in other institutionalized populations [39, 40]. Dementia is very common in elderly people living in nursing homes. In our study we recorded no improvement in cognitive score in the intervention group, though a large effect size was observed, since the cognitive scores were found to worsen in the control group. Despite the lack of improvement in the scores of the intervention group, the capacity of the music-based treatment strategy to act upon depression and counter the worsening of cognitive scores could be related to the way in which music affects the dopaminergic system. Reactions to musical stimuli are the result of a precise neurophysiological mechanism: music induces physiological dopamine release, with substantial improvement in emotional responses [37, 41]. Studies such as those of Van de Winckel [42] or Bruer [43] describe significant improvement in the MMSE scores in the intervention group versus the controls following a music-based intervention in a group of patients with dementia. This could be due to the type of intervention employed, since it did not consist of music therapy administered by a therapist experienced in the type of music and sessions involved.

There is abundant evidence that music therapy and music-based interventions in elderly people with dementia improve behavior handling, disruptive behavior, anxiety, and depression [5].

At the beginning of our study, the observations referred to anxiety, depression, and mood disorders were similar to those obtained in other studies conducted in nursing home residents, with prevalences higher than those recorded among elderly subjects living in the community. The effectiveness of music therapy in improving depressive symptoms in patients with dementia has been known for years [5, 42–44]. The management of behavioral symptoms in dementia has been found to be more effective if the musical intervention is performed taking individual preferences into account [45].

We recorded a large effect size in cognitive and emotional dimensions following the music-based intervention, though there was no improvement in emotional condition in the intervention group, in contrast to most studies, where improvement in levels of depression has been reported in 40–60% of the elderly people [45]. The results of our study are not in concordance with those of several other relevant studies in terms of the benefits of the application of music therapy in patients with neurological disorders, reducing patient anxiety and depression, as well as improving mood and state of mind [18, 30, 44, 46]. This could be due to the type of intervention used, since the previous studies involved professionals prescribing relaxing music or jazz, and the choice of music in our intervention was entirely different.

We recorded an increase in depression in the control group that could be due to possible contamination of the intervention. In effect, although the intervention was administered in a closed room, the occupational therapeutic activities were held jointly among all the elderly subjects, and during this period of the day the patients belonging to the intervention group were able to discuss their music activities with the members of the control group. Therefore, the control group could be more depressed because they were aware that they were being left out of the intervention [47].

Limitations

The intervention was targeted to all the nursing home residents, regardless of their level of cognitive deterioration (mild, moderate, or severe), in order to allow all of them to benefit from the intervention.

It must be taken into account that the performance of any non-pharmacological intervention depends on the patients, relatives, and therapists involved. It is therefore necessary to individualize the intervention, even if the latter is carried out on a group basis, conditioned to the observed patient needs or the needs expressed by the patients personally.

A stratified sampling approach could have been used to avoid female predominance bias. A larger sample would be needed to clarify the effect on neuropsychiatric disorders such as delirium and quality of life, the differences between standard care and pre-/post-music therapy, and also to allow subgroup analyses in order to understand more about how music therapy works. Furthermore, there may have been bias due to the presence of the Hawthorne effect, since the elderly subjects were aware of the fact that the study was being made, and there moreover could have been contamination between the groups, since both belonged to the same nursing home.

Analysis is required of the effects of interventions of this kind at a later point in time after they have ended. Randomized controlled trials involving larger patient samples are needed in order to obtain further evidence in this regard.

Conclusions

Music is effective in the management of functional, cognitive, and emotional symptoms. The present study confirms the important benefits of music interventions in patients with cognitive impairment, slowing the deterioration of cognitive and emotional symptoms in contrast to conventional treatments. This warrants the use of music as a non-pharmacological therapeutic strategy.

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SUPPLEMENTARY MATERIAL

The supplementary material is available in the electronic version of this article: http://dx.doi.org/10.3233/JAD-190361.

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