

# The effect of regular listening to preferred music on pain, depression and anxiety in older care home residents

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## Abstract

This research assesses the effect of listening to preferred music on pain, depression and anxiety in older people living in care homes. One hundred and thirteen participants were randomly allocated to either an experimental or a control group. The former, in addition to their usual routine, listened to 30 minutes of preferred music over a three-week period. Weekly assessments, using validated measures with some adaptations, evaluated levels of pain, depression and anxiety, each a common condition in this population. On completion of the programme, the groups switched over, thus enabling all participants to receive the potential benefits of the music intervention. Results showed statistically significant decreases for each dependent variable, with the size of the effect being greater for depression and anxiety than for pain. There were no significant improvements for those in the control group. Additional analysis identified variables that either facilitated or limited the benefits of the music. Those with severe pain were unable to benefit, but those who regarded music as important, listened frequently and whose preferences were accommodated all benefited to a greater degree than others. It was concluded that listening to preferred music is able to benefit many members of the care home population, although not all will benefit to the same degree.

## Keywords

*Older people, pain, depression, anxiety, preferred music, care homes*

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## Introduction

The use of music to benefit a wide range of physiological and psychological conditions is of increasing interest to academics and health professionals. However, few studies have explored its effectiveness amongst older care home residents. Life expectancy is increasing: the numbers of those over 85 are estimated to show an increase of 106% by 2032, a greater increase than any other demographic (The King's Fund<sup>1</sup>). Check this isn't UK specific? Or to developed countries? The number of care home residents in the UK is also expected to increase from 178,114 (2012 figures) to 231,122 in 2020 (POPPI, 2013).

The care home population is in a period of change. Rather than an alternative form of housing for older people in need of extra care, care homes are becoming a location of last resort for individuals with high support needs at the end of their lives. Only 5% of older people would choose to live in a care home (Wanless, 2006) but for most there is no choice. The majority of admissions are unplanned and often occur after a hospital admission or other crisis (Victor, 2012).

The wellbeing of many of this population is compromised by three conditions: pain, depression and anxiety. It is therefore important to identify interventions that could provide some relief. This is recognised in the UK by The National Standards for Care Homes, developed by The Care Quality Commission (CQC), which stipulates that the care provided should improve health and wellbeing (CQC, 2010). Although previous studies (examples?) have investigated the benefits of music for these conditions amongst the general

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<sup>1</sup> The King's Fund is an independent charity working to improve health and health care in England.

population, the findings have been variable and the studies criticised for insufficient methodological rigour. Further evidence of music's efficacy is needed.

The principal aim of this study was to evaluate the effectiveness of listening to preferred music on levels of pain, depression and anxiety in older care home residents. It was hypothesised that levels of each condition would decrease and that, due to the correlation between the three conditions, the extent of the effect would be similar for each variable. Voss (2004) states that: 'if patient anxiety and distress is reduced, then pain is also reduced'. A secondary aim was to determine if there were particular factors that facilitated or limited the effectiveness of the music intervention. It was hypothesised that those for whom music was important would show a greater level of positive response.

### ***Some challenges of ageing***

'Old age is synonymous with loss' (Kunzmann et al. 2005, P.144): 'Little by little, you let go of what once you had' (Kenny, 2014). This includes losses of independence, purpose, usefulness and social contact. All are distressing. Delgado expresses it eloquently:

I can't walk as fast or defend myself, my reflexes aren't as quick as they used to be, and I have some medical issues – so I stay home. Sometimes I would like to be out there in the world doing all the things I used to do, but I can't (Aging Today? Is this the author?, 2012).

These limitations foster a decline in perceived wellbeing, demonstrated in several studies. Life satisfaction declines rapidly towards the end of life as compared with a consistent pattern over the remaining lifecycle (Chen et al. 2001); depressive symptoms increase over the age of 80 (Tannock and Katona, 1995), particularly amongst care home residents

(McDougall et al. 2007; Mukai and Tampi, 2009; Jongenelis et al. 2004) and can result in both cognitive and functional decline (Lenze et al. 2001). Anxiety is prevalent, and awareness of its impact at this stage of life is growing (Small, 1996); its effect may be as damaging as major depression (De Beurs et al. 1999). Risk factors for each condition are similar: lack of social support, traumatic events, fear of worsening pain, disability and opioid dependence (Karp and Reynolds, 2009).

Up to 80% of the care home population experience pain (Ferrell, 1995; Helme and Gibson, 2001; Herr and Garand, 2001) and comorbid painful conditions escalate (Ferrell et al. 1990). Effects include decreased mobility, weakened immune systems, insomnia, poor appetite (EFIC<sup>2</sup>, no date) and reduced energy to fight symptoms or to adhere to treatment (Mitchell and MacDonald, 2009).

A strong association exists between pain, anxiety and depression, and each is a risk factor for the onset of another (Karp and Reynolds, 2009; Herr and Garand, 2001; Gagliese and Melzack, 1997). Furthermore, side effects and delayed responses to medication due to slower metabolisms may compromise treatment (Geerlings et al. 2002; Baldwin and Wild, 2004). Voss (2004) comments that ‘drugs alone sometimes aren’t quite enough; we need to find additional ways to decrease anxiety and pain’ and Melzack (2012, ix) advises, ‘Patients with chronic pain need every possible therapy to battle the pain’.

### ***Music as a therapeutic intervention***

‘A safe, effective and scalable treatment alternative’ is needed (Paykel et al. 2005, cited in Brandes, 2009, p.93). Many therapeutic interventions are inappropriate for the care home

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<sup>2</sup> European Pain Federation

population due to the physiological and/or psychological frailty of its residents. Listening to music is neither physically nor cognitively demanding (Laukka, 2007) and may therefore be suitable as a therapy for this population.

Its use to initiate changes in pain and mood is supported by two theories: the Gate Control Theory of Pain (Melzack and Wall, 1965) and the Broaden-and-Build theory (Fredrickson, 2004). The former suggests that a spinal gating mechanism within the dorsal horn, activated by cognitive and emotional processes, can modulate pain perception. A distraction, if sufficiently strong, can limit the cognitive resources available for pain perception. The latter suggests that positive emotions, as well as being a sign of optimal function, can also produce optimal function over the long term. This notion suggests that positive emotions can 'undo' the after-effects of negative emotions and can lead to 'improved psychological and physical wellbeing over time' (Fredrickson, 2004, p.1367). Both theories recognise the important role that emotions play in the relief of pain, depression and anxiety. The former recommends that an emotional component to a distraction results in more successful pain relief; the latter recommends that positive emotions be cultivated for improved psychological and physiological wellbeing. As one of 'the most powerful triggers of emotions' (Rickard, 2004), music may be regarded as a catalyst for benefiting these three conditions.

### ***The effective use of music***

The heterogeneity of studies in this field includes wide variations in methodology, particularly in relation to the delivery and selection of the music. The latter is of particular importance if music is to have effective therapeutic benefits (MacDonald et al. 2003).

However, as yet, there is no common agreement as to the criteria for the selection of particular genres or pieces (??). These may be researcher-selected, participant-selected or a combination of the two. If the former, structural components of the music may be one of the criteria for the selection. Such as? However, if the music is disliked, it may draw a negative response from participants: 'the "wrong" music can be boring or irritating' (Burack et al. 2003, p.73) and may even intensify depressive syndromes, aggressiveness and anxiety (Trappe, 2012).

Participant-selected music is not always clearly defined or understood. Some studies have allowed participants a choice of musical genre; this may be described as 'preferred' music. However, there is no assurance that an individual will enjoy all the music within that genre; the choice is limited and the music may be unknown or even disliked. This is not the same as music chosen by the participant for the degree of preference felt, its familiarity and associated memories. It is suggested that these are the criteria essential to music's beneficial effect (Janelli et al. 2004); the emotions aroused are more intense (Liljeström et al. 2013; Salimpoor et al. 2009) and can facilitate the desired psychological and physiological changes (Sequiera et al. 2009).

The 'Doses' Episodes? Excerpts? of music used in different studies have varied in number, frequency and duration. The total number of sessions has ranged from one to 48; the frequency of weekly sessions has ranged from one to six, and their durations have ranged from 20 to 90 minutes; there has been no agreed optimal timeframe. However, a three week period has been recommended as sufficient for significant differences to be observed (Maratos et al. 2008) and Nilsson (2008) recommends a minimum of a 30-minute session.

The delivery of recorded music can be achieved in various ways: via music players, music pillows or through direct streaming into a room. Each has its advantages. For this population, cost and ease of operation are important considerations.

## **Method**

Research amongst the care home population presents 'significant and unprecedented methodological problems' (Suzman et al. 1995, p.4). Physiological and psychological frailty demands assessment measures that are relevant and not over-burdensome, and an intervention that enables proper adherence. Furthermore, criticisms of methodological failings of previous studies, as detailed in Cochrane reviews and meta-analyses, need to be considered (Cepeda et al. 2006; Maratos et al. 2009; Nilsson, 2008); Petrovsky et al. 2015). Principal amongst these is the need for randomised control trials and larger sample sizes.

### ***Design***

A randomised control trial with a cross-over design was used for this study. The independent variable was an individual 30-minute daily listening programme of preferred music over a three-week period. The three dependent variables were pain, depression and anxiety which were assessed using validated assessment measures with some adaptation via once-weekly semi-structured interviews. Objective data were obtained from care staff questionnaires.

### ***Participants***

One hundred and seventeen participants were recruited from nine different care homes, all but one situated in Greater London. Sufficient cognitive and hearing acuity was required in order to provide informed consent, to take part in interviews and to adhere to the

requirements of the music intervention. Information was given regarding anonymity, confidentiality and the right to withdraw; each signed a consent form.

The variables of age and gender were representative of other UK care home populations (Lievesley et al. 2011): a majority were female (72.6%); the mean age was 87 (SD = 7.1) and 69% were widows. The ethnic profile was 77.9% white British, 15% other white, 4% Asian British, 2% Caribbean and 1% Middle Eastern. The sample was divided evenly between those who left school at 16, at 18 and those who went on to higher education.

Randomisation was achieved by writing participants' name on pieces of paper. Is there a more technical term for this method of selection? These were placed into a hat, thoroughly mixed and then drawn out one by one and placed alternately into two piles, each representing one of two groups: an experimental group (Group 1) and a control group (Group 2).

Prior to the start of the intervention, four participants withdrew. Three experienced sudden declines in health and one died.

## ***Materials***

***Questionnaires.*** Three questionnaires were used.

- i) Demographic information and music preference questionnaire. The Assessment of Personal Music Preference (Gerdner, 2007) was adapted for this population. Questions related to past music experience, music's importance, current listening habits, preferred and non-preferred genres, composers, instruments and performers.



- ii) Assessment of pain, depression and anxiety. Pain was assessed using the Iowa pain thermometer (IPT) and the Verbal Descriptor Scale (VDS). The IPT has been judged the best measure of present pain intensity for use with older cohorts (Herr et al. 2007). The VDS is from the short form of the McGill Pain Questionnaire (MPQ); it uses words and phrases to describe present pain intensity. Anxiety was assessed using the STAI-Y anxiety measure. It is widely used both in research and clinical settings. Depression was assessed using the PHQ-9 depression measure. It is validated for use with older adults and is recommended for routine application (Espinoza and Kaufmann, 2014). Items from the STAI-Y and PHQ-9 are responded to with a four-point Likert scale. Peat et al. (2002) recommended that unnecessary, ambiguous or unsuitable items be identified and discarded. Some adaptations were therefore made to improve their relevance and suitability for older people.
- iii) Care staff questionnaire. Objective measurements of participants' health were obtained from care staff. They answered five simple questions regarding the participants' physical health, general mood and levels of pain, anxiety and depression.

Interviews were recorded using the 'Quick Voice' app on an iPhone and then downloaded to a computer.

### ***Music delivery.***

All participants provided sufficient data for the compilation of suitable listening programmes. Each was approximately 90 minutes in length, thus allowing for some variety

in their daily listening schedule. Music was downloaded from iTunes. Those without music players ( $n = 98$ ) were provided with a simple USB memory stick music player produced by the RNIB.<sup>3</sup> For the remainder ( $n = 19$ ) who had access to CD players, the music was downloaded to CDs. Music players were placed within easy reach of participants and clear instructions provided. Participants listened to the music in their own rooms at a time of their choosing. Care staff were asked to provide assistance as necessary.

Despite the common view that those of a higher educational status have a greater tendency to enjoy classical music (Baldwin and Wild, 2004), this was not reflected in the sample. Educational status was equally divided between those who left school at 16, at 18 and those who went on to higher education. However, choice of musical genre was divided as follows: 81% classical, 2% jazz, 3% big band, 4% pop, 6% country and western and 4% folk.

### ***Procedure***

The identical procedure was carried out in each care home. Following randomisation, baseline assessments were made of the pain, depression and anxiety levels of all participants. No statistically significant differences in demographic variables such as age and gender were found between the two groups; nor were there any between the nine care homes.

A comparison of the two groups showing demographic variables and baseline levels of the three dependent variables are set out in Table 1.

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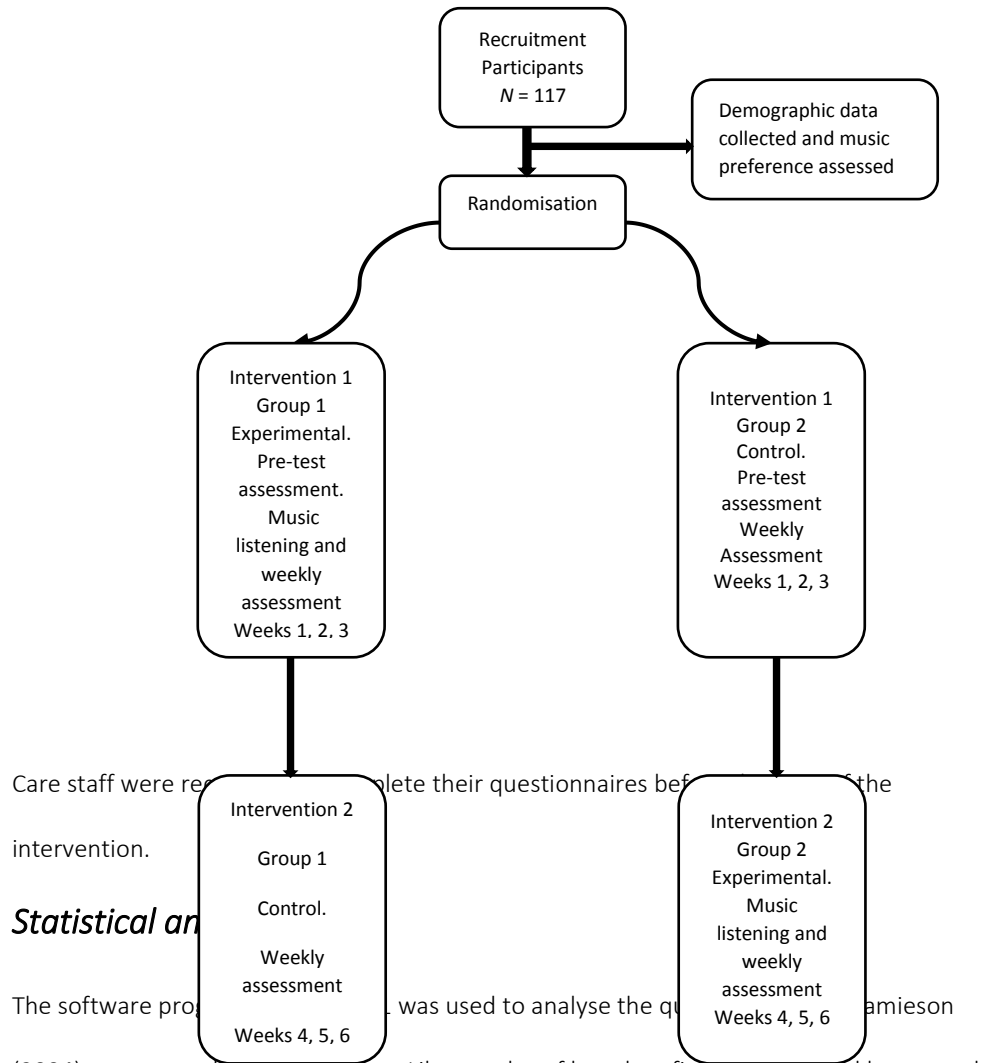
<sup>3</sup> Royal National Institute of Blind People

Variable	Group 1	Group 2
	<i>n</i> = 55	<i>n</i> = 58
Median age	88 (SD = 7.16)	87 (SD = 6.95)
Male	17	14
Female	38	44
Widowed	35	43
Single	11	14
Married	4	0
Divorced	2	4
White British	42	46
Other ethnic background	13	12
Left school at 16	14	24

Left school at 18	21	17
Higher education	19	17
Baseline pain measure	3.76 (SD = 2.37)	3.07 (SD = 2.18)
Baseline anxiety measure	21.23 (SD = 5.97)	21.45 (SD = 5.18)
Baseline depression measure	13.04 (SD = 4.11)	14.05 (SD = 3.74)

**TABLE 1:** Demographic Data of Groups 1 and 2

Those in Group 1 listened to their music programmes for a minimum of 30 minutes each day. In order to avoid confusion or anxiety in the participants, no further instructions, such as the time of day for listening, were given. Those in Group 2 maintained their usual routine. At the end of each week, the same assessments were made for all participants. After three weeks, the two groups switched over: Group 1 became the control group, Group 2 became the experimental group. This allowed all participants to receive the potential benefits of the intervention and also gave some indication as to any residual effects of the intervention. The first three-week period is called intervention 1, the second, intervention 2. A flow chart of the procedure is shown below in Figure 1.



Care staff were requested to complete their questionnaires before the start of the intervention.

**Statistical analysis**

The software program SPSS was used to analyse the questionnaire data. Jamieson (2004) recommend that scores from Likert scales of less than five points should be treated as being on ordinal rather than interval scales. The non-parametric Wilcoxon test was therefore used for the pre and post-test analysis.

## Results

**Pain.** Intervention One: the analysis of pre- and post-test scores for both pain assessment measures (VDS and IPT) for Group 1 (experimental) showed a statistically significant *decrease* in pain with effect sizes of  $d = 0.33$  and  $d = 0.31$  respectively. The control group showed no change in VDS scores and a very small non-significant *decrease* in IPT scores. Intervention Two: the same analysis for Group Two (experimental) showed non-significant *decreases* for both pain measures. The decrease in pain was greater in the experimental group than that shown in the control group, but the smaller effect size ( $r = 0.13$ ) demonstrates that the second period of intervention was less effective than the first in reducing pain levels. The control group, for the same period, showed a very small non-significant *decrease* as measured by VDS, and a small non-significant *increase* as measured by IPT. The results are shown in Table 2 below.

	IPT score	VDS score
Group 1 (Intervention 1) experimental	( $Z = 2.43$ , $N$ -Ties = 29, $P = 0.015$ )	( $Z = 2.95$ , $N$ -Ties = 29, $P = 0.003$ )
Group 2 (Intervention 1) control	( $Z = 0.22$ , $N$ -Ties = 29, $P = 0.828$ )	( $Z = 0.19$ , $N$ -Ties = 7, $P = 0.848$ )
Group 1 (Intervention 2) control	( $Z = .36$ , $N$ -Ties = 17, $P = 0.721$ ) (small increase)	( $Z = .84$ , $N$ -Ties = 17, $P = 0.403$ )
Group 2 (Intervention 2) experimental	( $Z = .80$ , $N$ -Ties = 15, $P = 0.422$ )	( $Z = 1.50$ , $N$ -Ties = 12, $P = 0.133$ )

**TABLE 2:** Results of pain: VDS and IPT measures

Weekly scores for experimental Group 1 (Intervention 1), shown in Figure 2, illustrate the week-on-week decreases in pain. Those for the experimental Group 2 (Intervention 2) in Figure 3 show a small increase between weeks five and six, resulting in a reduced overall effect. As the data were collected from the various care homes at different time periods, there was no identifiable event or situation to account for this.

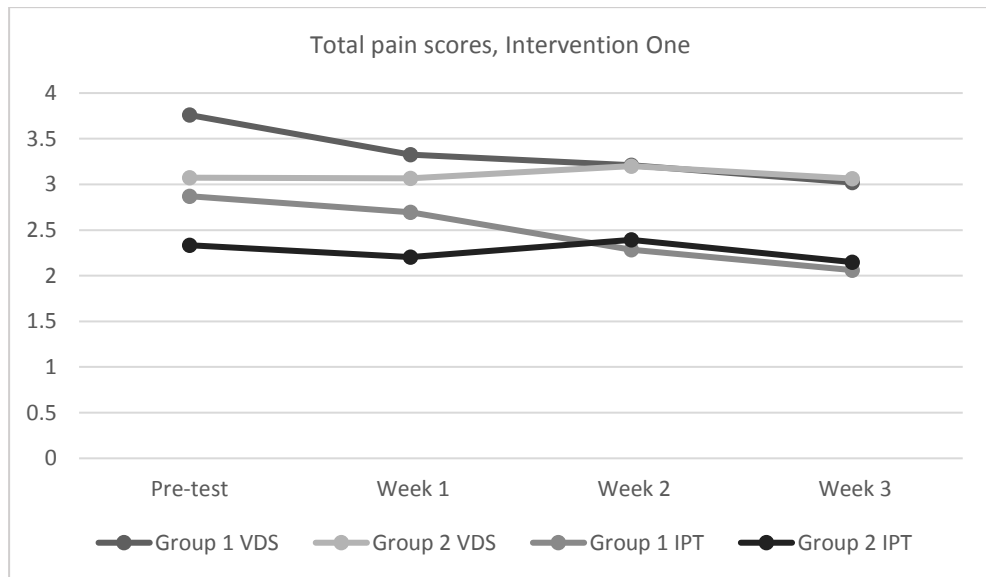


FIGURE 2: Total pain scores, Intervention One

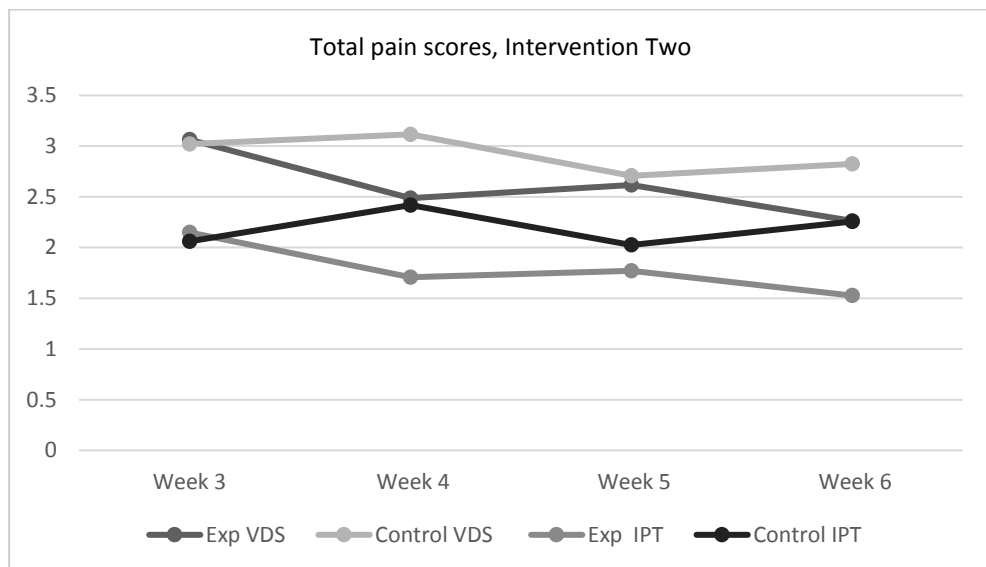


FIGURE 3: Total pain scores, Intervention Two



Further analysis showed that statistically significant decreases were found only for those who reported their pain as being between mild and strong:

Group 1, Intervention 1: ( $Z = 2.74$ ,  $N\text{-Ties} = 9$ ,  $P = 0.006$ )

Group 2, Intervention 2: ( $Z = 2.24$ ,  $N\text{-Ties} = 4$ ,  $P = 0.025$ ).

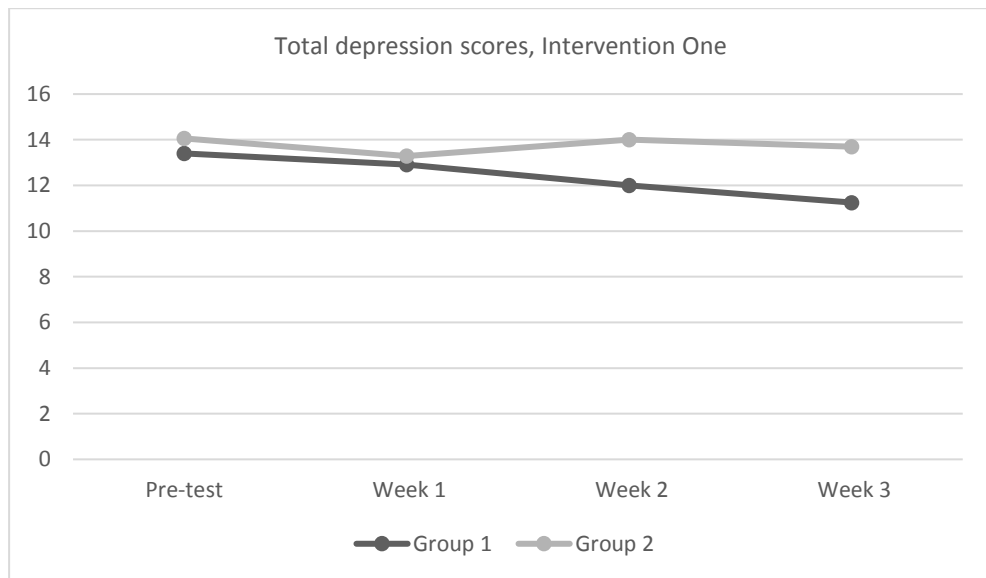
Results for those with hardly noticeable, weak, severe and excruciating pain were non-significant. Decreases in anxiety and depression for those with severe or excruciating pain were non-significant.

**Depression.** The analysis of pre and post-test scores showed a statistically significant *decrease* for both the first and second experimental groups with effect sizes of 0.62 and 0.74 respectively; there were no significant changes in the control groups: in the first a small *decrease* and in the second, a small *increase*. Results are shown in Table 3 below:

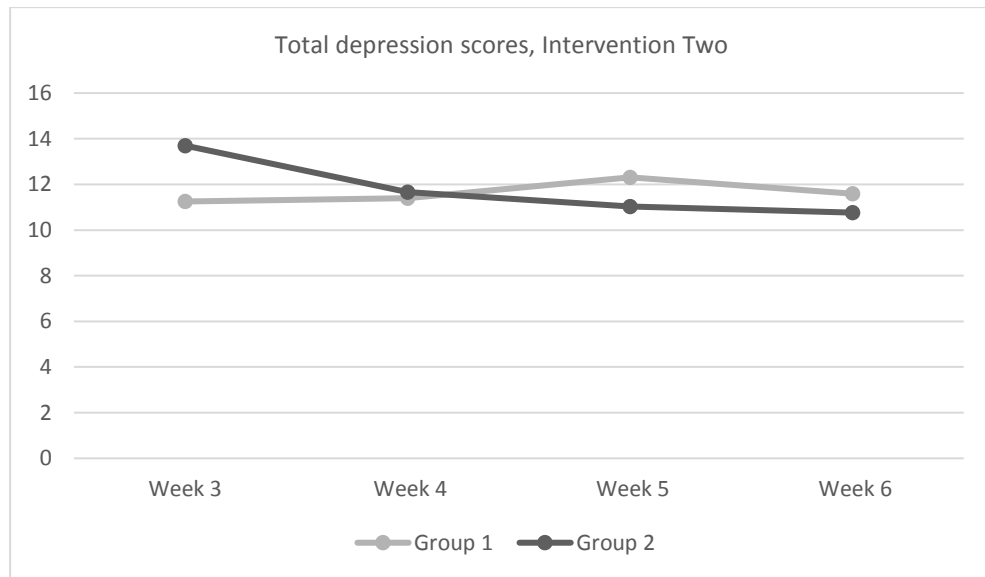
	PHQ-9 scale
Group 1 (Intervention 1) experimental	( $Z = 3.48$ , $N\text{-Ties} = 38$ , $P = 0.000$ )
Group 2 (Intervention 1) control	( $Z = .15$ , $N\text{-Ties} = 29$ , $P = 0.879$ )
Group 1 (Intervention 2) control	$Z = 1.36$ , $N\text{-Ties} = 26$ , $P = 0.176$ ) (increase)
Group 2 (Intervention 2) experimental	( $Z = 3.92$ , $N\text{-Ties} = 32$ , $P = 0.000$ )

**TABLE 3:** Results for depression scores

These findings indicate that both groups benefited equally with similar levels of significance and effect sizes. Figures 4 and 5 show the incremental weekly *decrease* that occurred during both interventions.



**FIGURE 4:** Total depression scores, Intervention One.



**FIGURE 5:** Total depression scores, Intervention Two.

Analysis of individual items of the assessment scale showed that some were more responsive to the music than others. Results of the first intervention showed significant benefits on three of the eight items: participants were less bothered by little things, less tired and had better concentration. They also had fewer depressive feelings (this finding was close to reaching significance with a  $P$  value of 0.058). Results of the second intervention showed that participants slept better, were more cheerful and less tired. All remaining items showed non-significant decreases.

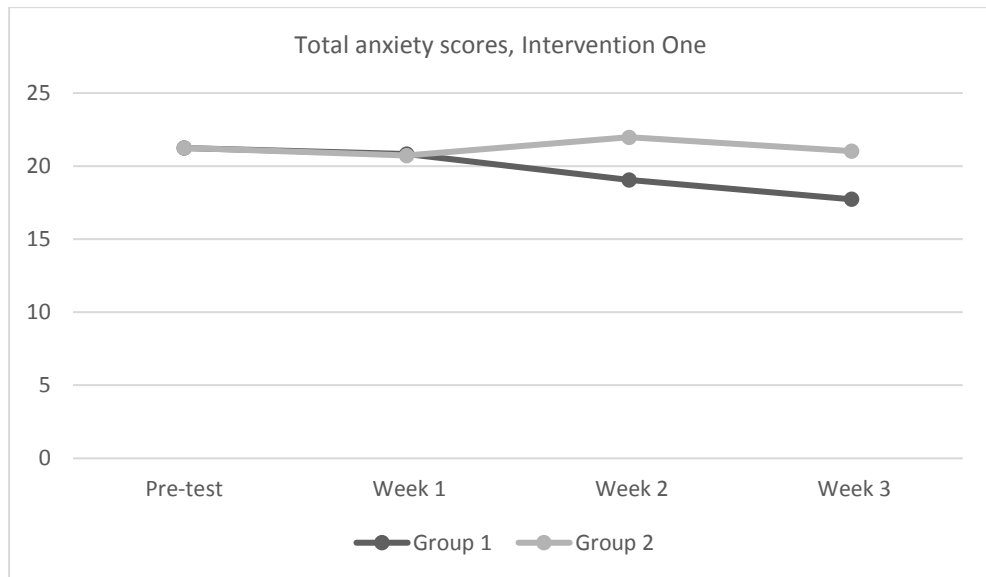
**Anxiety.** Analysis of pre and post-test scores showed statistically significant *decreases* for both the first and second experimental groups, with effect sizes of 0.67 and 0.65 respectively; there was no significant change shown for the control group in the first

intervention and a statistically significant *increase* in the second. Results are shown in the table below:

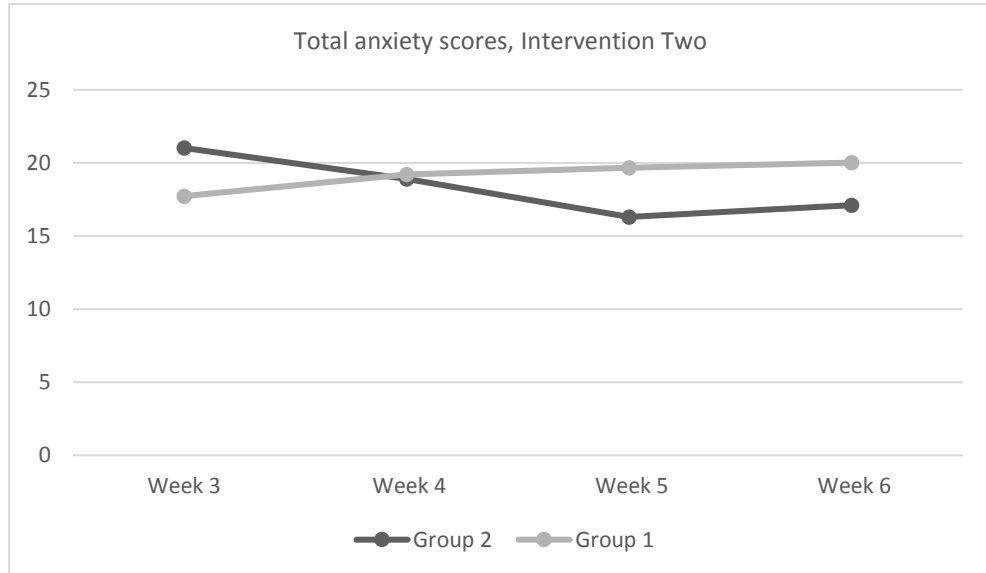
	STAI-Y
Group 1 (Intervention 1) experimental	( $Z = 4.45, N\text{-Ties} = 42, P = 0.000$ )
Group 2 (Intervention 1) control	( $Z = 2.91, N\text{-Ties} = 36, P = 0.771$ )
Group 1 (Intervention 2) control	( $Z = 2.56, N\text{-Ties} = 36, P = 0.01$ ). (increase)
Group 2 (Intervention 2) experimental	( $Z = 3.72, N\text{-Ties} = 32, P = 0.000$ )

**TABLE 4:** Results for anxiety

These findings indicate that both groups benefited equally with similar levels of significance and effect size. Figures 6 and 7 show the weekly changes that occurred during both interventions.



**FIGURE 6:** Total anxiety scores, Intervention One



**FIGURE 7:** Total depression scores, Intervention Two

Despite the small increase in anxiety during the last week of the second intervention the overall *decrease* was statistically significant. Again, it is not possible to discern the cause of this due to the disparate timings of the data collection.

Analysis of individual items of the assessment scale showed that some were more responsive to the music than others. Participants in both interventions were more relaxed and satisfied with life, as well as less irritable and worried. There were no corresponding improvements in either of the control groups.

***Care home questionnaire.*** Data provided by care home staff served as a comparison with participants' self-report scores. There were no statistically significant differences between the two data sets, which suggests that participants' scores were valid. However, care staff only provided data for 57% of the sample.

### ***Additional findings***

The switching over of the two groups provided an opportunity to assess any residual effects of the intervention in Group 1, following the music intervention. The decreases in pain, depression and anxiety did not continue; except for a very small decrease in VDS scores, there was an increase:

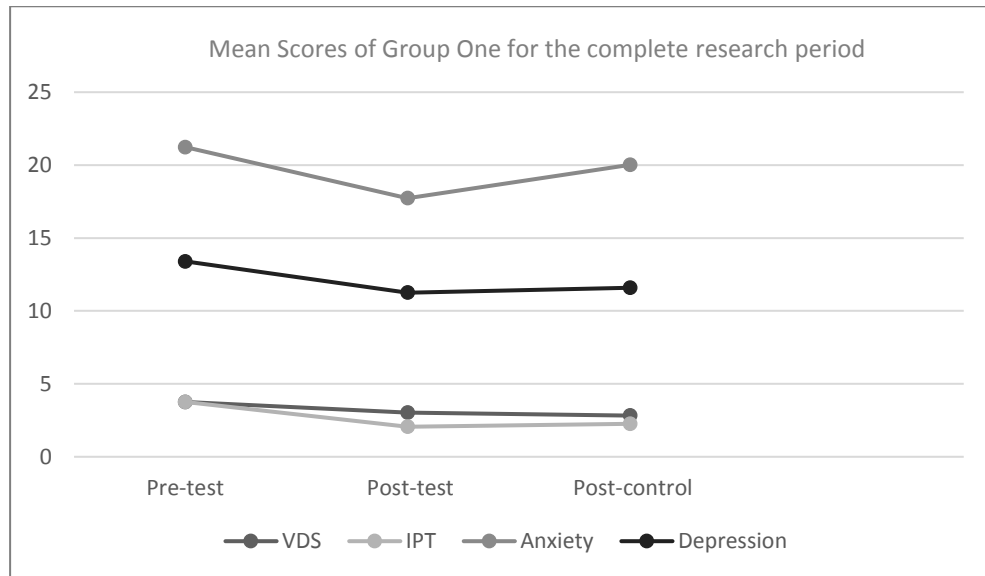
A non-significant *increase* in depression: ( $Z = 1.36$ ,  $N$ -Ties = 26,  $P = .176$ )

A non-significant *increase* in pain (IPT): ( $Z = .36$ ,  $N$ -Ties = 17,  $P = .721$ )

A non-significant *decrease* in pain (VDS): ( $Z = .84$ ,  $N$ -Ties = 17,  $P = .403$ )

A statistically significant *increase* in anxiety: ( $Z = 2.56$ ,  $N$ -Ties = 36,  $P = .010$ )

The results are shown in Figure 8 below.



**Figure 8:** Scores for Group One, weeks 1-6

As part of the assessment of music preference, participants were asked to rate their perception of music's importance. Answers were coded on a four-point Likert scale ('very important', 'important', 'quite important', 'not important'). Statistically significant decreases in pain, anxiety and depression were more frequent in those for whom music was very important than for those in the other categories. There were no significant improvements for those who considered music unimportant. However, the numbers in this category were very small ( $n = 9$ ).

Participants also rated the frequency of their music listening: 'occasionally', 'most days' and 'every day'.

Statistically significant decreases were found for all dependent variables in everyday listeners. There were some positive outcomes for less frequent listeners but none were found for improvements in pain.

In order to evaluate any difference in result between those who were specific as to their music preferences and those who were not, participants were divided into two categories: specific ( $n = 38$ ) and less specific ( $n = 75$ ). The allocation to each group was inevitably arbitrary. Statistically significant decreases were found for depression and anxiety for both categories; decreases in pain were only found for those who were more specific.

## Discussion

These results offer evidence to support the use of a music listening programme for the relief of pain, depression and anxiety. However, the hypothesis that each dependent variable would show benefits equally was not supported.

Levels of significance and effect size were similar for depression and anxiety; the decreases were accumulative and both groups received equal benefits. Results for pain levels were statistically significant in the first intervention; the effect size was smaller, however, and although there was a decrease in the second intervention this did not reach statistical significance.

There are two possible explanations for this. Firstly, further analysis of the results showed that those who reported 'just noticeable', 'weak' pain, 'severe' or 'excruciating' pain received no measurable benefit. For those with weak pain, any benefit would have been small, perhaps too small to detect a measurable effect. For those with severe pain, it is suggested that the musical distractor was insufficient for 'attentional engagement' when



placed in opposition to pain signals. This corroborates the findings of MacDonald et al. (2003) and Finlay (2014).

Secondly, participants were selected not on the basis of their experience of pain, but on the basis of their need for assistance as supplied in a care home. Pain was not universally experienced. As a result, the number of participants in whom there could be a discernible result was smaller than was the case for depression and anxiety. All participants reported some symptoms of depression and anxiety, thereby ensuring a greater number of those in whom there might be a discernible effect.

The findings also showed that the psychological variables were more sensitive to the intervention. Statistically significant decreases in depression and anxiety were achieved after two weeks of the intervention; significant decreases for pain were achieved after three weeks. Since the effect size was smaller for pain, this suggests that anxiety and depression responded to the music intervention both more quickly and to a greater degree than pain.

Nonetheless, for those with mild to strong pain, the effects were significant. An important contributory factor was the use of preferred music. Those able to give clear indicators of their preferred music showed significant decreases in pain levels; furthermore, the decrease continued following the intervention. For those who were less clear, the decrease was not significant. It is suggested that the greater involvement in the selection of music led to greater interest and enjoyment and therefore greater emotional arousal, essential for the relief of pain.

The hypothesis that those for whom music was important would benefit to a greater degree was supported by the findings. The greater the interest and the more frequent the

listening, the greater the benefits received. The converse was also true: those who expressed little interest received little benefit.

The week-on-week decreases in depression in both interventions, and in anxiety and pain in Intervention one, suggest that there may have been an accumulative effect. This gives support to Fredrickson's (2004) theory that the effect of positive emotions is cumulative, leading to an 'undoing' of negative emotions. If continued for a longer period of time, further benefits may accrue.

### *Limitations*

Bias is impossible to avoid completely (Maratos et al. 2008) and is a particular challenge within this population. Selection and performance bias were avoided by successful randomisation and by applying the same treatment protocol to participants in both conditions. However, detection bias was hard to avoid. Cochrane reviewers Cepeda et al. (2006) recognise that the blinding of participants to group allocations is rarely possible in music interventions. For a sole researcher, it was impossible. A number of strategies were implemented to reduce unintended influence. Each interview was conducted in the same way, using pre-coded assessments, consistent language, and the avoidance of leading questions or reacting with surprise or disapproval. Every effort was made to be rigorous and accurate in the reporting of scores.

The two strongest predictors of attrition are living in an institution and cognitive impairment (Beekman et al. 2002), both characteristics of this population. There were 26 withdrawals (23%): nine from Group One, 17 from Group Two. At the end of the study,

Group One had 46 participants, Group Two had 41. The reasons for withdrawal were more wide-ranging than anticipated: illness, hospital admittance, relocation, insufficient hearing or cognition, complaints from neighbours, fear of music players or inability to use them and an unwillingness to answer the questions. However, other studies have reported attrition rates of up to 45% (Bowsher et al. 1993). This suggests that levels of attrition were a reflection of the reality of research amongst this cohort.

'Fear' of the music players resulted in five withdrawals. Difficulties with their operation resulted in four withdrawals. The notion that some would find it an object of fear and anxiety was unexpected.

***Further research.*** There are three issues arising from this study that suggest areas for future research. Firstly, the recruitment of a sample with a higher incidence of pain would increase the probability of significant findings and would enable a better comparison of the relative benefits of music to pain and mood. Secondly, the incremental effect shown in the results would benefit further investigation. A longer intervention period would provide an opportunity to assess whether the improvements continued. Thirdly, the development of a low-cost music player, suitable for the demands of this population, would reduce attrition rates and enhance the experience for all participants.

## ***Conclusion***

These findings provide further evidence of the effectiveness of listening to preferred music. Although not everyone will benefit to the same degree, extreme old age is no barrier to receiving some alleviation from pain, depression and anxiety. It is hoped that if music were

listened to regularly over a longer time span, the benefits would continue, leading to greater wellbeing in this frail and vulnerable population.

## Ethical approval

The research for this project was submitted for ethics consideration and approved under the reference EDU 12/030 and approved under the procedures of the University of Roehampton's Ethics Committee on 28.05.2012.

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