Listen to the Music: Music and mindfulness in the workplace

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Thesis Portfolio Abstract

Background: The prevalence of work-related stress is increasing. Interventions, aiming to reduce work-related stress and improve wellbeing, are being explored.

Objective: This thesis portfolio explored the use of music interventions in the workplace and the effect of mindful music listening on stress, wellbeing, cognitive performance, and compassionate leadership.

Methods: A systematic review and meta-analysis of the literature was conducted to explore the effect of workplace music interventions on stress and wellbeing. The review synthesised how music interventions were delivered, by whom, and how stress and wellbeing were measured. Following this, a feasibility and acceptability study was undertaken to investigate the potential for a randomised control trial to explore a mindful music listening intervention on stress, wellbeing, cognitive performance, and compassionate leadership in university staff. Standardised measures of mood, stress, wellbeing, cognitive performance, and compassionate leadership were assessed remotely, pre- and post-intervention for 41 volunteers.

Results: A meta-analysis of four studies found no significant effect of music interventions on wellbeing. However, a narrative synthesis of all 16 studies suggested some evidence of effect of music listening on stress and wellbeing. The strongest evidence of effect was music listening on stress. The feasibility and acceptability data from the empirical study showed participants found the intervention enjoyable and beneficial. However, they struggled to engage with the intervention, regularly in the working day. Estimated effect sizes suggest medium effects for mood, compassionate leadership and cognitive performance and large effects for wellbeing.

Conclusions: Overall, these papers suggest that music interventions, including mindful music listening, may have positive effects on stress, mood, cognitive performance, and wellbeing. However, the evidence is heterogenous and drawn from small samples. More good quality research is needed to truly understand the efficacy of workplace music interventions. Further understanding of the elements which lead to effectiveness and engagement with employers would be imperative.

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Chapter One

Introduction to the thesis portfolio

Introduction to the thesis portfolio

Understanding and improving employee health and wellbeing has been a focus of the National Health Service (NHS) for a number of years. The NHS employs 1.5 million people, the largest employer in the United Kingdom (UK; Nuffield Trust, 2020) and surveys staff satisfaction yearly. With an increasing population and longer life expectancy the demand on the NHS is increasing, as is the challenge to support employees to maintain optimum physical and mental health. A review of the 2015 staff survey indicated 59% of staff reported they did not feel valued and a call for a national lead for NHS staff health and wellbeing was made (Wilkinson, 2015). Further evidence of mental health difficulties in the workforce was outlined by the NHS Staff and Learners' Mental Wellbeing Commision (Health Education England, 2019). They found high levels of workplace stress, vicarious trauma, poor mental health, and suicide in the NHS workforce; 24% higher than national average in female healthcare workers. The NHS Long-Term Plan (Alderwick & Dixon, 2019) and Interim People Plan (NHS England, 2019) outlined plans to improve staff retention, focus on staff physical and mental health and review working environments and work-life balance.

Mental health is an important part of employee health, job satisfaction and productivity. Poor workplace mental health has been found to cost employers between £33 and £42 billion (Stevenson & Farmer, 2017) and significant correlations have been found between poor staff wellbeing and worse patient safety, for example, medical errors (Hall et al., 2016). Work-related stress is a problem for NHS employees, at all levels; systemic pressures increase levels of stress, preventing psychological, emotional and physical engagement with patients, families and colleagues (The Point of Care Foundation, 2017).

The health and wellbeing of 'frontline workers' has come to the fore in the past twelve months, following the COVID-19 pandemic, with many employers having to balance employee health with managing the health crisis. Working in the NHS places demands on employees' cognitive and interpersonal skills and 40.3 % of staff reported feeling unwell as a result of work-related stress and the rate of presenteeism, going to work even when not feeling well enough to perform typical duties, was 56.6% (NHS England, 2020). These demands have increased throughout the pandemic, with many employees changing working environments, putting themselves at risk of infection or adapting to working remotely.

Research has shown levels of stress and mental health difficulties are likely to increase in this population following the onset of the pandemic (Allan et al., 2020; De Kock et al., 2021; Ricci-Cabello et al., 2020) and many guidelines seeking to address healthcare workers' mental health have not always aligned with the needs expressed by those working on the frontline (Vera San Juan et al., 2020). The prevalence has been further understood through staff surveys. The Royal College of Nursing (2020) conducted a survey between May and June 2020 and found 76% of respondents reported increases in their stress levels. In contrast to the difficulties posed by the pandemic the report found 74% of respondents felt more valued by the public and 54% more valued by patients (Borneo et al., 2020). Therefore, this issue is pertinent and important to clinical psychology practice as it may lead to an increase in the numbers of individuals seeking support, particularly from the NHS workforce and wider health and social care colleagues working on the frontline of the pandemic.

The need for flexible, tailored, evidence-based mental health and wellbeing support has been expressed by staff (Siddiqui et al., 2021) and recognised by the UK

Government and NHS. In October 2020 NHS England announced £15 million directly for mental health support for staff (NHS England and NHS Improvement, 2020) to be spent on expanding existing staff mental health services, online resources and ensuring rapid access. This need is also being met by third sector charities, for example, frontline19.com, giveusashout.org and mentalhealthnetwork.org. Many of these services are supported by volunteers, mostly psychologists or therapists, some also working in the NHS. NHS trusts are also beginning to set up their own staff support services (Cole et al., 2020).

Clinical psychologists are well placed to provide psychoeducation and support to staff, disseminate guidance, review, and conduct research into the effects of the pandemic on the mental health of the workforce and inform policy and service development. The application of psychological theory and evidence-based practice and the role clinical psychologists have within teams, their workplace and the wider system has been outlined by the British Psychological Society (BPS; Onyett, 2007; BPS, 2017). The importance of clinical psychologists' roles within teams has been further highlighted by the increase in guidance from the BPS and research since the onset of the pandemic. The BPS produced a number of guidance documents outlining the role clinical psychologists play in supporting staff health and wellbeing, particularly during the pandemic. The guidance encouraged managers to utilise the expertise of psychologists and mental health practitioners within their teams to support the wider NHS staff (British Psychological Society Covid19 Staff Wellbeing Group, 2020). This is further supported by Greenberg et al. (2020) who stated staff should be actively monitored and provided with evidence based treatments, highlighting the role of clinical psychologists.

This portfolio focuses on work-related stress, defined as a harmful reaction people have to undue pressures and demand at work (Health & Safety Executive, 2018) with a reported prevalence rate of 2,440 per 100,000 (Health & Safety Executive, 2020). If prolonged, this can develop into burnout; exhaustion, cynicism and professional inefficacy (Maslach & Leiter, 2016). The main causes of work-related stress are workload, tight deadlines, pressure, responsibility, lack of managerial support, organisation changes, violence, and role uncertainty (Health & Safety Executive, 2018). Work-related stress has a negative impact on cognitive performance, particularly executive functions, attention and memory (Deligkaris et al., 2014). The next section will seek to understand the stress response and consider what is known about interventions to support stress reduction.

Stress is a natural reaction and can be triggered by both positive and negative stimuli. Stress can trigger the evolutionary 'fight-flight' response (Henry, 1993). The response is almost instantaneous via the hypothalamic-pituitary-adrenal (HPA) axis; the amygdala interprets sounds and images, which if perceived as dangerous sends a signal to the hypothalamus. The hypothalamus communicates to the rest of the body via the autonomic nervous system, specifically the sympathetic branch. The adrenal glands release adrenaline and prepares the body and mind for action when a potential threat is perceived. Internal organs function more efficiently; blood pumps to muscles, increased breathing supports oxygenation, eyes widen for maximum vision. If a threat continues to be perceived the pituitary gland releases the adrenocorticotropic hormone and prompts the release of cortisol which sustains the 'high alert' level until a threat is no longer perceived (Guilliams & Edwards, 2010). Prolonged triggering of this response, in the absence of threat, can lead to

physiological and psychological tension (National Institute for Health and Care Excellence [NICE], 2017).

Chronic levels of stress have been found to be a risk factor for the development of more severe and enduring mental health difficulties (Arango et al., 2018; Mukhara et al., 2018; Sheth et al., 2017) and decreased neurogenesis in the hippocampus or dementia (Lupien et al., 2018; Ouanes & Popp, 2019; Särkämö & Soto, 2012). When we do not feel threatened, the brainstem regulates vagal tone and communicates with higher level brain regions (Porges, 1995) promoting emotional regulation (Visted et al., 2017), social engagement (Geisler et al., 2013) and cognitive performance (Thayer et al., 2009). These abilities are weakened if the stress response is engaged chronically (Wingenfeld & Wolf, 2011). These positive processes: emotional regulation, social connection, and cognitive performance, aid an individual's life across multiple domains, including relationships, self-awareness, and work performance.

Psychological interventions, with a focus on wellbeing, have been developed for use in the workplace, based on more traditional models, for example cognitive behavioural therapy but also using third wave approaches such as mindfulness. Mindfulness has been found to support emotional, social and cognitive skills. Keng et al. (2011) found mindfulness interventions had a beneficial effect on emotional reactivity, behavioural regulation and wellbeing. Mindfulness meditation practices have been shown to improve selective and sustained attention, working memory and executive function (Chiesa et al., 2011). Mindfulness has been adapted and used in individual and group formats within the workplace. Brief versions of mindfulness-based stress reduction have been found to be effective for reducing psychological distress in working adults, including healthcare workers (Spinelli et al., 2019;

Virgili, 2015) and trait mindfulness is positively correlated with trait emotional intelligence (Miao et al., 2018). One potential mechanism through which mindfulness works to improve emotional, social and cognitive domains is the parasympathetic nervous system, measured by heart rate variability (HRV; Tung & Hsieh, 2019). Mindfulness has been shown to balance the autonomic system and reduce cortisol (Heckenberg et al., 2018). Individuals who are more mindful have a healthier HRV a measure of the autonomic nervous system. Higher HRV levels indicate the parasympathetic branch is engaged, increasing the ability to engage higher level brain regions, linking stress, emotional, social and cognitive abilities (Burg et al., 2012; Prazak et al., 2012). Mindfulness is a flexible practice which can be incorporated into many aspects of life, including in engaging with nature, creative arts, and music.

Music has been shown to have beneficial effects across social, emotional, and cognitive domains in clinical and non-clinical populations. Throughout the life course, music is used to soothe, make social connections, support the development of identity and links to memories. Music is a popular pastime with 48 million people listening to the radio in March 2020 (Radio Joint Audience Research, 2020) and 30 million attending music concerts and festivals in the UK in 2018 (Johnson, 2020). Research has shown listening to music activates multiple areas of the brain in the following sequential order: the auditory cortex initially analyses sounds; frontal regions process musical structure; the mesolimbic system, involved in arousal and pleasure, is activated and produces dopamine; dopamine activates the nucleus accumbens and the cerebellum, and the basal ganglia process rhythm and meter leading to movement (Menon & Levitin, 2005).

This neuropsychological understanding of how music is processed has led to research investigating its' effects on stress, mental health and cognition. A review of 400 studies found that music positively affects neurochemicals in the brain's reward, social, immune and stress systems (Chanda & Levitin, 2013). Beneficial effects have been found in reducing depressive symptoms in adults (Leubner & Hinterberger, 2017), reducing physiological and psychological stress-related outcomes (de Witte et al., 2020) and improving cognitive functioning in clinical and non-clinical populations (Chan et al., 1998; Rickard et al., 2005).

There is a small evidence base for the effects of music listening on stress and wellbeing in working adults, including healthcare workers (Beck et al., 2015; Brooks et al., 2010; Lai & Li, 2011; Phillips & Becker, 2019) but further research is required to understand how, and by who, music interventions are delivered in the workplace and what effect they have on employees.

The thesis portfolio is interested in how music and mindfulness can be used in the workplace to improve employee wellbeing and reduce stress. Evidence has outlined the potential for both to be used as workplace wellbeing interventions but combining them has not been investigated outside of clinical populations. The portfolio consists of two main papers: a systematic review and an empirical study. The systematic review investigated the effect of music interventions on stress and wellbeing in the workplace. The empirical study expanded on this and explored the feasibility of a mindful music-listening intervention on stress, wellbeing, cognitive performance, and compassionate leadership in the workplace. This portfolio also includes a bridging chapter, additional methods and results chapter and an overall discussion chapter, which synthesises the findings from both the systematic review and empirical study.

The systematic review was prepared for submission to the journal: *The Journal of Occupational and Organizational Psychology.* Guidelines for submitting to the journal can be found in Appendix A. The empirical paper was prepared for submission to the journal: *Psychology of Music.* Guidelines for submitting to the journal can be found in Appendix B.

Chapter Two

Systematic Review

Prepared for submission to *Journal of Occupational and Organizational Psychology*

Title: THE USE AND EFFECT OF MUSIC INTERVENTIONS ON STRESS AND WELLBEING IN THE WORKPLACE: A SYSTEMATIC REVIEW AND META-ANALYSIS.

Short title: *THE USE AND EFFECT OF MUSIC INTERVENTIONS ON STRESS AND WELLBEING IN THE WORKPLACE.*

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Abstract:

Work-related stress leads to lower productivity, mental health difficulties and economic losses. This review explored what music interventions are used in the workplace, assessed their effect on stress and wellbeing of adult workers and how stress and wellbeing are measured.

Searches were conducted on Academic Search Complete, AMED, CINAHL, Embase, Medline Complete, PsycInfo, Scopus and Web of Science from inception to

2020. All intervention designs, with a quantitative measure of stress and/or wellbeing were included.

Two review authors independently screened and assessed for risk of bias. Sixteen studies were identified, with a total of 870 participants. All 16 papers were included in the narrative synthesis, four of which were also included in the meta-analysis, using post-intervention means and standard deviations. The narrative synthesis indicated that music interventions may have a beneficial effect on stress. There was mixed evidence for the effect on wellbeing with the meta-analysis showing no significant effect, (k = 4. Standardised Mean Difference= -0.9779, se = 0.7079, p = 0.1671, 95% CI = -2.3653 – 0.4095).

The review suggested music interventions may be effective for reducing stress in the workplace. Most trials had concerns relating to risk of bias and were heterogenous in design and measures, therefore, the results should be interpreted with caution.

This review was registered on PROSPERO (ID; CRD42020183097).

Practitioner Points:

- Work-related stress is an increasing problem which can lead to more severe and enduring mental health difficulties.
- Preliminary evidence suggests music interventions may be effective in reducing stress and improving wellbeing in the workplace and consideration should be given to how they can be employed in the workplace.

Keywords: Stress, wellbeing, music, workplace.

Data availability statement:

The data that supports the findings of this study are available from the corresponding author upon reasonable request.

Word count: 7301

Introduction

In 2019, adults employed in full-time work spent an average of 37.2 hours working per week (Office for National Statistics, 2020), equating to 22% of time in the week. An individual's experience at work affects their wellbeing while they are in their work environment and has carry-over effects into their personal life. Therefore, it is important that employers and employees recognise the potential carry-over and consider their health and wellbeing in the workplace (Stevenson & Farmer, 2017; Public Health England, 2019).

Wellbeing is defined in several ways in the literature, often holistically and more than the absence of illness (Dodge et al., 2012; Seligman, 2011; Stewart-Brown, 2013). The World Health Organisation (WHO) define wellbeing under the umbrella of health, incorporating physical, mental, and social wellbeing and is larger than the absence of disease or ill-health (WHO, 2020). Wellbeing was placed on the agenda for workplaces in the Worker's Health: Global Plan of Action (WHO, 2007) which stated employers must place an emphasis on protecting and promoting health in the workplace.

Work-related stress

Work-related stress, anxiety or depression have been defined as harmful reactions people have to undue pressures and demand at work (Health & Safety Executive, 2018). The main causes of work-related stress are workload, tight deadlines, pressure, responsibility, lack of managerial support, organisation changes, violence, and role uncertainty (Health & Safety Executive, 2018). Workplace mental health difficulties have been found to cost employers between £33 and £42 billion (Stevenson and Farmer, 2017). The Health and Safety Executive (HSE) (2020) reported a prevalence rate of 2,440 per 100,000 workers for work-related stress,

anxiety, or depression, and noted an increasing trend over the past five years. Work-related stress, anxiety or depression resulted in 17.9 million working days being lost, accounting for 51% of all work-related ill health (HSE, 2020). Employees who experience work-related stress, anxiety or depression are more likely to struggle with managing their workloads. This perpetuates their levels of stress and mental health difficulties and leads to a reduction in productivity and can lead to their positions being reviewed (Harvey et al., 2017; Hassard et al., 2018), creating a vicious cycle, if not acknowledged and effectively managed. Further negative consequences of work-related stress are absenteeism, frequently being away from work without good reason, and presenteeism, staying at work longer than usual or working when you are ill. Both contribute to productivity and economic loss in the workplace (Brunner et al., 2019).

Interventions to prevent work-related stress

A Cochrane review of studies designed to prevent psychological stress in healthcare workers reviewed 58 studies and found there was low quality evidence for cognitive behavioural therapy (CBT) or mental and physical relaxation interventions in reducing stress (Ruotsalainen et al., 2015). Czabala & Charzyńska (2014) identified evidence-based programs used in workplaces to promote mental health. They found the main aims of interventions were to reduce stress and absenteeism, improve coping skills and mental health and were attained using skills training, improving working conditions and qualifications and physical and relaxation exercises.

Workplace interventions can fall into three categories: person- and organisation-directed or combined person- and organisation-directed. Person-directed interventions are interventions which individuals or groups engage in.

Organisation-directed interventions are changes in wider workplace procedures, for example, process restructuring, work performance appraisals and work shift readjustments. A review of burnout prevention interventions found that interventions which were person-directed (e.g., cognitive behavioural training, psycho-social skills training, laughter therapy, counselling) had a positive reduction on burnout for up to six months. A combination of person- and organisation-directed interventions led to longer positive effects, over 12 months (Awa, et al., 2010).

Music interventions in the workplace

Music has been shown to have a positive effect on mental health and cognitive abilities across age ranges and clinical presentations: music training for children has shown to improve cognitive abilities (Ho et al., 2017), reduce symptoms of mental health difficulties in pregnant and postpartum women (Hatters Friedman et al., 2010; Fancourt & Perkins, 2017), reduce depressive symptoms in adults (Aalbers et al., 2017; Leubner & Hinterberger, 2017), stress reduction (de Witte et al., 2020) and improve memory retrieval for individuals with dementia (Vanstone & Cuddy, 2010; Baird & Samson, 2009).

Music listening has been shown to induce changes in humans' underlying physiology; tingling sensation, the experience of chills, increased heart rate and reduced breathing rate (Salimpoor et al., 2009). A meta-analysis found music and music assisted relaxation significantly reduced stress induced arousal (Pelletier, 2004). Music has been shown to modulate the stress response, and mechanisms by which this is achieved have been investigated. A review of 400 studies found that music positively affects neurochemicals in the reward system, social system, immune system and stress system of the brain (Chanda & Levitin, 2013).

Music interventions have been shown to have significant small-medium effects on reducing physiological stress and significant medium effects on reducing psychological stress across a range of settings in adults (Pelletier, 2004; de Witte et al., 2020). This is further supported by physiologic evidence. A review of the literature found that listening to music has a positive impact on the biological marker of stress, cortisol, and on the biological stress pathway and suggest the mechanism may be through the autonomic nervous system (Finn & Fancourt, 2018).

The use of music listening interventions in the workplace has begun to be explored (Raglio et al., 2020) and pilot studies have suggested some economic benefits. Landay & Harms, (2018) reviewed the use of music in management and found task performance, social behaviours, and learning can improve following music interventions. The review suggested that music works through the mechanisms of mood and emotion and recommended future research investigate the specific effects of music on mood and emotion.

Research has shown that music has positive effects on cognitive performance (Ho et al., 2017), stress (Finn & Fancourt, 2018) and mental health difficulties (Aalbers et al., 2017; Leubner & Hinterberger, 2017), in clinical and non-clinical populations. Understanding how music and music interventions could be used and the effects in the workplace requires further exploration, specifically relating to affect.

Review aims

Given the increasing problem of work-related stress, need for intervention and growing indication for the potential for music listening interventions, a review of intervention studies is warranted. The current review question was, therefore, what effect do music interventions in the workplace have on stress and wellbeing in adult

workers? Secondary aims of the review were to establish what music interventions are used in the workplace, how are they delivered and how are stress and wellbeing measured?

Method

This review was registered on PROSPERO International prospective register of systematic reviews (ID; CRD42020183097).

Search Strategy

In November 2020, a systematic search for studies was conducted in the following databases: Academic Search Complete (1975-2020), Allied Health and Complementary Medicine Database (AMED; 1995-2020), Cumulative Index to Nursing and Allied Health Literature (CINAHL Complete; 1937-2020), EMBASE (1947-2020), MEDLINE Complete (1916-2020), PsycINFO (1967-2020), Web of Science (1945-2020) and Scopus (1960-2020). To identify any further studies the references of included studies were reviewed and forward and backward reference checking used to ensure all relevant literature was included. The following conference papers were also hand searched; Society of Education, Music and Psychology Research (SEMPRE), International Conference of Music Perception and Cognition (ICMPC), Brain, Cognition, Emotions and Music (BCEM) and International Conference of Music Therapy.

Searches were performed using the following search terms:

First concept: Title; music*

AND

Second concept: Abstract; stress* or distress or well* or quality of life or welfare or psychological* or psychosocial* or anxiety or burnout

AND

Third Concept: Abstract; employee or work* or staff or personnel or occupation.

Selection criteria

Studies were included if they met the following criteria:

- Adults aged 18- years or older who are working.
- The main focus of the study was the evaluation of a music intervention.
- All studies investigating the effect of interventions, not exclusive of design.
- The intervention primary outcome was stress or wellbeing and a quantitative measure of this outcome was used.

Studies were excluded if they met the following criteria:

- Research using interventions which were not music based or where music was not the main part of the intervention.
- Not peer reviewed.
- No full-text paper was available.
- Paper not available in English.
- If the paper was a systematic review or meta-analysis.

Data extraction and critical appraisal

Titles, abstracts and full texts were screened by two reviewers (SP and EH). Data were extracted by one reviewer (SP). Data extracted included author, year, country, study design, population, experimental intervention, control intervention, stress and wellbeing outcome measures, results and conclusions from the interventions. Post-intervention means and standard deviations were extracted on primary outcomes of stress or wellbeing. If data were not reported in the desired form authors were contacted, by email, asking for clarification.

Included studies were critically appraised for quality and risk of bias using the Cochrane Risk of Bias 2.0 (ROB 2.0; Sterne et al., 2019) and the Risk of Bias in

Non-Randomised Studies of Interventions (ROBINS-I; Sterne et al., 2016) by two reviewers (SP and EH). The ROB 2.0 tools for individually randomised parallel-group trials and cross-over trials assess five domains and judges them as low, some concerns and high risk of bias. The domains were bias: arising from the randomisation process, due to deviations from the intended intervention, due to missing outcome data, in measurement of the outcome and in selection of the reported result. The highest rating within a domain is taken forward as the overall rating of bias for example, if at least one domain is assessed as high risk or multiple domains as some concerns the study will be judged as high risk of bias.

The ROBINS-I tool assesses seven domains of bias: confounding, selection of participants, in classification of interventions, deviations from intended interventions, missing data, in measurement of outcomes and in selection of the reported result. The tool judges bias as low/moderate/serious/critical/ no information. Overall bias is judged based on the greater risk identified within a domain, for example, if at least one domain is judged as serious or critical the study will be assessed as serious or critical. Throughout the screening and assessment process any disagreements were reviewed and agreed consensually.

Analysis

A meta-analysis of the effect of music interventions on stress or wellbeing was planned if sufficient homogeneity of measures and methods was found across the studies to answer the review question; what effect do music interventions in the workplace have on stress and wellbeing in adult workers? The means and standard deviations for stress and wellbeing post-intervention for both intervention and control groups were extracted for the meta-analysis as this is the purest form of data. A random-effect-model was used as it is not possible to assume that the studies

within the meta-analysis draw from the same population. Heterogeneity across studies was assessed using I^2. Publication bias was assessed using funnel plots and Kendall's tau to test for asymmetry. Moderator analyses would be conducted if the data had sufficient potential moderators identified. If the studies were too heterogenous a narrative synthesis would be completed.

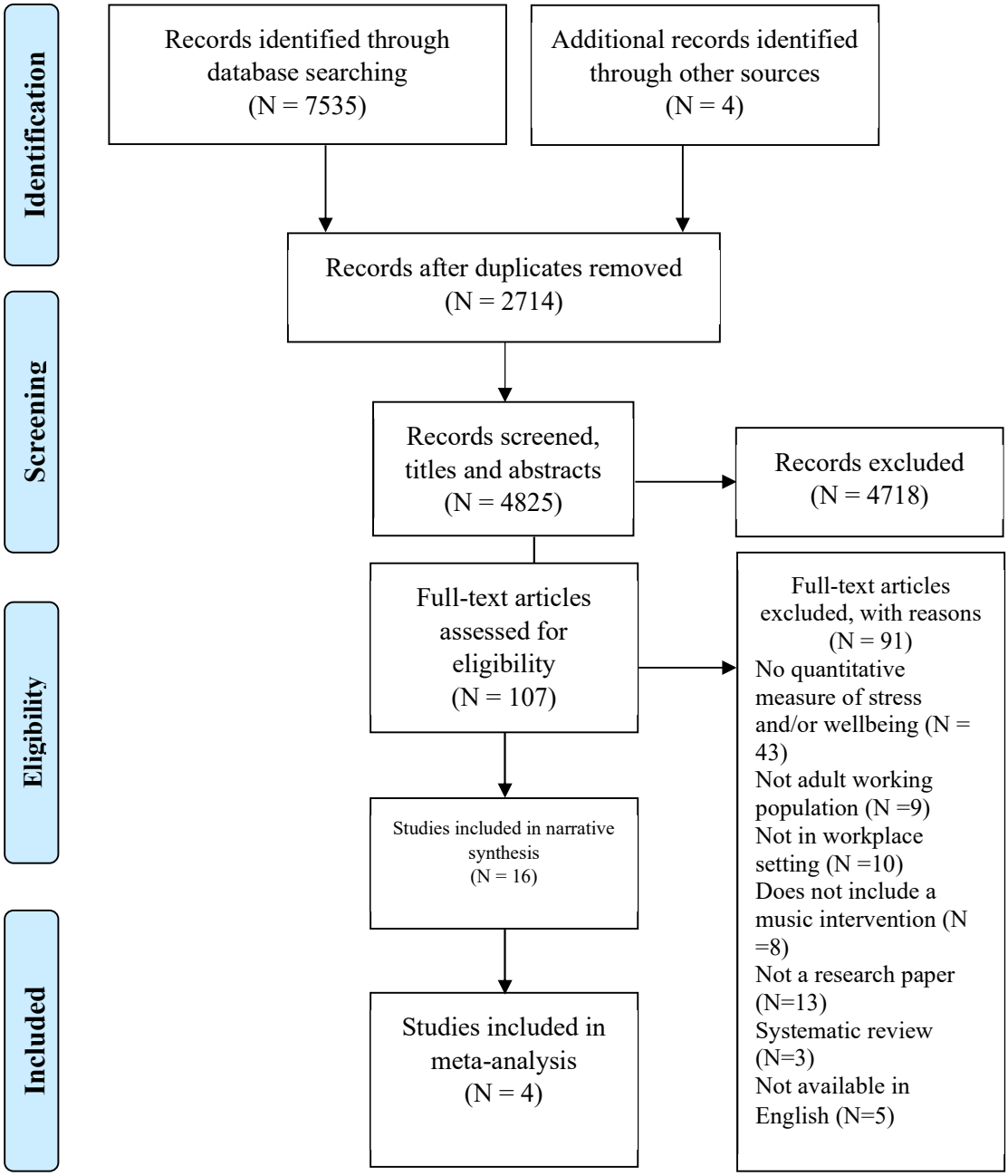
A narrative synthesis was conducted in line with Popay et al., (2006) guidance to answer the following review questions: What effect do music interventions have on stress and wellbeing? What music interventions are used in the workplace? How are they delivered? and How are stress and wellbeing measured?

Results

The database searches retrieved 7535 papers. Titles and abstracts were screened in line with inclusion/exclusion criteria. At full-text review, the key reasons for exclusion were; not a research paper, not in the workplace setting or adult worker population, no quantitative measures of stress/wellbeing, no music intervention, systematic review and not available in English. Sixteen papers were eligible for inclusion in the review: Bittman et al. (2003); Delerue & Rabusseau (2020); Eslami et al. (2018); Giordano et al. (2020); Hilliard (2006); Kacem et al. (2020); Lai & Li, (2011); Lesiuk, (2005, 2008, 2010); Phillips et al. (2020); Ploukou & Panagopoulou (2018); Smith (2008); Wachi et al. (2007); Wlodarczyk (2013) and Zamanifar et al. (2020). All 16 papers were included in the narrative synthesis, four of which were also included in the meta-analysis. Figure 2.1 outlines the PRISMA flowchart of systematic literature search.

Figure 2.1

PRISMA Flow Chart



Study characteristics

Key characteristics of the studies are presented in the study characteristics table (Table 2.1).

Design

Five studies employed a randomised control trial design (RCT; Eslami et al., 2018; Lesiuk, 2008; Ploukou & Panagopoulou, 2018; Smith, 2008; Zamanifar et al., 2020) Three studies used randomised crossover designs (Bittman et al., 2003; Lai & Li, 2011; Wachi et al., 2007). Six studies used a quasi-experimental design (Delerue & Rabusseau, 2020; Giordano et al., 2020; Hilliard, 2006; Kacem et al., 2020; Phillips et al., 2020; Wlodarczyk, 2013). Two studies used interrupted time series (Lesiuk, 2005; 2010).

Participants

Across all studies, a total of 870 participants were recruited into either a music or control condition. Eleven studies recruited participants from healthcare settings (Bittman et al., 2003; Delerue & Rabusseau, 2020; Eslami et al., 2018; Giordano et al., 2020; Hilliard, 2006; Kacem et al., 2020; Lai & Li, 2011; Ploukou & Panagopoulou, 2018; Phillips et al., 2020; Wlodarcyzk, 2013; Zamanifar, 2020). Two studies recruited from computer system developers (Lesiuk, 2005; Lesiuk 2010). One study recruited air traffic controllers as participants (Lesiuk, 2008). One study recruited participants from call centre employees (Smith, 2008) and one from corporate professionals (Wachi et al., 2007). The smallest sample size was 17 (Hilliard, 2016) and the largest was 120 (Zamanifar et al., 2020). Three studies reported if participants had previous musical training or typically listened to music in their working day (Lesiuk, 2005; Lesiuk, 2010; Smith, 2008).

Table 2.1

Study characteristics table

Author (year)	Country	Design	Participants (N)	Intervention	Control	Outcome measures	Main findings
Bittman et al. (2003)	USA	Randomised crossover	Care workers (112)	Six, weekly, one-hour group sessions following the HealthRHYTHMS Protocol facilitated by a physician, musician or music teacher	Standard work routine	Maslach Burnout Inventory & Profile of Mood States	Intervention showed significant pre-post change on all dimensions except DP. TMD showed a -46.0% change
Delerue & Rabusseau (2020)	France	Pre-post quasi-experimental	Hospital staff (20)	15 weeks of 20-60 minutes daily music listening, via headphones, limited to once per day in the workplace and unlimited outside of the workplace	None	Hospital Anxiety and Depression Scale	Wilcoxon matched-pairs test found no significant difference for anxiety ($Z=1.83$, $p=0.1$) and depression ($Z=0.2$, $p=.9$)
Eslami et al. (2018)	Iran	RCT	Surgery staff (70)	Five, 30-minute music listening sessions prior to undertaking surgery	Standard work routine	Spielberger Job Stress Questionnaire	Repeated measures ANOVA found music listening showed a significant reduction of job stress ($p=<.001$) and a statistically significant effect of time, group and time/group ($p=<.001$)
Giordano et al. (2020)	Italy	Quasi-experimental	Clinical staff (34)	Four-week, daily music listening to a recommended playlist, 15-20 minutes in length	None	MusicTeamCare-Q1	Paired-samples t-test found a significant reduction in sadness, fear, worry, tiredness, and fright after listening to the customised playlists ($p=<.05$)

Table 2.1 continued

Author (year)	Country	Design	Participants (N)	Intervention	Control	Outcome measures	Main findings
Hilliard (2006)	USA	Pilot parallel group	Healthcare workers (17)	a) Six, weekly, one-hour group sessions facilitated by a music therapist using an ecological approach. b) Six, weekly, one-hour group sessions facilitated by a music therapist using a didactic approach	None	Compassion Satisfaction/Fatigue self-test	Wilcoxon test did not find any statistically significant difference pre-post for either group for compassion satisfaction or fatigue, 1; Z=-.047, *p*=>.05 2; Z= -1.101, *p*=>.05
Kacem et al. (2020)	Tunisia	Quasi-experimental	Healthcare workers (34)	Three, 30-minute sessions of group music listening per day, over one month. Music was pre-selected in line with participant preferences	None	Perceived stress scale-10 Maslach Burnout Inventory	Mean score of perceived stress reduced from 22 (8.9) to 16 (7.9), *p*=.006. Mean score of emotional exhaustion reduced from 27 (10.8) to 19.2 (9.5), *p* = .004
Lai & Li (2011)	Taiwan	Randomised crossover	Nursing staff (54)	One, 30-minute session listening to pre-selected music with chair rest	One 30-minute chair rest session	Self-perceived stress	Paired t-tests found significant reductions in stress for music listening post-intervention (*t* (52) = -9.05, *p* = .001). Correlations found an association between music preference and a reduction in stress
Lesiuk (2005)	Canada	Quasi-experimental field study with interrupted time series and removed treatment	Computer information systems developers (56)	Three weeks of daily music listening from music library or own collection, as much as participants wanted.	No music listening	State Positive Affect State mood	State Positive Affect increased in the music listening weeks, and most greatly following the non-music week (*p* = <.05)

Table 2.1 continued

Author (year)	Country	Design	Participants (N)	Intervention	Control	Outcome measures	Main findings
Lesiuk (2008)	USA	RCT	Air traffic controllers (33)	Four, 15-minute breaks listening to music over 2 weeks whilst on shift. Preferred music chosen from a music library provided and through headsets	Silence	Stress Diagnostic Survey Trait Anxiety Inventory	Recurring themes included busy traffic for prolonged periods, supporting trainees, dealing with management etc. ANOVA found statistical difference for both groups (F (2) = 19.22, p= .0001). No differences found between groups.
Lesiuk (2010)	USA	Interrupted time series	Computer company employees (24)	Two weeks of daily music listening from music library or own collection, as much as participants wanted for a minimum of 30 minutes per day.	No music listening	Narrative work stress questionnaire Job Affect Scale	Recurring themes included time pressures, unrealistic deadlines, volume of work etc. Paired samples t-test indicated a significant difference between music and non-music weeks (p=.003)
Phillips et al. (2020)	USA	Two-group (intervention and control) quasi-experimental design.	Nursing staff (24)	Six weekly, 90-minute music therapy sessions facilitated by a senior nurse and singer-songwriter	None	PROMIS Insomnia Severity Index The University of California Loneliness Scale Professional Quality of Life Scale	ProQOL: All measures had a significant main effect of time, but no time-by-group interactions were significant. The time-by-group interaction effect for insomnia (F[3,120]=5.77, p= <.001 [n^2p= .126]) and loneliness (F[3, 98] = 7.46, p=<.001, [n^2p= .157])

Table 2.1 continued

Author (year)	Country	Design	Participants (N)	Intervention	Control	Outcome measures	Main findings
Ploukou & Panagopoulou (2018)	Greece	RCT	Nursing staff (65)	Four, weekly, one-hour percussion music sessions facilitated by a music teacher	Standard work routines	Hospital Anxiety and Depression Scale Pennebaker Inventory for Limbic Languidness	Repeated measures ANOVA showed a statistically significant reduction in anxiety (F (1) =7.99, p=0.007), depression (F(1) = 5.891, p=0.019) and psychosomatic symptoms (F(1) = 8.725, p=0.005) for the intervention group and no change for controls. -Intention-to-treat analysis was used.
Smith (2008)	Australia	RCT	Call centre employees (80)	Three, 15-minute group sessions listening to live improvised music and completing PMR exercise	Three, 15-minute group discussions reviewing shift	State Trait Anxiety Inventory	Repeated measures t-test found significant reduction in anxiety for intervention group, (t(df)= 16.8, p=<0.01) and no significant change for the control group
Wachi et al. (2007)	Japan	Randomised crossover	Corporate professionals (40)	One-hour HealthRHYTHMS drumming program led by an experienced facilitator	One-hour of reading at leisure	Profile of Mood States	Paired t-tests found overall improvement in TMD for both groups (p=.05) post intervention.
Wlodarczyk (2013)	USA	Quasi-experimental RCT	Care workers (68)	Six, one-hour sessions of active music-making and song writing facilitated by a researcher across eight-weeks	Five, 30-minute sessions completing questionnaires and group discussion across eight-weeks	Compassion Satisfaction and Fatigue Test	Mann-Whitney U found no significant difference between groups for risk of burnout (U (24,23) = 274, p=>.05) or compassion fatigue (U(24,23) = 281.5, p=>.05)

Table 2.1 continued

Author (year)	Country	Design	Participants (N)	Intervention	Control	Outcome measures	Main findings
Zamanifar et al. (2020)	Iran	RCT	Nursing staff (120)	1.Three, 20-minute music listening sessions 2.Three, 20-minute aromatherapy sessions 3.Three, 20-minute music listening and aromatherapy sessions Sessions occurred over three consecutive shifts.	Standard work routines	Beck Anxiety Inventory	One-way ANOVA found statistically significant difference in anxiety for all four groups (p=<.05).

Note. DP = depersonalisation. C/B = Confusion/Bewilderment. TMD = Total Mood Disturbance. ProQOL = Professional Quality of Life. PMR = progressive muscle relaxation. Active music making = session involving active participation in a music activity, for example singing or drumming.

Methodological quality

Risk of bias was assessed by two independent assessors (SP & EH) and any discrepancies were discussed until a consensus was reached.

All studies employing an RCT design were assessed as having some concerns over their potential risk of bias. Zamanifar et al. (2020) was the only study which had pre-registered a trial protocol; however, this did not specify an analysis plan. Therefore, all studies were assessed, conservatively, as some concerns for potential risk of bias in selection of the reported result. One study (Lesiuk, 2008) was assessed as having some concerns over the randomisation process as stratified sampling was employed.

All three studies employing crossover designs were assessed as some concerns for risk of bias. All had potential bias arising from the randomisation process. One study (Wachi et al., 2007) was assessed as unclear across all five domains.

Seven studies employed a non-randomised design and were assessed using the ROBINS-I. One study (Giordano et al., 2020) was assessed as serious risk of bias as it was felt the study had not sufficiently reduced the risk of potential confounding variables. Two studies (Hilliard, 2006; Lesiuk, 2010) were assessed as some concerns relating to risk of bias due to possible confounders, missing data, and measurement of outcomes. Figures 2.2-2.4 present visual representations of the assessments.

Figure 2.2

Risk of bias in RCT designs

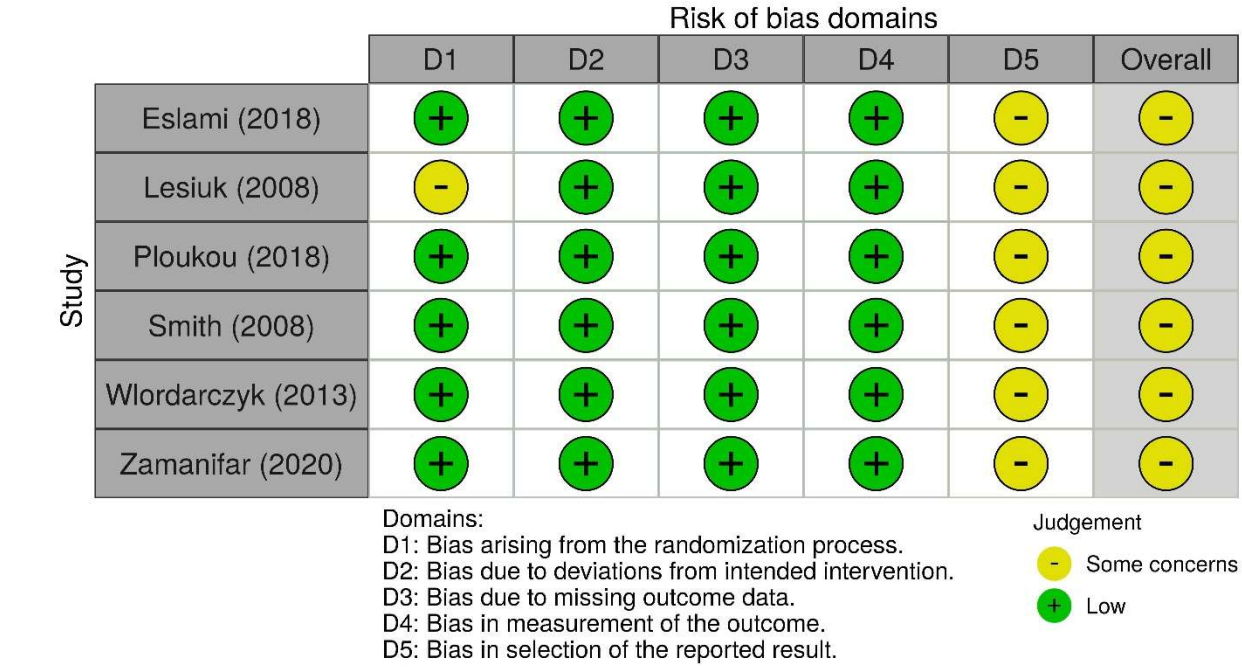


Figure 2.3

Risk of bias in crossover designs

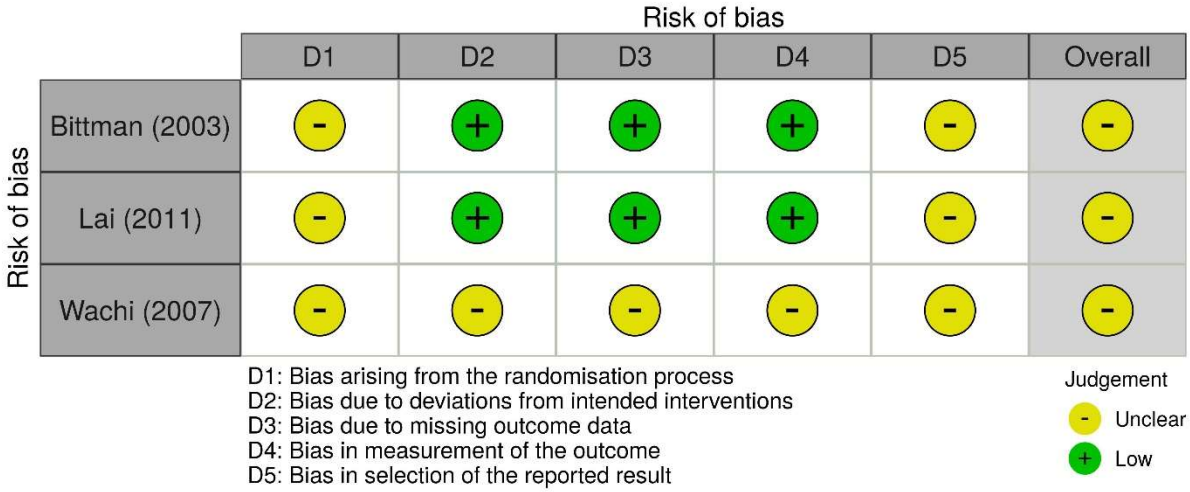
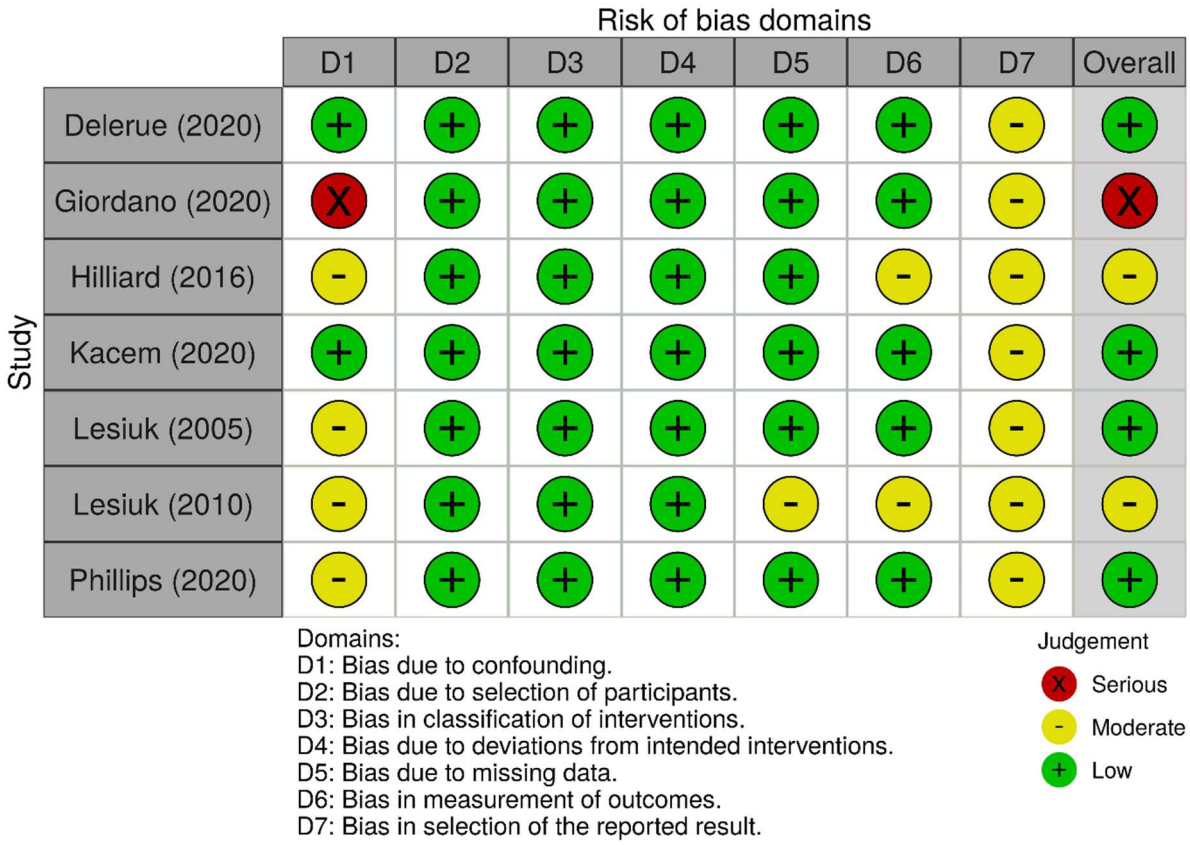


Figure 2.4

Risk of bias in non-randomised design



Effect of music interventions

An unadjusted meta-analysis of four studies employing a randomised control design (Ploukou & Panagopoulou, 2018; Smith, 2008; Wachi et al., 2007; and Zamanifar et al., 2020) was conducted for the effect of music intervention on measures of wellbeing. RCTs and the first post-intervention measurement of crossover trials were used.

For the purposes of this meta-analysis the WHO definition of wellbeing was used, and includes psychological health; therefore, measures of depression, anxiety

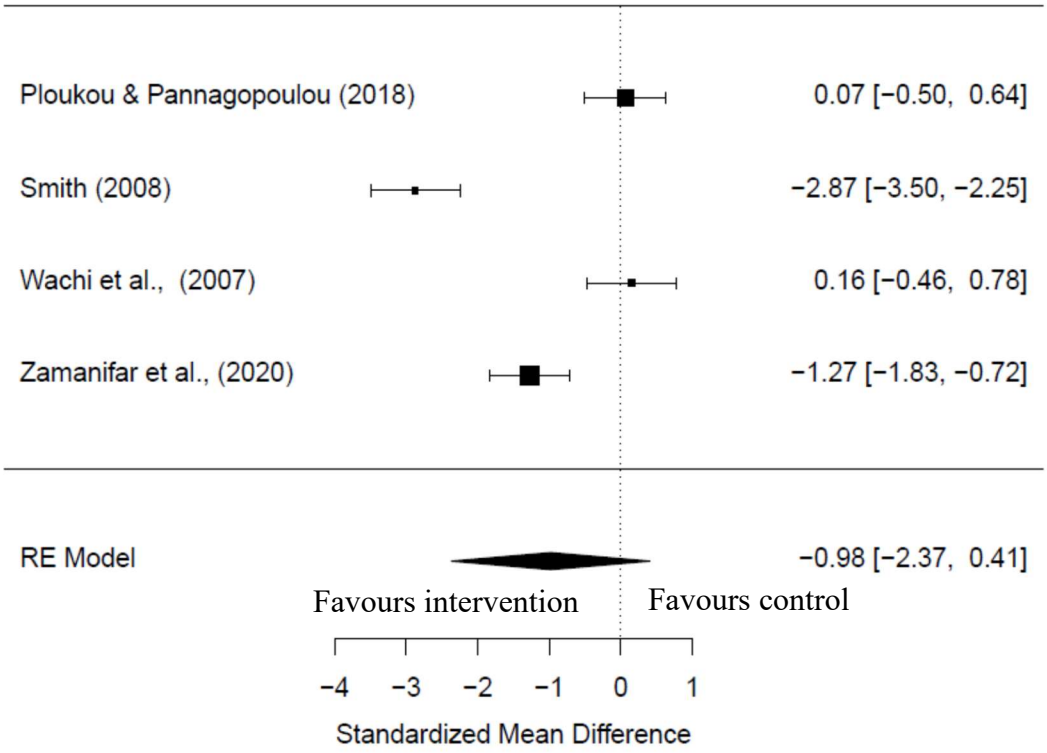
and overall mood were included (WHO, 2007). The independent variable for this analysis was music intervention and the primary outcome wellbeing. The total number of participants included in the meta-analysis was 228 (intervention n=112, control n=116). All four studies were assessed as having some concerns in relation to risk of bias. Analysis was completed using MAVIS (www.kylehamilton.net/shiny/MAVIS).

The means and standard deviations for wellbeing post-intervention for both groups were used in the meta-analysis as this is the purest form of data. One measure of anxiety was reported in median and percentiles (Ploukou & Panagopoulou, 2018). The authors were contacted for the means and standard deviations of this data as it is not possible to calculate these from the reported data, however this data was not received and therefore not included in the meta-analysis. A random-effect-model was used as it is not possible to assume that the studies within the meta-analysis drew from the same population.

The unadjusted meta-analysis found no overall significant effect of music intervention on wellbeing (k = 4. Standardised Mean Difference= -0.9779 se = 0.7079, p = 0.1671, 95% CI = -2.3653 – 0.4095). There was a high amount of heterogeneity between the studies, (Q= 62.1811, p = <0.0001, I^2 = 95.47%), suggesting the studies are quite different. Figure 2.5 visually presents the results.

Figure 2.5.

Random-effect-model forest plot.



The forest plot shows the study conducted by Zamanifar et al. (2020) has the greatest weighting of the four, as indicated by the proportionate sizes of the squares. Two studies (Ploukou & Panagopoulou, 2018; Wachi et al., 2007) confidence intervals include zero. This means their effect is not statistically significant. The other two studies (Smith, 2008; Zamanifar et al., 2020) have confidence intervals which are entirely on the negative side, suggesting an improvement of wellbeing as a result of the intervention, as a lower score on the measures indicates a reduction in symptomology.

The overall standardized mean difference is -0.98 with confidence intervals which include zero, indicating there is not a statistically significant effect of music interventions on wellbeing in the workplace. Therefore, the null hypothesis; there is

no effect of music interventions on wellbeing in the workplace cannot be rejected. Publication bias and moderator analyses were not run as the number of included studies was below five.

As noted in the descriptions of the studies, there was large heterogeneity between the interventions and outcome measures used. Therefore, a narrative synthesis, guided by principles from Popay et al. (2006), explored the effects of the interventions for all 16 studies.

Music listening

Stress. Significant reductions in stress post-intervention were found in the intervention group compared to controls. Three studies assessed stress using subjective measures (Eslami et al., 2018; Kacem et al., 2020; Lai & Li, 2011) and found music listening interventions to lead to a statistically significant reduction in stress. Eslami et al., (2018) also found a significant effect (p=<0.001) of time, group, and time/group.

Lai & Li, (2011) employed biological measures of stress also finding evidence of effect of music listening on stress. The study found music preference was significantly associated with a reduction in subjective and objective measures of stress, excluding cortisol. However, there were statistically significant changes for both intervention and control post-intervention on objective measures of stress; heart rate, mean arterial pressure, finger temperature and cortisol ($p = 0.001$).

Wellbeing. Significant improvement in wellbeing was seen following music listening interventions. Wellbeing was measured through burnout and affect. Kacem et al. (2020) found a significant reduction in stress and burnout post-intervention and 74% of participants felt the intervention was beneficial. Five studies employed measures of affect. Two studies, employing interrupted time series designs found

positive affect increased in music listening weeks and most predominantly following non-music listening weeks (Lesiuk, 2005, 2010). Lesiuk (2005) found no significant impact of time spent listening on mood. There was a statistically significant negative correlation of age and music listening; older participants listened to less music.

Lesiuk (2008) found state anxiety levels decreased for both groups across time, but no significant difference was found between groups. When groups were engaging in the music intervention or resting in silence their anxiety levels dropped and then increased again when returning to work. The author considered how silence may have provided a meditative type space and noted participants in the intervention group were able to choose music from a selection but did not have a true 'choice' over the music they listened to, and this may have negatively affected the results. In contrast, Zamanifar et al. (2020) found a statistically significant difference in anxiety for all groups; intervention and control following three, 20-minute sessions of music listening with or without aromatherapy as compared to standard work routines.

Delerue & Rabusseau (2020) found no significant difference for anxiety or depression following a 15-week music listening intervention. Giordano et al. (2020) found all of the customised playlists had a significant positive effect on wellbeing measures. The breathing playlist gave a statistically significant result on all subscales tiredness, sadness, fear and worry. The energy playlist showed statistically significant results on all subscales. The serenity playlist showed statistically significant results in sadness, fright and worry as measured by the MusicCareTeamQ1.

Active music making

Stress. No studies which used an active music making intervention took a subjective measure of stress. Wachi et al. (2007) employed biological measures of

stress and found evidence of positive effect of active music making on stress as indicated by NK cell activity and cytokine profiles.

Wellbeing. Four studies assessed the effect of active music groups using compassion fatigue and/or burnout measures. Two studies used the Recreational Music Making HealthRHYTHMS group protocol (Bittman et al., 2003; Wachi et al., 2007) both finding statistically significant positive effects on wellbeing, mood and burnout. No significant change was found on the depersonalisation and confusion/bewilderment subscales of the Maslach Burnout Inventory. Bittman et al. (2003) conducted follow-up of participants who completed the intervention arm first. This did not include administrators and department managers and further statistically significant change was seen in all subscales except confusion/bewilderment and personal accomplishment. Two studies did not find any significant differences between groups when measuring compassion fatigue (Hilliard, 2016; Wlodarcyzk, 2013).

Three studies reported the effect of active music groups using measures of affect (Ploukou & Panagopoulou, 2018; Smith, 2008; Wachi et al., 2007). Ploukou & Panagopoulou (2018) found a statistically significant reduction in anxiety, depression and psychosomatic symptoms for those in the music group and no change for controls. Similarly, Smith, (2008) found the music intervention led to a significant reduction in anxiety for participants in the music group but not controls.

One study assessed professional and personal wellbeing separately (Phillips et al., 2020). Professional wellbeing was found to increase over time for both intervention and control groups. Personal wellbeing showed a statistically significant effect of group and time on insomnia and loneliness. Protective factors which

enhance wellbeing also found a statistically significant effect of time and group for self-compassion and self-reflection.

How were interventions delivered and used?

Music interventions in the workplace were delivered in a variety of different ways. These will now be discussed as two groups: individual and group interventions.

Individual interventions

Eight studies used music listening as the main intervention (Delerue & Rabusseau, 2020; Eslami et al., 2018; Giordano et al., 2020; Lai & Li, 2011; Lesiuk, 2005, 2008, 2010; and Zamanifar et al., 2020).

Prescribed music choices. Music listening interventions with music chosen for participants was used by Delerue & Rabusseau (2020), Eslami et al. (2018), Giordano et al. (2020), Lai & Li (2011) and Zamanifar et al. (2020) who directed participants to choose the music they listened to from pre-selected choices/playlists.

Duration of intervention differed across the studies, between 15 and 60 minutes per session. Lai & Li (2011) asked participants to listen to music for a single, 30-minute session. They examined the effect of music on stress indices and examined the association between music preference and stress, prescribing six genres and asked participants to self-select music from these. Genres included: Western orchestral, piano, jazz, harp, synthesizer, and Chinese traditional orchestra music. All genres had similar music characteristics; no sudden changes in rhythm or volume, slow tempo, between 60 and 80 beats per minute.

Two studies looked at under five sessions (Eslami et al., 2018; Zamanifar et al., 2020). Eslami et al. (2018) investigated the effect of music therapy on stress for surgery room workers. The music prescribed to participants was Iguana, music

which is smooth and free of emotional melody or rhythms and less than 80 beats per minute and was authorised by the Iranian Music Therapy Association. Participants listened to the music for 30-minutes before five surgery sessions. Zamanifar et al. (2020) investigated the effect of music therapy, aromatherapy and a combination of both on anxiety of nurses. Participants in the music therapy and combined groups were asked to choose their preference between traditional, pop and classic music to listen to for the three, consecutive, 20-minute, daily listening sessions.

Two studies used extended intervention periods (Delerue & Rabusseau, 2020; Giordano et al., 2020). Giordano et al. (2020) investigated the influence of music therapy as a support intervention to reduce stress and improve wellbeing in clinical staff who were working with patients with COVID-19. They provided participants with a playlist and listening guide, encouraging participants to find a quiet space, close their eyes and focus on an image whilst listening. Following a telephone assessment in week one, playlists were tailored to the participants' needs to listen to for four weeks for 15-20 minutes per playlist. Delerue & Rabusseau (2020) aimed to obtain an in-depth understanding of hospital staffs' experience of listening to music. Participants chose from 30 standardised musical sequences, either starting with a low tempo and increasing to a higher tempo or the reverse. Participants listened to music for between 20 and 60 minutes, a maximum of once per day in the workplace and unlimited outside of work over 15 weeks.

Participants in the individual interventions, where music choice was directed by the research team, used a variety of means to listen to music. Research teams directed participants regarding means of listening in different ways, including use of headphones (Delerue & Rabusseau, 2020; Eslami et al., 2018; Lai & Li, 2011; Zamanifar et al., 2020), using an MP3 player (Eslami et al., 2018). However,

Giordano et al. (2020) directed participants to listen to the prescribed playlists when and how they chose.

Self-selected music. Lesiuk (2005, 2008, 2010) designed the studies to allow for participants to have free choice over the music they listened to as part of the intervention. Lesiuk (2005) measured the impact of music listening on state positive affect, work quality and time on task in software developers. Participants were given access to a library of 65 CDs and could listen to these or music from their own collection. Participants listened to music for three of five weeks whilst at work and were directed to listen to music as and when they wished to. In a later study, Lesiuk (2010), using the same designs and music choices, participants were set a minimum of 30-minutes music listening per day for two of three weeks. Both studies asked participants to listen via a personal speaker or headphones.

Lesiuk (2008) examined the effect of preferred music listening on air traffic controllers. The intervention was carried out over four shifts within two weeks. Towards the end of the shift, five to seven hours in, participants used 15 minutes of their break to listen the music of their choice via headphones.

Group interventions

Eight studies used active music groups as the main intervention (Bittman et al., 2003; Hilliard, 2016; Kacem et al., 2020; Phillips et al., 2020; Ploukou & Panagopoulou, 2018; Smith, 2008; Wachi et al., 2007; Wlodarcyzk, 2013). These were either facilitated by the research team or other trained professionals and will be described below.

One study, Kacem et al. (2020), used music listening as a group intervention. The study aimed to assess the impact of music therapy on stress levels and burnout risk on operating room staff. The sessions, three 30-minute music therapy sessions

per day for one month, involved individuals listening to music in the operating room whilst working.

Facilitated by researcher. Smith (2008) combined music and a relaxation intervention (progressive muscle relaxation) to investigate the immediate effects of a single live music and progressive muscle relaxation session in adults in an occupational setting at the end of their shift. The session was facilitated by the researcher and lasted 15 minutes. Wlodarcyzk (2013) examined the effect of a single one-hour group music session for grief resolution and to determine if it had a positive effect on worker risk of burnout and compassion fatigue. The intervention used active music-making and song writing.

Facilitated by other trained professionals. Bittman et al. (2003) and Wachi et al. (2007) both used interventions based on HealthRHYTHMS group drumming protocol and were facilitated by musicians or experienced facilitators. Percussion instruments were chosen to ensure all participants could engage without prior musical training. Bittman et al. (2003) conducted the sessions for one-hour over six weeks with the aim of building support, communication and interdisciplinary respect and began and ended the sessions with a mindfulness-like exercise. Wachi et al. (2007) used one three-hour session which focussed on drumming, building rhythms and improvisation.

Ploukou & Panagopoulou (2018) also used percussion instruments as the main elements of the intervention. They examined the effects of music intervention on anxiety, depression, and psychosomatic symptoms for oncology nurses. Participants in the intervention attended four-weekly one-hour classes which involved improvising with percussion instruments led by a music teacher.

Hilliard (2016) sought to evaluate the effects of music therapy on compassion fatigue and team building of professional hospice workers. The intervention used traditional music therapy techniques. The intervention group used an open, ecological approach, using improvisation on percussion instruments. The control intervention was a music therapy group which used a didactic approach with a directive facilitator incorporating psychoeducation and cognitive-behavioural theories. Both interventions were held for one-hour weekly sessions for six weeks. Both groups were facilitated by a certified music therapist and only used live music.

Song writing in a group was used as the main part of the intervention by Phillips et al. (2020) to investigate the effects of storytelling music on the emotional wellbeing of oncology nurses. The study utilised a six-week intervention with 90 minutes of weekly groups facilitated by an advanced nurse and singer-songwriter.

Outcome measures

Four studies used a measure of stress as the primary outcome: Kacem et al. (2020), Eslami et al. (2018) and Lesiuk (2008, 2010). The measures were the Perceived Stress Scale-10 (Cohen et al., 1983), Spielberger Job Stress Scale (Spielberger, 1986) and the Stress Diagnostic Survey (Ivancevich & Matteson, 1988).

Validated measures of wellbeing used included Profile of Mood States (POMS; McNair et al., 1971), Maslach Burnout Inventory; 3 dimensions (Maslach et al., 1996), Compassion Satisfaction/Fatigue self-test (Figley, 2002) Trait Positive and Negative affectivity scale (Watson & Tellegen, 1985), ProQOL; 3 wellbeing subscales (Hudnall-Stamm, 2008) and the Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983).

Other validated measures of outcomes likely to be negatively influenced by work-related stress were: Spielberger State Trait Anxiety Inventory (Spielberger, 1983), Beck Anxiety Inventory (Beck et al., 1988), PROMIS (depression) (Cella et al., 2007), Insomnia severity index (Bastien et al., 2001), Loneliness Scale (Russell, 1996) and the Work experience scale (Moos, 2008).

Non-validated measures of stress were used Music Team Care Q1 (Giordano et al., 2020) and self-perceived stress visual analogue scale (Lai & Li, 2011).

Discussion

This systematic review and meta-analysis aimed to understand the effect of workplace music interventions on employee stress and wellbeing. In terms of music listening, narrative synthesis indicates that listening to music at work, either prescribed or from own preferred genre can reduce work-related stress and improve wellbeing. It is suggested that choosing music of own preference may have a mediating effect, but this needs to be further explored. These effects are further supported by the findings of Lesiuk (2005, 2010), employing an interrupted time series design, which found a greater improvement in mood from non-music listening weeks to music listening weeks.

Synthesis of findings from studies of active music making group interventions indicated that they can be effective interventions for promoting wellbeing in the workplace. However, evidence is mixed particularly in relation to reducing compassion fatigue and burnout in healthcare workers, with two studies showing no pre-post change (Hilliard, 2016; Wlodarcyzk, 2013). However, meta-analysis of randomised control studies found no significant effect of music interventions on wellbeing in the four studies included in the analysis. Two studies report a statistically significant effect of music intervention on wellbeing in their

narrative results, however this is not supported by the meta-analysis data. The meta-analysis conducted was looking for overall group differences and is not controlling for other factors. The difference noted may be due to the researchers controlling for baseline differences, moderators or confounders in their data analysis which results in the difference between their reported effect and the effect found by the meta-analysis.

Music interventions used in the workplace fell into two groups: music listening or group active music making. Within these subgroups there were a number of levels of heterogeneity; workplace setting, sessions, length and facilitation.

Both intervention types were either individual or group. The majority of music listening interventions were individually led and involved a mix of self-selected (k=4) or prescribed music choices (k=1). Active music interventions were mainly in groups and typically involved percussion instruments. Facilitators were from a variety of backgrounds; music therapist, senior nurse, songwriter, music teacher and experienced facilitator. This may impact on how the intervention was delivered, the level of intervention fidelity and level of creativity employed in session.

The number of sessions and length of intervention also varied greatly. Music listening interventions ranged from 15 minutes to as much as the participant wanted for between a single session to 15 weeks. Active music group interventions were either one hour or 90 minutes and ranged from one session to eight weeks. This high level of heterogeneity does not allow for conclusions to be drawn on minimum intervention periods or which combination is most effective.

Eleven studies drew from healthcare worker populations, which increases the ability to generalise results to employees in this sector. However, there is a large

amount of variety within this population and often this is used as an umbrella term capturing a number of different roles, disciplines and levels of training.

The measures used to measure stress and wellbeing were widely heterogeneous. Some only used subscales or sections of standardised measures. This review cannot, therefore, provide any guidance on which measures are most commonly used or most appropriate to use in future research.

Strengths of reviewed studies

One study attempted to control for confounding variables through their exclusion criteria (Eslami et al., 2018). For example, participants were excluded if previous training in problem-solving, stress management and yoga techniques, which may have been employed by the participants in addition to the intended music intervention and other life events which are likely to persistently increase levels of stress for individuals, for example, death of a relative or divorce.

Many of the studies chose to recruit participants from healthcare professions. It is well documented that this group undertake work which can lead to high levels of work-related stress and negatively impact on wellbeing, with up to 40.3% of NHS staff reporting feeling unwell as a result of work-related stress (NHS England, 2020). Therefore, a strength of studies using this population is they are drawing on a population for whom the intervention would address a need and begin to explore novel interventions to support this population.

The use of washout periods in crossover designs is important. Wachi et al. (2007) ensured a six-month washout period between interventions, supporting the researchers to make clearer statements about the effect of the intervention compared to studies which used minimal washout periods, where the intervention may have acted as a confounding variable for some participants.

The studies reviewed were drawn from a wide range of countries and cultures. This provides an understanding of the cross-cultural implications of music interventions in the workplace.

Weaknesses of reviewed studies

Design

Overall, there were methodological weaknesses in the majority of the studies. Many studies lacked clarity of information on randomisation and blinding. Statistical power was likely to be low in many of the studies due to relatively small sample sizes. Clearer reporting, in line with Consolidation Standards of Reporting Trials (CONSORT; Schulz, et al., 2010) guidance would aid a more comprehensive assessment of quality and risk of bias.

There was a large amount of heterogeneity regarding outcome measures and definition of primary outcomes. Wellbeing was not defined in a number of the papers and a variety of measures (validated and unvalidated) were used. Agreed operationalisation and measurement of outcomes across studies would improve the understanding of any effects of interventions on specified outcomes.

Some studies did not include an active control and did not report if they requested participants in the control arm not to engage with music or to report their level of engagement with music at work. Utilising active controls would improve the assessment of the effect of the intervention, reducing the risk of extraneous variables.

Few studies conducted a follow-up on participants. Bittman et al. (2003) followed up on a subset of participants. Follow-up of all participants, including administrators and managers in the completion of the POMS (McNair et al., 1971) and Maslach Burnout Inventory (Maslach et al., 1996), at all time points, not just pre- and post- would have allowed for a wider interdisciplinary understanding of any

effect on mood and burnout, which, it could be argued, can be experienced across all disciplines not just those in a direct caring role. Collecting follow-up data would support researchers to understand the longevity of any effect of the interventions. In turn, this would provide evidence for employers to assess the potential positive benefit to their employees and company.

Only one study is pre-registered on a trial's registry. However, the protocol did not provide a description of the a priori analysis plan and therefore it was not possible to make a robust assessment of any of the studies regarding risk of bias of reported results and thus all were rated as having some concerns.

Potential confounding variables

A number of potential confounding variables were identified in the reviewed studies: using different therapists across experimental and control groups, recruiting from different companies and not conducting subgroup analysis, previous and current musical training and engagement. Insufficient detail was collected and evaluated for these variables and therefore it was unclear of the potential impact of these on intervention effect.

Studies which used a crossover design were weakened by the use of short washout periods. This made it difficult to draw conclusions from their data as it may be possible that the effects of the intervention were not washed out within the time period for participants.

A greater mix of participants, across biological sex, age range and professions would provide clearer understanding of the efficacy of the interventions in more workplaces and increase the generalisability of findings.

Limitations of this review

This review could have been strengthened by two independent reviewers conducting the searches independently and extracting data to improve accuracy, reduce risk of author bias and risk of error. Risk of bias assessments are in themselves limited by their subjective nature. This was minimised by having two independent assessors; however not all potential assessor bias can be removed.

This review did not include studies in the grey literature or in languages other than English. Therefore, publication bias may be present in the current review and information which could add to answering the question may be missing. The search terms may have been limited as four additional studies were identified through reference and forward/backwards citation searches.

The heterogeneity in the reviewed studies led to challenges synthesising the research, evident in the narrative synthesis and limited number of studies included in the meta-analysis. The large 95% confidence intervals reported in the meta-analysis results also indicates a lack of precision in estimating effects.

Implications for further research

Future research should seek to address the limitations identified in the reviewed studies. Robust methodology, for example gold standard RCT design and reporting in line with CONSORT guidance, would improve the evidence base by reducing potential confounding variables, participant allocation bias and support estimation of the 'true' effect of music interventions.

Defining primary outcomes and collecting subjective and objective measures and relevant data and potential participant variables which may act as confounders would be imperative. Three studies collected information on previous musical training and current daily music listening. This could be used to inform if this is a mediator of the effect of interventions and future research should consider collecting

this information from participants to explore this further. Further supplementary analysis of physiological markers of stress could be investigated to act as objective measures. Combined, these could give a clearer understanding of the 'true' effect of music interventions. Although, it is recognised objective measures are often invasive and can in themselves elevate the natural stress responses and skew results.

A greater understanding of potential differences between individual and group music listening could be explored, as well as the optimum conditions for this. Many of the studies asked participants to listen using headphones but little discussion is provided to why this was or the potential impact of this on the intervention. Exploring the impact of prescribed vs self-selected music may also develop our understanding of the mechanisms at play in the interventions. Further analysis of the music listened to, including tempi, melodic content, rhythmic content, genre could be useful as this might inform any possible physiological effects of the music being listened to and potential interaction with other effects of the intervention.

Trialling interventions for different periods would further the understanding of minimum periods required. Lengthy periods of interventions may be scrutinised by employers and employees and therefore may negatively affect uptake of intervention in trials or in practice. Further analysis of economic impact of music interventions on staff wellbeing and turnover across industries to better understand this impact and guide choices of intervention for staff wellbeing in the workplace would be important to ensure that employers understand the potential economic benefit alongside the staff wellbeing evidence. Bittman et al. (2003) conducted an economic-impact analysis which projected a cost saving of $89100 for a single 10 bed facility, with a projected potential annual savings in the industry of $1.46 billion

as a result of employees engaging in a Recreational Music Making group demonstrating positive initial findings.

As with much scientific research developing cross cultural studies would aid the robustness of the scientific literature. The majority of the reviewed studies were conducted in North America and Europe. As many countries and businesses become multicultural, it would be important to understand if there are any potential confounding variables which may negatively influence the effectiveness of interventions between cultures.

Implications for clinical practice

This review demonstrates music interventions have scope to be used as a means of supporting employee mental health, but more is to be learnt about the most effective interventions, minimum intervention periods and the possible effect of untrained facilitators. The evidence is not sufficiently robust to make clear recommendations, but the strongest evidence is for individual music listening interventions where a level of choice is given over music selection. This review demonstrates there is more space for creativity when thinking about staff wellbeing, interdisciplinary cohesion and reducing staff turnover and further research could lead to the development of enjoyable, low-cost wellbeing interventions.

Conclusions

The current review demonstrates the use of music interventions in the workplace is an area of interest and potential use in relation to reducing employee stress and improving wellbeing. There is evidence of some effect of music listening on stress and wellbeing and of active music making on wellbeing. However, there is a large amount of heterogeneity in the evidence and many of the studies have some concern in relation to quality. The current literature could be improved and expanded

by considering larger scale RCTs and more detailed understanding of the minimum intervention periods, effect of musical genre, prescribed vs self-selected music and greater use of standardised measures.

Disclosure of interest

None of the authors have any interests which would result in conflict.

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Chapter Three

Bridging chapter

Bridging Chapter

The systematic review focussed on assessing the literature of music interventions in the workplace. It aimed to ascertain what music interventions are used and how effective they are as a stress reducing and wellbeing improving intervention in the workplace. The review found some evidence for the efficacy of music interventions on stress and wellbeing. The most promising evidence was in relation to music listening interventions. Three studies found significant effects of music listening on stress (Eslami et al., 2018; Kacem et al., 2020; Lai & Li, 2011) and five on wellbeing (Giordano et al., 2020; Kacem et al., 2020; Lesiuk, 2005, 2008, 2010). Stress was not formally measured in relation to active music making interventions. When pooling the effect of music interventions on wellbeing from randomised control studies no significant effect was found.

The systematic review concluded that the use of music interventions in the workplace is an area of interest and potential use in relation to reducing employee stress and improving wellbeing, particularly when considering an intervention which may engage employees, feels familiar to them and is minimal in cost. However, the evidence for effect is unclear and would require larger scale studies to understand which type of interventions are most effective; group, individual, active, passive, led by trained music professional or untrained facilitator, more detailed understanding of the minimum intervention periods, effect of musical genre, prescribed vs self-selected music and greater use of standardised measures.

As discussed, work-related stress is an increasing problem with multiple negative consequences, including physical health, psychological health, productivity, and economic cost to the employer. Clinical psychologists have a role in advocating for the understanding, assessment of, and evidence-based support for mental health

difficulties and this can include in the workplace. Empirical research is increasingly pointing towards the use of psychological interventions to address and improve mental health in the workplace (Awa et al., 2010) and therefore, using the breadth of skills developed in training, clinical psychologists are well placed to evaluate, be innovative and adapt evidence based approaches to non-clinical populations as part of a preventative model in mental health support. Several interventions have been investigated as a means of reducing work-related stress, mindfulness is one.

Mindfulness is based on a Buddhist practice and defined as paying attention in a specific way, in the present moment, non-judgementally (Kabat-Zinn, 1994), its practice can support individuals to move from 'default mode' to be more reactive to situations and immersed in activities. Mindfulness-based interventions (MBIs) have been developed incorporating mindfulness as a significant aspect of the intervention. Several psychological interventions incorporate mindfulness-based exercises as part of interventions or as a therapeutic intervention in its' own right, for example Acceptance and Commitment Therapy and Mindfulness-Based Stress Reduction.

Mindfulness practice has been found to reduce physiological markers of stress; cortisol, blood pressure and heart rate (Pascoe et al., 2017) and is positively correlated with higher heart rate variability (Burg et al., 2012; Prazak et al., 2012). MBIs have also shown significant positive effects on executive functioning, selective and executive attention, working memory and mental health in comparison to controls (Chiesa et al., 2011; Keng et al., 2011).

A systematic review found a minimum of eight weeks mindfulness practice enhanced working memory, sustained and selective attention, and executive function (Chiesa et al., 2011). This is further supported by Hölzel et al. (2011) who found mindfulness led to increases in grey matter, insula, changes in prefrontal cortex and

reduced amygdala activity – brain regions linked to memory, emotion and attentional self-regulation. However, Anderson et al. (2007) found no effect of mindfulness-based stress reduction (MBSR) on measures of attention as compared to waitlist controls.

Effects of mindfulness on physiology, wellbeing and cognition are well known in nonclinical populations (Keng et al., 2011). Sharma and Rush (2014) reviewed the use of mindfulness-based stress reduction (MBSR) as a stress management intervention in a non-clinical population. The review found positive effects for psychological and physiological measures of stress and advised all stress reduction should include mindfulness as part of the approach. The effect of MBIs on mental health was systematically reviewed. Both reviews found moderate effects of MBIs for improving mental health across both child and adult populations (Dunning et al., 2019; Demarzo et al., 2015).

The use of MBIs as a workplace intervention for mental health, has also been researched and MBSR is seen as the 'gold standard' for reducing stress in otherwise healthy individuals (Khoury et al., 2015). Virgili (2015) reviewed the effectiveness of MBIs on psychological distress in working adults and found medium to large effect sizes for both within- and between-group comparisons, concluding brief versions of MBSR as effective as eight-week versions. However, MBIs have not been found to be any more effective than other occupational stress interventions, for example relaxation training (Ruotsalainen et al., 2015).

Bartlett et al. (2019) reviewed 23 randomised controlled studies and found beneficial effects of workplace mindfulness training; medium effect sizes for stress, anxiety, psychological distress and wellbeing and sleep. Spinelli et al. (2019) found similar effects of mindfulness interventions for healthcare professionals, moderate

effects on anxiety, depression, stress and psychological distress. However, Lomas et al. (2017) found inconsistent quality of RCTs showing potential, but not conclusive evidence for MBIs as effective on reducing mental health issues, improving wellbeing and job performance. It is important to note that MBIs are contraindicated for some mental health difficulties, including suicidality and assessment for suitability should be conducted on a case-by-case basis (Van Dam et al., 2018). Therefore, caution should be taken when using MBIs in different populations. However less is known about the effects of MBI workplace interventions on cognitive performance and compassionate leadership.

MBIs combined with music listening have been suggested to lead to improved cognition, and proposed as an intervention for improving mental health difficulties (Eckhardt & Dinsmore, 2012). Baylan et al. (2019) found mindful music listening (one hour per day for eight weeks) to be a feasible intervention post-stroke. Comparing mindful music listening and audiobooks found significant improvement on immediate and delayed story-recall and attentional switching for the music group. Further study of brain imaging in acute post-stroke recovery showed listening to music led to grey matter volume increases in frontal and limbic areas in comparison to listening to audiobooks and control groups (Särkämö et al., 2008). Music listening has also been shown to induce mindfulness states and produce benefits in improving attention (de la Cruz & Rodríguez-Carvajal, 2014).

Given the evidence for MBIs and music listening as interventions to reduce stress, improve wellbeing and cognitive function across clinical and non-clinical population and the well placed role of clinical psychologists to further the understanding in this area the following empirical paper aimed to begin to investigate if music listening could be used as a tool to complement mindfulness and

make it more accessible to a wider audience in the workplace. The design and cognitive outcomes were inspired by the MELLO study (Baylan et al., 2019). However, a lack of sufficient control comparison and limited research in workplace interventions are limitations of previous studies.

The original design for the empirical study was to pilot a mindful music listening intervention with employees of the National Health Service (NHS). Ethical approval had been gained from the Faculty of Medicine and Health Science ethics board (2019/20-012) and Health Research Authority (IRAS: 272219). Seven NHS trusts had agreed to work as local collaborators on the study and identify potential participants from their employee pool. The COVID-19 pandemic resulted in all NHS research deemed non-essential and not directly linked to COVID-19 being paused and no face-to-face research with human participants could be conducted due to the potential risk of transmission and illness.

Adaptations to the original design were made; all aspects of the study; advertisement, recruitment, accessing participant information, consenting, completing measures, intervention and debrief were to be completed remotely, via a web-portal. Recruitment was also changed from NHS to university staff. It should be noted from March 2020 many employees in the university moved to working from home, in line with Government guidance following a national lockdown, aimed to reduce the transmission of the COVID-19 virus. Therefore, working environments changed and work requirements and pressures changed for almost all potential participants. Despite significant attempts to engage university staff in the project, including support and advertisement of the project from the executive board, we did not receive the enrolment for the study we anticipated. As a result, the empirical paper was underpowered and therefore, the write up in chapter four is set out as a

feasibility study. To maintain transparency and research integrity efficacy results will be reported in chapter six, however no conclusions can be drawn from these as the study was underpowered.

The project recruiting from the NHS currently remains paused and may be undertaken or amended by a future Clinical Psychology Doctorate student. If this is not possible the study will be closed.

Chapter Four

Empirical Paper

Prepared for submission to *Psychology of Music*

Listen to the Music: A feasibility study of mindful music listening and the effects on cognitive performance, stress, wellbeing, and compassionate leadership in university staff.

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Abstract

Background Work-related stress in an increasing problem in today's society. Music and mindfulness interventions have been shown to be effective in clinical populations on stress, wellbeing, and cognitive performance.

Objectives To assess the feasibility and acceptability of a randomised control trial of a mindful music listening intervention on stress, wellbeing, compassionate leadership, and cognitive performance in university employees.

Methods A pseudo-randomised, parallel-arm, feasibility study, comparing two groups; mindful music listening and music listening across eight weeks intervention was used. The chief investigator was blind to allocation. Feasibility was measured using recruitment and data collection rates. Acceptability of the intervention was measured using listening times, compliance with the intervention and qualitative feedback.

Results Forty-one university employees, not presenting in clinical thresholds on mood screens or practising mindfulness, completed pre- and post-measures on mood, stress, wellbeing, compassionate leadership, and cognitive performance. Twenty-one participants engaged in the intervention period. Twenty participants did not complete the intervention. Future trials would need to recruit 102 participants (Cohen's d = 0.5, $\alpha = 0.05$, $1\text{-}\beta = 0.8$) to detect significant difference in wellbeing. The intervention was acceptable to many participants however, feedback suggested explicit support from management and more frequent reminders may support engagement in the intervention.

Conclusions. A randomised control trial of mindful music listening may be feasible to trial the intervention for work-related stress in university employees with

sufficient attention to retention of participants and/or completion of intervention. A larger study would benefit from face-to-face assessments, particularly for mood screening and cognitive performance to support sufficiently robust data collection. Employees felt wellbeing interventions are an important area to continue researching.

Keywords: music listening, mindfulness, workplace.

Introduction

Focus on employee health and wellbeing is growing. Research has shown poor employee health is associated with poorer productivity and job satisfaction and is inadequately understood by employers or society (Black, 2009). Interest in this area has further increased since the COVID-19 pandemic across employment sectors. Working in the pandemic has had a negative impact on employee health and has highlighted the health and safety of staff as a top priority going forward and further research is required to better understand the implications of this (Allan et al., 2020; Evanoff et al., 2020; & Sahu, 2020).

Mental health is an important part of employee health, job satisfaction and productivity. Stevenson and Farmer (2017) reviewed workplace mental health and found the cost to employers between £33 and £42 billion. This is further supported by data from the Health and Safety Executive (HSE; 2020) who reported a prevalence rate of 2,440 per 100,000 workers for work-related stress, anxiety, or depression. Mental health difficulties resulted in 17.9 million working days being lost and work-related stress, anxiety and depression accounted for 51% of all work-related ill-health with prevalence levels highest in public sector workers, including education, health and social care, administration, and defence (HSE, 2020). Presenteeism, working despite being ill, has been shown to be higher in employees with mental health problems and typically results in poorer productivity (Royal College of Psychiatrists, 2018).

Work-related stress, anxiety or depression is defined as a harmful reaction people have to undue pressures and demand at work (Health & Safety Executive, 2018). The main causes of work-related stress are workload, tight deadlines, pressure, responsibility, lack of managerial support, organisation changes, violence,

and role uncertainty (Health & Safety Executive, 2018). Prolonged work-related stress can have negative consequences in relation to burnout, exhaustion, cynicism, professional inefficiency (Maslach & Leiter, 2016) and cognitive performance; specifically, executive function, attention, and memory (Deligkaris, et al., 2014).

Stress can trigger the evolutionary 'fight-flight' response (Henry, 1993), almost instantaneously via the hypothalamic-pituitary-adrenal axis, signalling to the body to prepare to fight or flee. Prolonged triggering of this response, in the absence of threat, can lead to physiological and psychological tension (National Institute for Health and Care Excellence [NICE], 2017) and can have damaging effects on physical health, mental health, brain tissue and is a risk factor for the development of other mental health difficulties. Cortisol is a neurochemical produced in response to stress. Elevated levels of cortisol have been associated with cognitive function decline, depression, dendritic atrophy and decreased neurogenesis in the hippocampus (Särkämö & Soto, 2012; Lupien et al., 2018).

Polyvagal theory (Porges, 1995) states when humans are not feeling threatened, the brainstem regulates vagal tone and communicates with higher level brain regions, promoting emotional regulation (Visted et al., 2017), social engagement (Geisler et al., 2013) and cognitive performance (Thayer et al., 2009), linking stress, emotional, social and cognitive abilities, leading to higher productivity and improved experience at work.

Wider systemic changes in working practices and working environments may also be causal and maintaining factors for poor mental health. Mental health difficulties in higher education employees are increasing (Urbina-Garcia, 2020) with an overall increase of 165% in referrals to occupational health between 2009 and 2015 (Morrish, 2019). Universities have moved towards a directive performance

management which has been shown to have detrimental effects on health of academics (Franco-Santos & Doherty, 2017). More recently, our work environments and ways of working have changed rapidly in response to the pandemic, negatively impacting on employee wellbeing (Carnevale & Hatak, 2020; Tuzovic & Kabadayi, 2020). Research has shown that for 2019/20, COVID-19 does not appear to be a main driver for the increase in work-related stress, but it may be a contributory factor and continue to be as the pandemic continues (HSE, 2020).

Growing interest in employee health and wellbeing has led researchers to seek to understand what interventions might help. Ruotsalainen et al. (2015) found low quality evidence for CBT or mental and physical relaxation interventions for stress reduction in the workplace. Further research has suggested the combination of person- and organisation-directed interventions show sustained positive effects on burnout including; cognitive-behavioural training, psycho-social skills and counselling (Awa et al., 2010).

Beneficial effects of workplace mindfulness training have been found on stress, anxiety, psychological distress and wellbeing (Bartlett et al., 2015; Spinelli et al., 2019), with MBSR seen as the 'gold standard' for reducing stress in otherwise healthy individuals (Khoury et al., 2015). However, the quality of RCTs has been inconsistent and conclusive evidence for MBIs as effective interventions to reduce mental health difficulties, improve wellbeing and job performance cannot be reported (Lomas et al., 2017). Contraindications have been indicated for MBIs which are not specifically tailored to the mental health difficulty (Van Dam et al., 2018). Therefore, caution should be taken when using MBIs in different populations. In addition to mindfulness, music listening has been proposed and researched for potential benefits across emotional, cognitive, and social domains.

Music listening can induce physiological change; tingling, chills, increased heart rate and reduced breathing rate (Salimpoor et al., 2009) and music and music assisted relaxation have been found to significantly reduced stress induced arousal (Pelletier, 2004). A review of 400 studies found that music positively affects neurochemicals in the reward system, social system and stress system in the brain and immune system (Chanda & Levitin, 2013). Music listening has been shown to positively effect cognition; exciting neurotransmitters critical in learning, working memory and executive functioning (Särkämö & Soto, 2012; Rickard et al., 2005; Chan et al., 1998). Evidence for music listening in the workplace has suggested positive effects. Interventions using music have shown benefit for relaxation and re-focussing (Brooks et al., 2010), reduced stress symptoms (Lai & Li, 2011; Raglio et al., 2020) and faster return to work following sick-leave, improved wellbeing and mental health outcomes. This highlights the potential for employees to benefit from music interventions.

Combining MBIs and music listening have been found to be effective at reducing stress, improving cognition and wellbeing in post-stroke rehabilitation (Baylan et al., 2016, 2019; Särkämö et al., 2008, 2014). However, some studies lack a sufficient control comparison and there is limited research in workplace settings and understanding of how combining MBIs and music listening can be used in non-clinical populations.

Study aims and objectives

This study aimed to assess the feasibility and acceptability of a randomised control trial of a mindful music listening intervention in comparison to music listening for university employees during the working day.

The study had the following specific objectives:

- Assess the feasibility of recruiting and gathering sufficient data in the population.
- Assess the acceptability of the intervention for university employees
- Explore participants' thoughts about the intervention, its' accessibility, and practicalities in the workplace.
- Collect data on the primary outcomes to inform sample size calculation for a larger trial.

Method

Design

A feasibility , parallel-arm, repeated-measures, between-groups design was employed. Questionnaires and tasks were administered at screening, baseline, and post-intervention.

The two intervention arms were:

1. Undirected music listening
2. Mindful music listening

The outcomes measured were:

1. Stress (Perceived Stress Scale-10 score)
2. Cognitive performance (sustained attention, verbal working memory and executive function)
3. Subjective wellbeing, (overall wellbeing score from PERMA profiler)
4. Mood (anxiety and depression scores from GAD-7 and PHQ-9)
5. Compassionate leadership (trait emotional quotient, overall score from TEIQue-SF)

Participants

Participants were recruited from a non-clinical population; staff working at the University of East Anglia. Convenience sampling was used. Participants were made aware of the study via email advertising through the university's standard email communications and via the university's and researchers' Twitter accounts. Data was collected remotely via an individual remote research portal accessed via the study website (listentothemusic.live). Ethical approval was gained from the Faculty of Medicine and Health Sciences Research Ethics Committee (2019/20-128). Eligibility criteria*:* Over 18 years old and able to hear (including use of hearing aids). Exclusion criteria: Previous or current mindfulness practice; scoring above threshold on mood screening tests; any diagnosed (untreated) severe mental health difficulties or recent trauma; planned extended annual leave (over five, consecutive, working days) in the intervention period.

Interventions

Participants were allocated to one of two intervention arms: experimental and control. The experimental intervention was mindful music listening, participants were instructed to engage in one of two mindfulness exercises before mindfully listening to their choice of music. The control condition was undirected music listening. It included the same instructions as the intervention aside from the mindfulness exercise and instruction to listen mindfully. In both arms participants had free choice over the music they listened to and were instructed on how long they should listen for each session. The experimental arm included the choice of one of two mindfulness exercises. The experimental intervention and mindfulness exercises were based on the MELLO study (Baylan et al., 2019). The study period lasted for eight weeks for both arms; requiring participants to listen to music, once a day, for five days per week, during the working day. The music listening time increased over

the eight-week period from five minutes to 25 minutes for the intervention arm and 10 minutes to 25 minutes for the control arm.

At the beginning of the sessions, participants were encouraged to listen to their chosen music at a time when they were unlikely to be distracted, to use headphones and to turn off all other notifications on their devices. Following each listening session, participants recorded the genre of music they listened to and rated their experience and how relaxed they felt, responding on a 10-point Likert scale. All aspects of the study were completed online, via the participants' secure remote research portal.

Measures

Demographic information was gathered from each consenting participant: age, gender, handedness, education level, professional group, years in management, contracted hours, approximate working hours, if they typically listen to music as a means of relaxation, if they play or create music as a means of relaxation and formal musical training.

Participants' mood was screened prior to randomisation using the Generalised Anxiety Disorder Scale (GAD-7; Spitzer et al., 2006) and Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001), in line with the inclusion and exclusion criteria. Both measures ask participants to consider their experiences over the previous two weeks, in relation to the questions and choose one of four options: not at all, several days, more than half the days, nearly every day. Participants who presented with a score of equal to or greater than 10 on either scale were excluded. This cut-off is in line with standard clinical symptomology taken from the Improving Access to Psychological Therapies (IAPT) guidance (The National Collaborating Centre for Mental Health, 2018).

Following randomisation, included participants were assessed at baseline and post-intervention on mood, stress, cognitive performance, and compassionate leadership using the following measures:

GAD-7 (Spitzer et al., 2006). The GAD-7 is a seven-item self-report measure assessing generalised anxiety. The GAD-7 has a sensitivity of 89% and specificity of 82% (Rutter & Brown, 2017). Total scores were calculated, with a potential range of 0-21, higher scores indicating greater levels of anxiety.

PHQ-9 (Kroenke et al., 2001). The PHQ-9 is a 9-item self-report measure and screens for depression. The PHQ-9 has a sensitivity of 88% and specificity of 88% (American Psychological Association, 2019). Total scores were calculated, with a potential range of 0-27, higher scores indicating greater levels of depression.

The Perceived Stress Scale-10 (PSS-10; Cohen & Williamson, 1988). The PSS-10 is a 10-item self-report measure of perceived stress. Participants rate their thoughts and feelings from the past month against five options: never, almost never, sometimes, fairly often, very often. The PSS-10 has a reliability (Cronbach's α) of 0.78. Total scores were calculated, with a potential range of 0-40, higher scores indicating higher perceived stress.

PERMA profiler (Butler & Kern, 2015). The PERMA profiler is a 23-item self-report measure of wellbeing. Participants rate themselves, in general, against the statements, using a 11-point scale (0 = not at all to 10 = completely). The PERMA profiler has a reliability of 0.95. Overall wellbeing was calculated using the average of positive emotion, engagement, relationships, meaning, accomplishment, and happiness was calculated, with a potential range of 0 to 10, with higher scores indicating higher subjective wellbeing.

Trait Emotional Intelligence Questionnaire – Short Form (TEIQue-SF; Petrides, 2009). The TEIQue-SF is a 30-item self-report measure of trait emotional intelligence. Participants rate their level of agreement (1= completely disagree to 7 = completely agree) to the statements. The TEIQue-SF has a reliability of 0.88. Total emotional intelligence was calculated by calculating the average of the responses, with a potential range of 0-7, with higher scores indicating higher trait emotional intelligence. Compassionate leadership, as measured by trait emotional intelligence, was chosen as it is required in the work of all employees, particularly managers (West et al., 2017). A working environment with colleagues who have low emotional intelligence is likely to be more difficult to work in and contribute to causative factors of work-related stress. Therefore, it was important to measure this and understand levels of trait emotional intelligence in the sample and the feasibility of using the measure.

Digit span backwards (NeurOn, 2020, based on Wechsler, 2008), required participants to view an increasing string of numbers, remember the string and click the numbers in reverse order. The test ended after two consecutive incorrect trials. Scores were calculated using the longest number string correctly reported. Higher scores indicated stronger verbal memory.

Trails B (NeurOn, 2020, based on Bowie & Harvey, 2006), asked participants to alternately link letters and numbers in ascending order. This was scored using the test completion time. Longer test time indicated poorer executive function.

The Sustained Attention to Response Test (SART; NeurOn, 2020, based on Robertson et al., 1997) required participants to respond by pressing the space bar

when they viewed any number, except the number 3. Commission error assessed sustained attention in the SART with higher errors indicating poorer sustained attention.

The cognitive measures were assessed using online versions of the traditional neuropsychological assessments. Psychometric properties of the cognitive measures are not provided as these have not been formally assessed and cannot be compared to traditional face-to-face administered assessments. Cognitive performance was measured as both mindfulness and music listening have been shown to have a positive impact on cognitive performance (Baylan et al., 2019; Chiesa et al., 2011; Hölzel et al., 2011; Särkämö et al., 2008).

All measures were completed online, via the study's remote research management portal (Mantal; mantal.co.uk) which links to NeurOn (neuropsychology.online). Participants were shown a demonstration video and given a trial of each cognitive test prior to completing their assessment to aid understanding of the instructions. Feedback on the acceptability of the intervention was gained post-intervention via a questionnaire.

Procedure

Participants were directed to the study website to access the participant information sheet and consent form. Informed consent was taken through the remote research portal. Following consenting, participants were assigned a unique anonymised number and directed to complete the demographics and screening measures.

Screening measures were reviewed in line with the inclusion/exclusion criteria. Included participants were pseudo-randomly allocated, balanced based on

gender, working in management and age to one of two arms (music listening or mindful music listening) by a member of the research team. Pseudo-randomisation is a method employed when it is not possible to truly randomise a sample and for convenience, for example when recruitment is ongoing and allocation to arm is staggered, which was the case in this study (Jadad, 1998; National Health and Medical Research Council, 2009; Smith et al., 2015). Participant gender, working in management and age were used to inform allocation to condition to ensure balance across both conditions. The chief investigator identified that participants were ready for allocation. Participants were allocated a participant number. A member of the research team, who did not have access to the outcomes data, completed the pseudo-randomisation based on gender, working in management and age, ensuring no influence could be given to allocation outside of these three demographics. This process was used to balance gender, managers and age across arms. Given the feasibility trial mimics a randomised control trial, we did not provide participants with information on the hypotheses which would have been tested if this was an RCT. Participants who did not meet the inclusion criteria were informed by email. If mood screening measures indicated a potential concern regarding mental health the email included signposting information to their employer support services, their GP and local NHS mental health services.

Following allocation to condition, participants watched an introductory session, completed the baseline measures, and began the intervention. Following the eight-week study period participants were directed to complete the post-intervention measures and feedback before being directed to a debriefing screen.

Throughout the intervention participants were encouraged to contact the chief investigator if they encountered technical difficulties or had questions. Participant

activity was regularly reviewed through the remote research portal and reminder emails sent to participants if they had not completed a listening session for three consecutive days.

Analysis Plan

To explore the feasibility questions recruitment and attrition rates were calculated. Data collection was reviewed and errors or missing data calculated. The acceptability of the intervention was assessed by reviewing the listening times and continuity of engagement with the intervention. Data from the qualitative feedback forms were taken and themes of responses identified. Descriptive statistics, mean difference and estimated effect sizes were calculated for each primary outcome to inform sample size calculation for a larger trial. The study has been reported in line with Consolidated Standards of Reporting Trials (CONSORT) 2010 extension for randomised pilot and feasibility trials (Eldridge et al., 2016).

Data preparation

Where participants had withdrawn or been excluded, due to lack of engagement, prior to completion of the intervention an intention-to-treat analysis was used; baseline results were carried over to post-intervention results. This ensured a conservative assessment of the efficacy of the intervention. Missing data within outcomes were handled using mean substitution imputation.

Results

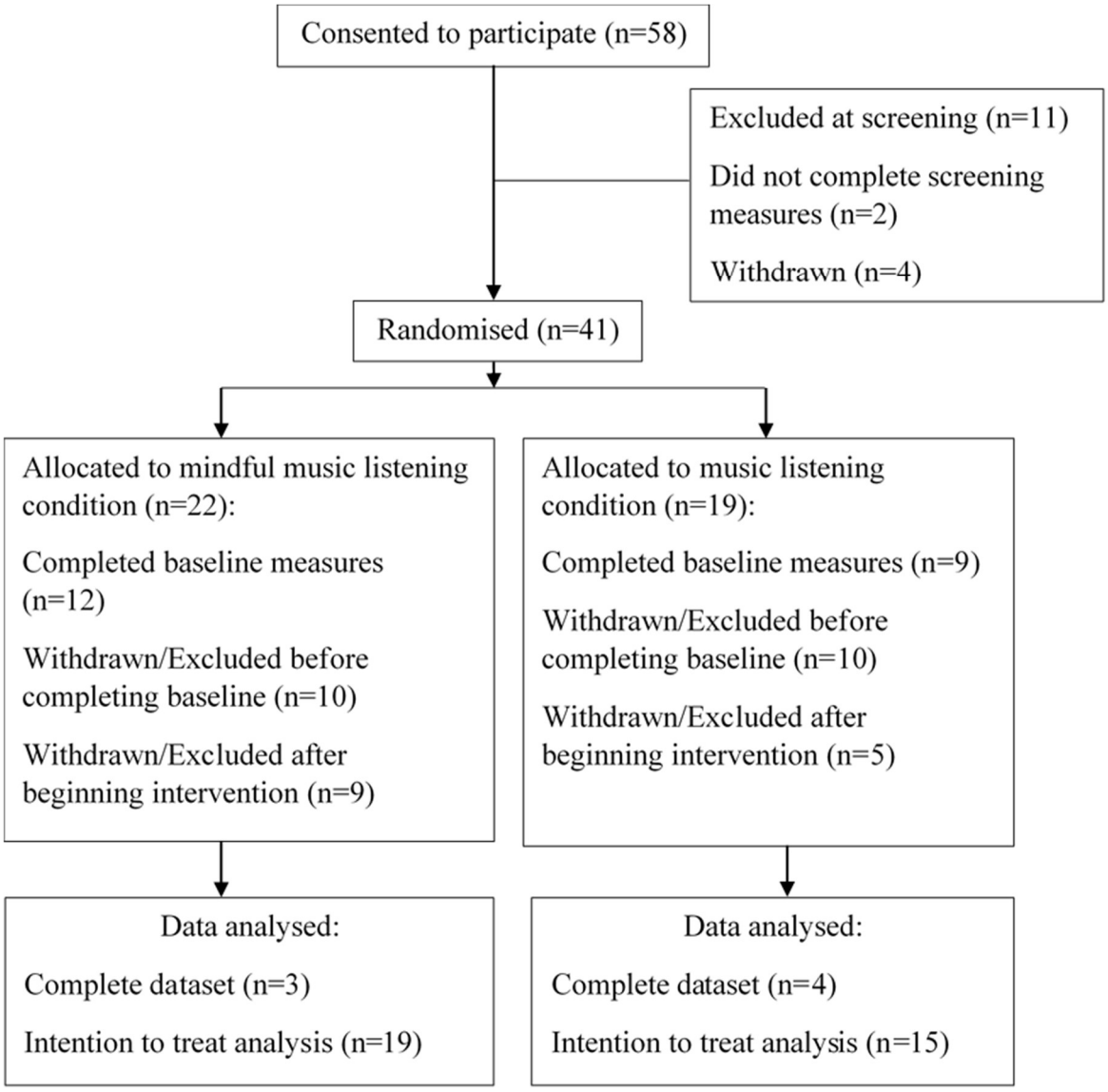
Recruitment

Recruitment ran from June 2020 to October 2020. Recruitment stopped on the 31st October 2020 due to time constraints on the period for data collection. Fifty-

eight participants consented to take part in the study. Fifty-two completed the demographic information and screening measures. Forty-one participants were allocated to either the music listening or mindful music listening condition, prior to completing the baseline measures. Of those who were not recruited into the study, 11 were excluded based on the exclusion criteria: seven scored above threshold for the mood screen, four had previous or current mindfulness practice and six withdrew from the study before completing or did not complete the measures. Fourteen participants randomised withdrew or were withdrawn from the study due to lack of engagement with the intervention. A total of seven participants completed the intervention and post-intervention measures. Figure 4.1 shows feasibility of recruitment.

Figure 4.1

CONSORT flow chart



A recruitment rate of 1.6% from the population and 14.5 participants per month were found for this study. An overall attrition rate of 88% was found from consenting to post-intervention measures; 86% for intervention and 80% for control arm. Attrition rates including participant data analysed using intention-to-treat were 49%; 43% for intervention and 55% for control arm.

Sample Characteristics

Forty-one participants were recruited to the study and randomised; 29 identified as female gender, 11 as male and one non-binary, with a mean age of 48.3 years (SD = 10.7). Sixteen participants had previous formal music training, with a mean of 2.8 years (SD=4.7) and 16 participants currently worked in management roles. Demographics for the 41 participants included in analysis are shown in Table 4.1.

Table 4.1

Sample characteristics

Variable	Whole sample (baseline N=41)			Intervention (baseline N=22)			Control (baseline N=19)		
	n (%)	M	SD	n (%)	M	SD	n (%)	M	SD
Gender									
Female	29 (70.7)			15 (36.6)			14 (34.1)		
Male	11 (26.8)			6 (14.6)			5 (12.2)		
Other	1 (2.4)			1 (2.4)					
Age		48.3	10.7		49.0	9.0		47.4	12.5
Education									
GCSE	1 (2.4)			1 (2.4)					
A Level	1 (2.4)			1 (2.4)					
Bachelor's	11 (26.8)			4 (9.8)			7 (17.1)		
Masters	10 (24.4)			8 (19.5)			2 (4.9)		
Professional Certificate	4 (9.8)			2 (4.9)			2 (4.9)		
PhD/Doctoral degree	14 (34.1)			6 (14.6)			8 (19.5)		
Contracted days		4.4	1.3		4.6	1.0		4.2	1.7
Work in management	16 (39.0)			8 (19.5)			8 (19.5)		
Years working in management		5.4	8.3		5.3	8.1		5.5	8.8
Music listening (hours)	26 (63.4)	6.5	8.7	14 (34.1)	6.7	9.3	12 (29.3)	6.2	8.2
Play/create music (hours)	19 (46.3)	3.0	5.4	8 (19.5)	1.3	2.2	11 (26.8)	5	7.3
Music training (years)	16 (39.0)	2.8	4.7	10 (24.3)	3.6	5.5	6 (14.6)	1.9	3.5

Feasibility of collecting data

Twenty participants, ten from each arm, did not complete the baseline measures and therefore were classified as missing data. A technical difficulty resulted in 12 participants results missing data for question eight of the TEIQue-SF baseline measure (Intervention [N=6], Control [N=6]). A similar difficulty occurred for one intervention participant on the post-intervention TEIQue-SF on four

questions and two intervention participants on the PERMA. Missing data on outcome measures was imputed using mean substitution. Fourteen participants did not complete the post-interventions (Intervention [N = 9], Control [N = 5]). Where participants had not completed the intervention an intention-to-treat analysis was used, as per a priori plan, and baseline results were carried over to form post-intervention results. This ensured a conservative assessment of the efficacy of the intervention.

A technical difficulty meant the following was not collected at baseline: digit span backwards (Intervention [N=2]), Trails B (Control [N=2], Intervention [N=4]), SART (Control [N=2], Intervention [N=2]). Missing data at baseline was excluded from analysis. Reviewing the SART data indicated that all of the participants had probably misunderstood the instructions (all having 100% commission errors, meaning they pressed the spacebar when a three appeared, contrary to the instructions provided). It is not clear if this is a reporting error from the system or if all participants misunderstood the instructions. Therefore, these data were not analysed. It is questionable if sufficient, robust data was gathered using a web-based platform in this sample in this study.

Acceptability of the intervention

Acceptability of the intervention was assessed through the listening logs completed by participants at the end of each listening session. For the 260 mindful music listening sessions the most common time to listen to music was 19:08 (earliest = 05:11, latest = 23:27). On average participants rated their experience as 7.08/10 (SD = 1.32) and their feeling after the session as 7.16/10 (SD= 1.35) (with 10 being relaxed).

In comparison the 216 music listening sessions were listened to most commonly at 14.54 (earliest= 06:01, latest 22:23). On average participants rated their experience as 7.76/10 (SD=1.44) and their feeling after the session as 7.88/10 (SD=1.14).

Participants who completed both pre- and post-intervention measures completed feedback forms, assessing acceptability of the intervention and active control, seven participants completed. One participant's responses were intermittently recorded by the system. Table 4.2 details the feedback.

Table 4.2

Detailed feedback from participant's who completed the interventions.

Question	Intervention Response Mean (SD) n	Control Response Mean (SD) n
How useful have you found music listening as a way of managing stress? (0= not at all, 10= extremely)	9 (1) 3	6.33 (2.08) 3
How practical was it to use music listening as a tool to manage stress and improve wellbeing in your workday? (0= not at all, 10= extremely)	6 (3.46) 3	4.67 (1.15) 3
How easy has it been to find time to listen to music in the working day? (0= not at all, 10= extremely)	4.33 (3.05) 3	5 (1) 3
During the mindfulness exercises and music listening how often did you find yourself lowering your gaze or closing your eyes?	Always 3	N/A
How have you listened to music over the past eight weeks?	My own collection (1) Music streaming platform (1) Both (1)	My own collection (1) Music streaming platform (1) Both (1)
Has the music you have been listening to been known to you (old favourites) or have you explored new music?	Combination of both new and old (3)	Combination of both new and old (3)
How easy did you find it to access the study in general, for example, use the website, complete the measures, be randomised to different 'conditions' etc.?	8.67 (0.58) 3	5.33 (0.58) 3

The feedback showed participants who completed the study period found mindful music listening more helpful as a way to reduce stress than non-directed music listening, more practical as an intervention during the working day and found the study easier to access. This is contrary to the average listening times, which shows the control group's average listening time was during the workday. The responses indicated participants from both arms found it more difficult to find time during the working day to engage in the intervention, indicated by the large range of listening times.

Four participants provided qualitative data on the intervention in helping to manage stress and improve wellbeing. One noted they typically listen to music and had hoped to have music suggested to them. Three noted positive benefits on stress and wellbeing, one pointing out the positive effect of mindfully listening to music,

> I think music is very important and I love to have music as a de stressor. I think being able to get up and dance is a great way to make you smile. Great to have the 'excuse' to listen to music for 20 minutes a day. Should be on prescription!

and

> I've found this really useful, especially the 'dissolve' on outbreath, I use this on recurring 'worry' thoughts in my head and they go away, it works really well. I've played music in my head for as long back as I can remember, and I think there is the possibility that it's my brain using music to sooth me. Thank you for having me on the study.

Five commented on the practicality of music listening as a tool to reduce stress and improve wellbeing in the workplace; finding time was noted as a

difficulty; “Not always easy to find the length of time to completely devote to listening to music.”, another participant spoke to the same point,

> I think in general it is practical if you don’t feel you have to make time for it. I actually found it harder doing this study as I felt the need to adhere completely to the task and sometimes the day would run away from me.

A further participant added to this with a suggestion of feeling the need to have permission from management,

> It would need to be something that could be put in the working diary for wellbeing/personal development. I work two days a week so I would feel uneasy taking time for it unless it was an agreed diary commitment. Due to currently working from home in the Covid pandemic I did manage a couple of mindful music listening sessions during my breaks, but they were often coupled with something else such as lunch!

Alongside this, distractions were noted as a potential difficulty which did not aid accessibility, “Sometimes difficult to not be distracted. Headphones are essential.” and a suggestion on supporting engagement was made, “I guess an app with automatic reminder would be more useful for me. One may even think to combine it to devices like Fitbit or iWatch to be able to capture other features (e.g., heartbeat) as well.”.

Five participants provided comments on the accessibility of listening to music in their working day. These included one participant noting music listening has previously been part of their working day, however, others noted difficulties managing workloads and working at home, “This was difficult sometimes: I found myself listening often in early evenings. But the work / life separation is all a bit odd at the moment because of working from home due to Covid.” and

> As in the previous comment, I always have music on when I work at home (as I have been due to Covid) and I often take 5 mins out to listen and enjoy music, or dance. It's actually harder to take 25 mins in a busy household where there are no distractions."
>
> "It's usually at the end of my working day or just before I go to bed. Both works well. I don't think I did any sessions during my working day.

However, one participant felt listening to music in the working day would be more accessible working from home than in the workplace, "Working from home in the Covid pandemic does mean you have somewhere to do the mindful listening to music. It would be difficult to find a place to do this comfortably on UEA campus". Generally, participants found it difficult to listen to music in the instructed way in their working day.

Six participants provided comments on the general accessibility of the study. Three noted technical frustrations with the remote research portal, "All fine, though one day I forgot to press the next button after filling everything and couldn't access the next day's session because of that.", "Once you'd completed a few listening sessions having to scroll through completed sessions to get to the next one was a (very minor) frustration and

> It was very well laid out and the instructions were very clear. I just had a couple of technical blips. My scores on the Pre-intervention measures didn't appear to be saving properly but I was able to redo them. A couple of sessions were very slow, and I had to refresh which sometimes lost information. One of my sessions I couldn't do towards the end of the study as

it showed that I hadn't completed hardly anything - which was a worry! Lucky all was fine the next day.

One suggested an app to provide reminders and another commented on the ease of being distracted and importance of using headphones.

Feedback received from participants who withdrew or disengaged.

Eleven participants completed feedback. The self-assessed engagement shows most participants withdrew or disengaged around week four of the study period. Figure 4.2 shows the stages reached before participants withdraw or were excluded due to lack of engagement.

Table 4.3 details the reasons participants withdrew or disengaged.

Figure 4.2

Stages reached before withdrawal/exclusion

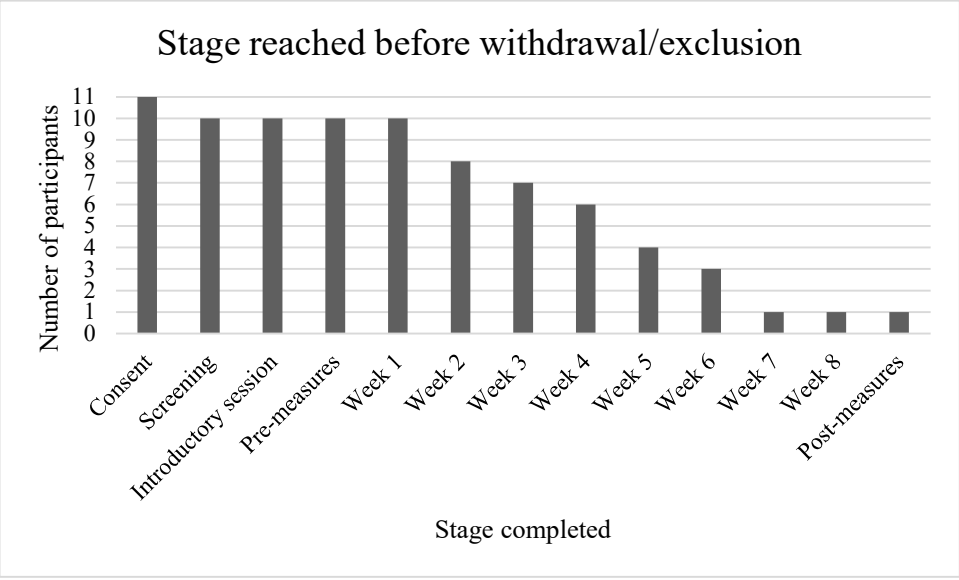


Table 4.3

Reasons for withdrawing and ease of access

Question	Response	n
Why did you choose to leave the study?	I could not find the time	8
	There were technical faults which stopped me participating	3
	I found it too stressful	2
	It was not what I expected	1
Overall, how easy did you find it to access the study in general?	Very easy	5
	Easy	3
	Okay	2
	Difficult	1

One participant noted they found the choice of two mindfulness exercises repetitive, which impeded their engagement. Two participants noted a timetable of listening and more reminders would have aided their engagement, and another noted it required access to computers and the internet which some may have been attempting to reduce in their work breaks. Nine participants felt further research in the areas of stress and wellbeing in the workplace, wellbeing interventions in the workplace, including university staff and online resources, music listening, and mindfulness warrant further investigation

Sample size calculation for a full-scale trial

Descriptive statistics were calculated for baseline and post-intervention scores on the outcomes measured. The means, standard deviations, 95% confidence intervals, mean difference and estimated effect sizes are shown in Table 4. 4. Estimated effect sizes were calculated using the post-intervention means and standard deviations to inform sample size estimation for a future trial.

Table 4.4

Descriptive statistics for outcome measures at baseline and post-intervention

Outcome measure		Baseline, n=41	Post n=41	Mean difference [95% CI]	Estimated effect size *(g)* [a]
GAD-7	Intervention mean (SD) n [95% CI] missing data	4.17 (2.08) 12 [1.61, 5.05] 10	3.67 (2.23) 12 [2.25, 5.08] 10	0.34 [1.72, 2.40]	0.15
	Control mean (SD) n [95% CI] missing data	3.33 (2.24) 9 [1.61, 5.05] 10	3.33 (2.24) 9 [1.61, 5.05] 10		
PHQ-9	Intervention mean (SD) n [95% CI] missing data	2.67 (3.63) 12 [0.36, 4.97] 10	3.33 (3.28) 12 [1.25, 5.42] 10	1.22 [1.43, 3.87]	0.42
	Control mean (SD) n [95% CI] missing data	2.56 (2.19) 9 [0.88, 4.24] 10	2.11 (2.20) 9 [0.41, 3.81] 10		
PSS-10	Intervention mean (SD) n [95% CI] missing data	14.58 (3.50) 12 [12.36. 16.81] 10	13.17 (5.29) 12 [9.81, 16.53] 10	0.27 [4.83, 4.29]	0.05
	Control mean (SD) n [95% CI] missing data	14.22 (3.96) 9 [11.18, 17.27] 10	13.44 (4.42) 9 [10.05, 16.84] 10		
PERMA	Intervention mean (SD) n [95% CI] missing data	6.75 (1.23) 12 [5.97, 7.53] 10	6.80 (1.29) 12 [5.98, 7.62] 10	0.83 [1.83, 0.17]	0.76
	Control mean (SD) n [95% CI] missing data	7.45 (0.62) 9 [6.97. 7.93] 10	7.63 (0.72) 9 [7.08, 8.18] 10		
TEIQue-SF	Intervention mean (SD) n [95% CI] missing data	4.66 (0.48) 12 [4.36, 4.97] 10	4.84 (0.63) 12 [4.44, 5.24] 10	0.41 [0.99, 0.17]	0.66
	Control mean (SD) n [95% CI] missing data	5.18 (0.64) 9 [4.69, 5.67] 10	5.25 (0.62) 9 [4.69, 5.67] 10		
Digit span backwards	Intervention mean (SD) n [95% CI] missing data	6.60 (1.43) 10 [5.58, 7.62] 12	6.80 (1.55) 10 [5.69, 7.91] 12	1.36 [0.74, 3.46]	0.62
	Control mean (SD) n [95% CI] missing data	5.78 (1.48) 9 [4.64, 6.92] 10	5.44 (2.70) 9 [3.37, 7.52] 10		
Trails B	Intervention mean (SD) n [95% CI] missing data	44.25 (10.03) 8 [35.87, 52.63] 14	44.25 (10.03) 8 [35.87, 52.63] 14	3.82 [8.68, 16.32]	0.34
	Control mean (SD) n [95% CI] missing data	49.00 (26.72) 7 [24.29, 73.71] 12	40.43 (12.39) 7 [28.97, 51.89] 12		

[a] Hedges g effect size has been reported as sample sizes for each group were different. Interpretation: 0.2 = small, 0.5 = medium, 0.8 = large effect size.

Discussion

The aim of this study was to assess the feasibility of recruiting and collecting data, assess the acceptability of mindful music listening in the workplace, and collect data for primary outcomes to inform sample size calculation for a larger trial. The study provides rich evidence on the feasibility and acceptability of both mindful music-listening and music listening as interventions in the workplace. The outcomes of the study will now be discussed.

A major issue was the surprisingly low overall recruitment level of 1.6%. Difficulties in recruitment were anticipated and several steps were taken to overcome this. Study adverts were circulated weekly for three months in school newsletters, university wide communications and promoted by the Vice Chancellor. Regarding retention, this study had large attrition rates of 86% for the intervention and 80% for the control arm. In comparison to studies researching mindfulness this is large. A meta-analysis of mindfulness training in healthcare professionals found attrition rates ranged from 0 to 56% (Spinelli et al., 2019). Studies employing music interventions have also previously reported lower rates 27% (Kacem et al., 2020) and 15% (Giordano et al., 2020). Several factors may have influenced the low uptake and high attrition rates. This study was undertaken three months following the first COVID-19 national lockdown, which saw many employees move to working from home. This has blurred the separation between work and homelife, increased demands on attention and focus (Kaushik & Guleria, 2020) and has had a well-known negative impact on employee wellbeing (Carnevale & Hatak, 2020; Tuzovic & Kabadayi, 2020) and setting aside time to engage in research may have felt an additional

burden. Participants may have also found the utilisation of technology burdensome, as it is likely their use of computers and screens would have increased through this period and adding in an additional task which required using computers, tablets, or smartphones may have led to fatigue and attrition. All of these are likely to have negatively impacted on the recruitment and attrition rates for this project.

The sample characteristics suggest the data represents those working in educational and research roles, rather than the breadth of roles employed within a university, limiting the generalisability. Participants from educational and research roles may have more autonomy over their time and more frequent access to technology which may have been a barrier to recruitment from a wider range of university employees. This was not impeded by the eligibility criteria, which were appropriate; exclusions based on safeguarding against potential harms and to manage confounding variables.

Baseline measures were completed post-randomisation due to an ongoing recruitment process. There are limitations to this methodological choice, as it may allow for bias of results; participants may adapt their responses to potentially fit the intervention or researchers may be biased by the results when allocating to arm. The most robust method would be to have all participants complete baseline measures pre-randomisation, to minimise potential for bias. A further risk potential for bias is the use of pseudo-randomisation, which may be more prone to bias than true randomisation, which would be the method of choice for a future fully powered randomised control trial.

Completing measures remotely led to several data issues. Data imputation methods were used to rectify missing data; however, this posed problems with the robustness of the data (Musil et al., 2002). Collecting cognitive performance data via

the remote research portal proved difficult; data were missing, and it appeared participants misunderstood instructions of the SART. Participants did watch instructional videos and complete trials before completing the assessments, however it was not possible to review responses for understanding and completion. Face-to-face assessments or instantaneous review may have avoided confusion and missing data.

The listening time data indicates the control arm found the music listening intervention more acceptable to complete in the workplace/during working hours as participants typically engaged in the intervention during working hours. Qualitative feedback shows the intervention arm found mindful music listening useful to reduce stress and acceptable in the working day. If the participants withdrew, this was mostly linked to a perception of not having time to engage.

It was not possible to assess if participants followed the intervention instructions. It was likely that there were differences in how participants approached the study. This was drawn from the understanding of when the majority of participants listened to music; not during the working day as instructed and many required regular prompting to continue to engage in the study. It was clear from the feasibility and acceptability data that this area of research is needed and warranted. Fifteen percent of participants expressed an interest in this, and related topics being explored and many suggestions on how the intervention and accessibility could be improved were made.

Using the post-intervention means and standard deviations to estimate a sufficiently powered sample size for a larger trial, the results suggested a larger trial would need to recruit an estimated sample size of 102 participants for statistically significant results change to be found for wellbeing ($a = 0.05$, $1-\beta = 0.8$). This may

support any suggestion that the intervention has potential as a workplace wellbeing intervention, in line with previous findings for music (Lesiuk, 2005, 2010; Smith, 2008) and mindfulness interventions (Bartlett et al., 2019; Spinelli et al., 2019) in the workplace.

Typically, core mindfulness exercises use the breath or body as anchors throughout the exercise, using voiced prompts to bring the attention back to the anchor. Kabat-Zinn expands on these anchors in 'Full Catastrophe Living' stating "as long as you are awake you can be mindful. All it takes is wanting to and remembering to bring your attention to the present moment" (Kabat-Zinn, 1990, p.437). The exercises listed in this core text also include a sitting with sounds exercise, which is suggested to also be used with music. Full Catastrophe Living (Kabat-Zinn, 1990) details the content of the Mindfulness Based Stress Reduction (MBSR) programme founded in Massachusetts. MBSR has a large evidence base and has been shown to have a large effect on outcome measures of mental and somatic health and quality of life (de Vibe et al., 2017). The experimental arm of this study utilised mindfulness exercises and asked participants to listen to their music of choice mindfully following the guided exercise. Although this did not include prompts to return their attention to an anchor, for example the breath or body, this is consistent with MBSR, Baylan et al. (2019) and Särkämö & Soto (2012). Mindfulness based interventions include mindfulness meditation as well as present moment awareness and being mindful in the everyday. Mindful music listening could be considered a hybrid of the two.

Implications for future research

A strength of the study is the feasibility and acceptability data collected. This provided important information for future trials and suggests potential for mindful music listening as a workplace wellbeing intervention. There are limitations to this study which alongside the feasibility/acceptability data can be carried forward into future, larger scale studies.

Future studies would need to recruit for a minimum of seven and a half months [sample size calculation = 102 participants (Cohen's $d = 0.5$, $\alpha = 0.05$, $1\text{-}\beta = 0.8$ using an independent sample t-test)]. To support recruitment of larger samples face-to-face screening could be considered to allow for thorough risk assessment and more nuanced inclusion criteria, not solely based on clinical thresholds. Recruiting from a variety of workplaces would increase generalisability and allow understanding of factors and/or groups difference in engagement. It would be important to continue to explore MBIs in public sector workplaces and promoting self-awareness and care for mental health as a cost-effective intervention.

To support sustained engagement researchers should engage with employers on promoting the intervention to ensure participants feel they have permission to engage fully and provide frequent reminders to support participant engagement. It would also be important to widen the reach of recruitment, through engaging with teams and not relying solely on promotion via email communications. Investigating fewer outcomes may allow for more regular assessment and understanding if there is a minimum dose effect for the intervention without increasing participant burden. Calculating reliable change would support the understanding of change which may not be indicated by clinical significance. To ensure sufficiently robust data are collected ensuring clarity of participant instructions, including if they should restrict

their usual music listening activity to reduce the impact of extraneous variables and thorough testing of reporting systems to ensure data collection.

Conclusion

This study has provided a rich understanding of how feasible the intervention and active control have been in the workplace for university staff. Although no conclusions could be drawn on the efficacy of mindful music listening as an intervention to reduce stress, improve wellbeing, compassionate leadership, and cognitive performance, further research, with larger sample sizes may be able to understand the potential effect of mindful music listening as a wellbeing intervention and is deemed important by employees.

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Chapter Five

Additional Methodology

Additional Methodology

This additional chapter will provide further description of the methods and procedure and consideration to choices made which are not covered in the systematic review and empirical paper, due to word count.

Systematic Review

Quality assessment

The quality of included studies was assessed using the Cochrane Risk of Bias tools: Risk of Bias 2.0 (ROB 2.0; Sterne et al., 2019) and Risk of Bias in Non-Randomised Studies of Interventions (ROBINS-I; Sterne et al., 2016). These tools were chosen as they are recommended by Cochrane Handbook of Systematic Reviews of Interventions (Higgins, et al., 2020) and are common tools used in the wider literature. They provide a conservative estimate of risk of bias by using the least favourable assessment across the domains. Different versions of the tool are available for different study designs, which was appropriate for this meta-analysis and systematic review as it included studies of interventions not exclusive to randomised control trials. The appropriate tools were chosen for the designs employed by included studies in this review: randomised, crossover and non-randomised. However, it has been found to be a complex tool which does require extensive knowledge of research design and statistics prior to use (Minozzi et al., 2020).

Other assessment tools are available to assess the quality of studies, for example, JADAD Scale for Reporting Randomised Controlled Trials (Jadad et al., 1996), Critical Appraisal Skills Programme checklists (CASP; CASP, 2020) and the Newcastle-Ottawa Scale (Wells et al., 2011). These tools were not chosen as the JADAD assesses fewer domains, the CASP is only recommended as an educational

tool and does not recommend using a score system, and the Newcastle-Ottawa is for non-randomised designs only.

Empirical Paper

Design

The original design of a mixed pilot and feasibility study using a pseudo-randomised, parallel-arm design was chosen. This was deemed appropriate as a within-groups design would not sufficiently control for interference of mindfulness, the active variable of interest in the intervention. As outlined in the introduction of the empirical paper, little is known about the use of mindful music listening in the workplace. When an intervention is novel it is common practice to use pilot and feasibility studies to scope out the area of interest and begin to understand if interventions are feasible and acceptable in the chosen population before conducting larger main studies.

A pilot study is defined as a version of a main study, run in miniature, to test if aspects of a larger study will work together, with a focus on the processes of the study (Arain et al., 2010; National Institute for Health Research, 2019). This differs from a feasibility study that seeks to estimate parameters which support the design of main studies, for example; number of eligible participants, response rates to questionnaires, adherence and compliance rates (Arain, et al., 2010; National Institute for Health Research, 2019). A mixed design was chosen to enable the testing of the intervention whilst also asking feasibility questions to inform future larger scale studies.

The pilot part of this study sought to test hypotheses and answer research questions and ensure that all aspects of the intervention and active control ran smoothly. The hypothesis and research questions for the study were;

1. Does mindful music listening improve participants cognitive performance and wellbeing compared to music listening?
2. Mindful music listening will result in a greater reduction in stress as evidenced by a reduction in subjective stress measured by the Perceived Stress Scale.
3. Is there a difference in effectiveness of the intervention at different levels of stress?
4. Is there an effect of mindful music listening on compassionate leadership?

The feasibility part of this study sought to assess the feasibility and acceptability of the intervention in the workplace and estimate sample size for a future trial.

Convenience sampling was used, and participants were made aware of the study via email advertising via the university communications and Twitter (Appendix G).

As the original study aimed to test hypotheses sample size was calculated based on previous effect sizes in the literature, for stress; 0.56 (Bartlett et al., 2019) and 0.52 (Spinelli et al., 2019). An a priori sample size calculation (Appendix H) was conducted using GPower (Faul et al, 2007). A total sample size of 94 was calculated. It was decided, a priori, if this was not achieved the study would report on recruitment rates as part of feasibility.

Participants

Participants were recruited from staff working at the University of East Anglia (UEA). The UEA employees 3,712 staff (UEA, 2020). All staff were made aware of the study via email communications including a promotional article in the university wide communications, via weekly school bulletins and via the university

and researchers Twitter. Fifty-eight employees expressed an interest and consented to participate in the study.

Participants were subject to the following inclusion and exclusion criteria:

Inclusion criteria:

1. Over 18 years old
2. Ability to hear (including use of hearing aids)
3. Employed at the University of East Anglia.

Exclusion criteria:

1. Currently practicing mindfulness or previous, routine, mindfulness practice
2. Scoring in the severe range on mood screening tests
3. Any diagnosed (untreated) severe mental health difficulties or recent trauma
4. Planned extended annual leave (over five, consecutive, working days) in the intervention period

The above criteria were set to ensure that all participants were employees of UEA and not students. Participants also needed the ability to hear as both the intervention and control utilised music listening. Mood assessed to be in the severe range and diagnosed, untreated, mental health difficulties or recent trauma were excluded as this is not a clinical intervention. It would not be appropriate for participants to feel they were gaining support for their mental health needs, which would not be monitored or risk assessed by a healthcare professional. The clinical cut-off used were in line with standard clinical symptomology taken from the Improving Access to Psychological Therapies (IAPT) guidance (The National Collaborating Centre for Mental Health, 2018). IAPT offer evidence-based psychological interventions for common mental health disorders. These cut-offs were deemed appropriate as the sample was drawn from a non-clinical population

and therefore, more comparable to the population seen in IAPT services than secondary mental health services who support individuals with severe and enduring mental health difficulties. The cut-offs also supported risk management, allowing participants with greater need to be signposted to the appropriate services. Annual leave of over one working week within the intervention period was avoided to ensure continuity of the intervention and reduce the risk of confounding variables.

Intervention

The intervention for this study, mindful music listening and intervention period, were inspired by the Measuring the effects of listening for leisure on outcome after stroke (MELLO) study and utilised the same mindfulness exercises (Baylan et al., 2019). Their study sought to understand the effect of mindful music listening on post-stroke outcomes. Participants were asked to listen to between 5 and 25-minutes of music per day. Increasing the listening time to thirty minutes music listening per day, five days per week for the final four weeks of the intervention was chosen in line with previous research into music listening (Lai & Li, 2011; Raglio et al., 2020). Increases in listening time over the intervention period was also in line with many teachings of mindfulness which introduce the idea of mindfulness to the new participant and then gradually build up exercises and length of time spent in mindful practice. Consideration was also given to session length in relation to the working day. The UK Government set out in law that workers who work six hours or more, per day, are entitled to one uninterrupted 20-minute break (UK Government, 2020), therefore this would provide opportunity for participants to complete the intervention in their work breaks, if they chose. The intervention period is also in line with a review of mindfulness interventions which found significant changes occurred after eight-weeks (Chiesa et al., 2011). Therefore, this was chosen to not over burden

participants. Table 5.1 details the increasing intervention length across the study period.

Table 5.1

Intervention Plan

Week	Active Control: Music listening	Intervention: Mindful music listening (mindfulness/music listening)
	Time in minutes	
1	10	10 (5/5)
2	15	15 (5/10)
3	20	20 (5/15)
4 to 8	25	25 (5/20)

Participants were free to choose their own music and were signposted to music streaming sites if they did not have their own catalogue. Free choice of music has been found to improve positive affect and cognitive performance (Lesiuk, 2010; Krause et al., 2015; Liljeström et al., 2013; Sloboda, 2010). Therefore, it was imperative to give participants free choice to ensure they had autonomy over their music selection.

Measures

Screening measures

The Generalised Anxiety Disorder Scale (GAD-7; Spitzer et al., 2006) and Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001) were used to screen participants' mood. The GAD-7 is a 7-item self-report measure and screens for generalised anxiety disorder and was developed to increased recognition of GAD in primary care settings (Rutter & Brown, 2017). The PHQ-9 is a 9-item self-report measure and screens for depression (Kroenke et al., 2001).

The mood screening measures were set at a cut-off of greater than or equal to 10 for both the GAD-7 and PHQ-9. The GAD-7 was originally validated in a

primary care population, which would be the most appropriate fit for the study's non-clinical population, in which a clinical cut-off of greater than or equal to 10 indicated moderate to severe difficulties with 89% sensitivity and 82% specificity (Spitzer et al., 2006). The PHQ-9 clinical cut-off of greater than or equal to 10 has 88% sensitivity and 88% specificity (Kroenke et al., 2001; Levis et al., 2019).

The GAD-7 and PHQ-9 were chosen as mood screening measures as they are accessible to all, reasonably short and have been validated in the general population (Löwe et al., 2008; Martin et al., 2006). They also provide an assessment of risk for self-harm/suicide within them which is imperative as they were completed without face-to-face assessment and both are used regularly within low intensity mental health services in the National Health Service (NHS) (The National Collaborating Centre for Mental Health, 2018).

Consideration was given to the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983), Positive and Negative Affect Schedule (PANAS; Watson et al., 1988) and Profile of Mood States (POMS; McNair et al., 1971), however, it was felt as both GAD-7 and PHQ-9 had strong psychometrics, were short, assessed risk and were routinely used in NHS services these were most suitable as screening measures for this study.

Outcome measures

Several assessments were used to assess the effect of mindful music listening. All measures were completed online, via the remote research portal, pre- and post-intervention.

Mood was assessed using the GAD-7 and PHQ-9, as at screening.

The Perceived Stress Scale-10 (PSS-10; Cohen & Williamson, 1988) is a 10-item self-report measure which is accessible and has been mainly empirically used in

student and worker populations across the world (Lee, 2012). The PSS-10 was selected as the psychometric properties were found to be superior to that of the 4- and 14-item versions (Lee, 2012).

Wellbeing was assessed using the PERMA profiler (Butler & Kern, 2015). This draws on Seligman's (2011) definition of wellbeing as five pillars which act as the building blocks of wellbeing: positive emotion, engagement, relationships, meaning and accomplishment. The PERMA profiler is a measure of these pillars and negative emotion and health. It is a 23-item self-report measure which uses a 11-point scale (0-10). This measure was chosen as it provides an overview of participant's subjective wellbeing and allowed us to consider the individuals wider wellbeing and understand it in relation to work-related stress. The author, Peggy Kern, states there are no clear cut-offs but does suggest the following guidance on interpretation; Languishing, below 5; sub-optimal functioning, 5-6.4; normal functioning, 6.5-7.9; high functioning, 8-8.9; and very high functioning 9 and above (https://www.peggykern.org/questionnaires.html).

The Trait Emotional Intelligence Questionnaire – Short Form (TEIQue-SF; Petrides, 2009) was used to measure compassionate leadership. This measure is based on trait emotional intelligence theory, which understands emotional intelligence as a personality trait (Petrides et al., 2007) and measures typical behaviours in emotive situations and self-rated abilities and are seen to give a good prediction of behaviour in a range of situations as well as being correlated to job satisfaction and performance (O'Connor et al., 2019). O'Connor et al.'s review (2019) recommends Trait emotional intelligence measures be utilised in research, particularly research set in workplaces and specifically recommend the TEIQue-SF. The TEIQue-SF is a 30-item self-rated form which asks participants to rate

themselves on a seven-point scale. Compassionate leadership as measured by trait emotional intelligence was chosen as it is required in the work of all employees, particularly managers (West et al., 2017). A working environment with colleagues who have low emotional intelligence is likely to be more difficult to work in and contribute to causative factors of work-related stress. Therefore, it was important to measure this and understand levels of trait emotional intelligence in the sample and any potential effect of mindful music listening on it.

Cognitive performance was measured online via the study's remote research management portal, Mantal, and linked to NeurOn. NeurOn provides online administration and reporting of cognitive assessments. Digit span backwards was chosen as a measure of verbal working memory. Trails B measured processing speed, selective attention and executive function and SART measured sustained attention. These specific cognitive abilities were chosen to be measured as previous research has shown that mindful music listening has had a positive effect on these abilities (Baylan et al., 2019).

The feasibility aspects of the study were assessed by reviewing the number of participants who expressed an interest in the study, reviewing the compliance to the interventions using the participants' daily session log and reviewing participant feedback at the end of the study.

Procedure

Interested parties were directed to visit the study webpage (listentothemusic.live) where they could access further information about the study or email the chief investigator via email. Participants were able to read information about the research team, the basic aims of the study as well as access the participant information sheet (Appendix I) and consent form (Appendix J).

Once completing the consent form, participants were directed to complete the demographics form and screening measures; GAD-7 and PHQ-9. The chief investigator assessed if participants would be included or excluded based on the results of the demographics and screenings measures, in line with the inclusion/exclusion criteria.

Participants who did not meet the inclusion criteria received an email stating they have not been included in the study. If the screening measures suggested serious concern for the participants mental health the chief investigator contacted the individual, via email, encouraging them to seek support from their manager, GP and/or occupational health department for further support. Appendix K details the signposting information sent to participants.

Participants who met the inclusion criteria were randomised to either the experimental or control condition and received an email inviting them to an introductory session, available via the remote research portal. Included participants watched a recording of an introductory session facilitated by the chief investigator. The session included further information on the study, instructions on the assessments undertaken before the study begins and directions on how to use and demonstrations of the remote research portal and music platforms. Participants were encouraged to email any questions to the chief investigator, and these were answered via email. Those randomised to the mindful music listening intervention were provided with a basic introduction to and experiential practice of mindfulness. The session lasted approximately twenty minutes. Following this, participants completed the baseline measures and intervention, outlined in chapter four.

Participants randomised to the experimental arm were asked to engage in one of two five-minute mindfulness exercises (Appendix L) before listening, in a mindful way to music.

On logging in to their remote research portal, participants saw an instruction screen and were instructed to complete their music listening at a time when they were unlikely to be disturbed. This could be completed at any time within a 24-hour period. All participants were asked to log the genre of music they listened to, how they found their listening experience and how they felt following it. If the activity log indicated participants had not engaged for three consecutive days, a reminder email was sent asking them to either continue to listen to their music or to advise if they would like to withdraw.

Following the intervention period, participants were instructed to complete the post-intervention measures (a repeat of the pre-intervention measures) and a feedback form. At the end of the study participants were shown a debrief screen and prompted to indicate if they would like feedback on the study and access to the mindfulness exercises.

Ethics

Guidelines on ethical research practice were consulted throughout the research process (BPS, 2014; UEA, 2019) and the chief investigator completed the NHS Good Clinical practice training prior to commencing the research.

Participant and Public Involvement

Participant and public involvement was conducted during the planning and development of the study. Two members of NHS staff were consulted on the design of the project as consideration was given to the feasibility of the intervention in the wide range of workplace settings within the NHS. Additionally, the participant

information sheet, consent form and protocol were reviewed by the two members of staff and feedback considered. As discussed in Chapter two, this study was originally designed to be undertaken within the NHS staff population. Due to COVID-19 and restrictions on non-essential research in the NHS, this was not possible, and the study was modified to recruit from staff at UEA.

Once recruitment had begun, a member of UEA staff highlighted they did not feel represented on the gender question of the demographics form. This resulted in a meeting to discuss their concerns and potential revisions of the demographics form to ensure it was as inclusive as possible to the LGBTQ+ community. The option of non-binary was added to the gender demographic question.

Following the intervention, participants were asked to complete a feedback on the intervention. An equivalent feedback form was sent, via email, to all participants who had withdrawn from the study to gain feedback and ascertain the reasons why they withdrew. These data were used to inform the acceptability questions outlined in the empirical paper.

Informed Consent

Informed consent was taken electronically via the remote research portal once participants had read the participant information sheet, consent form and had any questions answered by the research team. Consent was gained by participants checking the boxes and electronically selecting next on the remote research portal. Consent was retaken at the beginning of the intervention.

Mental Capacity

Mental capacity was assumed, in line with the Mental Capacity Act (2005) as participants were sampled from a non-clinical population. This was not formally

assessed and could not have been as the study was conducted entirely remotely, with no interaction between participants and the research team except via email.

Confidentiality

Confidentiality was upheld, in line with the Data Protection Act (2018) and General Data Protection Regulation (2018). All non-anonymised participant information (names, email address) were stored on the UEA secure server, accessible only to the research team on password protected spreadsheets. Once this information was no longer needed it was deleted. All anonymised data were stored on the UEA secure server or secure anonymised platform (NeurOn), accessible only to the research team. Research data will be archived at UEA for 10 years, after which it will be destroyed (UEA, 2018).

Participants were emailed with reminders and encouraged to continue to engage in the study. Participants were able to email the chief investigator should they experience any technical difficulties or wish to withdraw from the study. Participants had the right to withdraw at any stage of the intervention and could do this by notifying the chief investigator by email. Internal UEA emails are encrypted, ensuring all information remains confidential. Once emails have been received the information was saved to the secure server and deleted from the inbox and once no longer needed, deleted.

Risk

Mood was assessed at screening. The measures included a question specifically about risk of harm to self. If participants scored in the severe range on the screening measures they were informed and signposted to local support services. One participant felt it was unnecessary for them to be excluded as their mental health needs were being met by the relevant services. Email communication was sent to the

individual from the research team expressing understanding for their frustration and explaining the process of gaining ethical approval and the due care and diligence required to all who may express and interest in the study. In line with this the participant was excluded from participating, signposted and thanked for their interest.

Analysis plan

Descriptive statistics were calculated for the data. Further inferential statistics were not conducted as the sample size was small and the study was underpowered. Attempting to investigate for significant differences would have been invalid. Comparisons of baseline demographics (age and gender) and outcomes were conducted using independent samples t-tests, Mann-Whitney U and Fisher exact tests. The results of the assumptions for parametric and non-parametric tests are detailed in Appendix M.

If the sample size was large enough, independent groups t-test would have been used to compare the groups for pre-post differences for the outcomes measured. Before inferential statistics were conducted the data would have been checked for the assumptions of parametric tests; one continuous dependent variable, categorial independent variable with two groups, independence of observations, no outliers, data are approximately normally distributed (tested through visual screening and Shaprio-Wilks tests) and homogeneity (Levene's test). Indication of these tests not being met would be given by the alpha value being less than or equal to 0.05. If either of these were not met the non-parametric equivalent, Mann-Whitney U test would be conducted.

The assumptions of the non-parametric tests would need to be met for this to be conducted; one dependent variable measured using continuous or ordinal data,

one independent variable consisting of two categorical groups, independence of observations and the distribution of scores for each group have the same shape. If these were met a Mann-Whitney U would be conducted and reported using median comparison. If the distribution of scores were different the mean ranks differences would have been reported.

Data Imputation

There are two main ways to manage missing data; deletion or imputation. Each method has a variety of methods, all with costs and benefits. For the participants who did not complete the post-intervention measures, intention-to-treat analysis, using last observation, was used to handle whole outcome missing data from participants who had completed pre- but not post-intervention measures as they had withdrawn from the study. If data were missing at pre-intervention this was not included in the analysis as it was not possible to infer the participants' results and pairwise deletion was used in the calculation of descriptive statistics. Pairwise deletion excludes cases on each outcome measure and results in different sample sizes for different measures. This was deemed appropriate for this data as it would not result in multiple datasets being deleted across outcomes, as would be the case with listwise deletion. At baseline whole data sets were missing for 9% of participants on digit span backwards and 28% on Trails B.

If data were partially missing, for example responses within an outcome measure, responses were imputed. This was deemed appropriate as the sample was small and to ensure as much data as possible was available for analysis. measures were continuous; therefore, the following imputation options were considered; mean, median, mode, multiple imputation and linear regression. Different imputation models are recommended depending on the pattern of the missing data, missing

completely at random (MCAR), missing at random (MAR) or not missing at random (NMAR). Caution in interpreting results should be taken when using any data imputation methods as they can bias the variance and underestimate error (Kang, 2013).

As the partial missing data were due to a system error this was deemed MCAR. MCAR is defined as missing randomly and without underlying reasons connected to the other variables or other factors (Musil et al., 2002). Partial missing data were present at baseline on the TEIQue-SF on one question for 12 participants. The TEIQue website (psychometriclab.com) advises users to handle missing values by entering the middle value, 4, except when more than 15% of values are missing or to use value imputation procedures. Missing data from the TEIQue-SF pre-intervention was explored in two ways, entering the middle value and using mean substitution. Mean substitution was calculated (M=3.3) and used to impute the missing data. The value was rounded down to three in line with the whole number options on the questionnaire and to ensure a conservative estimate of overall trait-emotional intelligence. Comparing mean substitution and middle value substitution resulted in a difference of 0.03 for overall compassionate leadership for 57% of participants. As this was a small difference it was felt using mean substitution and using a more conservative estimate was appropriate, particularly in this small sample. Post-intervention partially missing data were present for two participants on PERMA and one on TEIQue-SF. Data were imputed in the same way, using mean substitution to ensure consistency of approach.

Chapter Six

Additional Results

Additional Results

This chapter provides more detailed demographic information and further details of participants' engagement in the intervention and active control, for example listening times and music genre. It also considers the data of the seven participants who completed the intervention and understanding changes seen post-intervention.

Demographics Information

For the 41 participants whose data were analysed, further exploration of the impact of previous music use and training was completed. See Table 6.1 for descriptive data. Overall, levels of music listening, music playing, and formal music education were relatively low. As no significant change was seen on any of the primary outcomes it is not possible to draw conclusions on the impact of previous music listening habits, music playing/creating or formal music training on the efficacy of the intervention.

Table 6.1

Music use and education prior to study for 41 participants included in data analysis.

Variable	Whole sample (baseline n=41)			Intervention (baseline n=22)			Control (baseline n=19)		
	n (%)	M	SD	n (%)	M	SD	n (%)	M	SD
Music listening (hours)	26 (63)	6.5	8.7	14 (64)	6.7	9.3	12 (63)	6.2	8.2
Play/create music (hours)	19 (46)	3.0	5.5	8 (36)	1.3	2.2	11 (58)	5	7.3
Music training (years)	16 (39)	2.8	4.6	10 (45)	3.6	5.5	6 (32)	1.9	3.5

Main outcome measures

Independent samples t-tests were conducted to compare scores at baseline. Assumptions of normality and homogeneity were met for all outcome measures and age except digit span backwards. Digit span backwards was assessed using Mann-Whitney U test. The groups did not differ significantly at baseline: age (t (19) =-.923, p=0.367), GAD-7 (t (19) = -.880, p=0.390), PHQ-9 U = 47.50, z = -.477, p = 0.651, PSS (t (19) = -.221, p=0.827), PERMA (t (19) = 1.570, p=0.133), digit span backwards U = 33.5, z = -.963, p = 0.356, Trails B U = 26.5, z = -.174, p = 0.867. Non-parametric tests were conducted for PHQ-9, digit span backwards and Trails B as the data did not meet the parametric assumptions. TEIQue-SF was found to be statistically significant at baseline (t (19) =2.143, p=0.045). A Fisher's exact test was conducted between gender and arm as the data did not meet the assumptions for Chi-Square. The groups did not differ significantly at baseline for gender, p=0.796.

Table 4.4 showed that the means and standard deviations overlap. Pre-post differences were calculated, however inferential statistics were not performed on these data because the data did not meet the assumptions required for these statistics. Non-parametric tests were not conducted as 14 datasets included intention-to-treat analysis and seven included imputed and missing data meaning the data would not have the power to inform any definitive conclusions.

Further analysis of the seven participants, who completed the intervention period, for the outcomes measured is considered here. Participants were sampled from a non-clinical population; therefore, it is unlikely that clinical levels would be met or change be over those thresholds in this sample. Three ways of assessing change were explored; clinically relevant change, comparison to non-clinical norms and reliable change.

Clinically relevant change

Clinically relevant change is assessed through cut-offs on validated outcome measures. Two participants in the control group moved from medium to low levels of stress (six- and two-point reductions). Two participants in the intervention group remained in the low levels of stress groups but saw a seven- and eight-point reduction within the low category. This could indicate clinically relevant change following the mindful music listening intervention.

Comparison to normative data

Normative data is data collected from the wider population and used to define what is typical within that population. Making comparisons of participant data against normative data is common practice in neuropsychological assessment and can usually be compared on other variables such as age groups and/or gender. Table 6.2 outlines the sum scores and percentiles for each participant pre- and post-intervention on each primary outcome where normative data was available.

Table 6.2

Outcome scores and percentiles

		GAD-7		PHQ-9	
Arm	Participant	Baseline	Post-intervention	Baseline	Post-intervention
		Sum score (percentile)	Sum score (percentile)	Sum score (Percentile)	Sum score (Percentile)
Control	1	5 (77.5)	6 (82.7)	3 (63.1)	3 (63.1)
	2	6 (82.7)	4 (70.5)	4 (72.3)	1 (39.3)
	3	4 (70.5)	5 (77.5)	3 (63.1)	1 (39.3)
	4	3 (61.2)	3 (61.2)	2 (51.9)	3 (63.1)
Intervention	5	5 (77.5)	1 (38.7)	0 (16.4)	3 (63.1)
	6	2 (50.4)	3 (61.2)	0 (16.4)	3 (63.1)
	7	5 (77.5)	2 (50.4)	0 (16.4)	2 (51.9)

Mood. Normative data for the GAD-7 was taken from Löwe et al. (2008) who gathered data from 5030 members of the general population. The normative data shows a score of greater or equal to eight means less than 10% of the population

scored higher on the measure. The seven participants who completed the intervention period's data were compared to the normative data.

When comparing participants' scores with the normative data for the GAD-7, we can at baseline see that one participant's score fell in the 82.7th percentile, meaning 17.3% of the population scored higher than them. Three of the seven participants scores fell in the 77.5th percentile, meaning 22.5% of the population score higher than them. At post-intervention four participants' scores reduced or remained stable, meaning four of the participants' scores were below that scored by 70% of the population. Three of the participants' scores increased by one point from baseline to post-intervention. This is not clinically significant change and may be attributed to typical fluctuation in mood over time.

Normative data for the PHQ-9 was taken from Kocalevent et al. (2013) who screened 5018 members of the general population. The normative data showed a score of greater than or equal to eight means less than 10% of the population scored higher on the measure. Four participants' scores increased from baseline to post-intervention, indicating a higher level of depression. One remained stable and two reduced. At baseline three participants scored zero, meaning 83.6% of the population scored higher than them for depression. No participants scored 0 at post-intervention. One participant scored two, meaning 48.1% of the population scored higher than them at baseline. This was the same at post-intervention. Two participants scored three at baseline, meaning 36.9% of the population scored higher. Four participants scored three at post-intervention. One participant scored four at baseline, meaning only 27.7% of the population scored higher.

Other outcomes. No normative data were available for the PSS-10, PERMA profiler or freely available for the TEIQue-SF or cognitive measures.

Reliable change

Reliable change is a statistical technique which specifies the amount of change that must be shown on an outcome measure, pre- to post-intervention, for the change to be deemed reliable (Jacobson et al., 1984) and is defined as change which is not attributable to measurement error.

Mood. Calculating reliable change (Jacobson et al., 1984) showed that one participant in the intervention group showed significant reliable change on the GAD-7 pre- to post-intervention. There was a reduction in GAD-7 mean score for the intervention group. The control group remained static.

Two intervention participant's GAD-7 scores changed reliably pre-to-post intervention, using the normative sample standard deviation (3.41) and Cronbach's alpha (0.89). One reduced from five to one, indicating a reliable change of 2.50, the second from five to two indicated a reliable change of 1.88. Therefore, it is possible to conclude the change seen in these two participants is reliable and not attributable to measurement error. Both participants were in the mindful music listening arm.

No reliable change was found for any participants' PHQ-9 scores using the normative sample standard deviation (3.52) and Cronbach's alpha (0.87). For PHQ-9 the levels of low mood increased slightly for the intervention group and reduced for the control group. This could be an effect of mindfulness – increased awareness and attention on emotional experience and possibly openness to this experience. In comparison to music which could be understood as a distraction tool and therefore temporarily lift mood. The unknown impact of COVID-19 and the national measures are also hard to understand how they are impacting on the participants – isolation, caring responsibilities, carer burnout, working from home, increased workload,

physical health, mental health. Overall, further analysis of the seven participants who completed the intervention has found some reliable change for anxiety.

Acceptability data

Acceptability of the intervention was further assessed through the listening logs completed by participants at the end of each listening session.

Music listening

Data from the daily music listening logs for each group was analysed. For the 260 mindful music listening sessions the most common time to listen to music was 19:08, with the earliest listening time at 05:11 and the latest at 23:27. On average participants rated their experience as 7.08 (SD = 1.32) and their feeling after the session as 7.16 (SD= 1.35) (with 10 being relaxed). The most popular genres of music were classical (n=56), pop (n=50) and other (n=26).

In comparison the 216 music listening sessions listened most commonly at 14.54, with the earliest listening time at 06:01 and the latest at 00:24. On average participants rated their experience as 7.76 (SD=1.44) and their feeling after the session as 7.88 (SD=1.14). The most popular genres of music were classical (n=58), pop (n=46) and electronic dance (n=26). Table 6.3 outlines the listening habits of the participants who completed the intervention/active control period.

Reviewing the listening times across the eight-week intervention period, it was most common for participants to listen to their music during the working day in the first four weeks. There was a trend towards participants listening after working hours. Participants in the intervention arm typically listened to their music in the evening. Table 6.4 details the listening times across the intervention period.

Table 6.3

Listening log data for seven participants who completed the intervention

Participant	Arm	Consecutive listening	Listening time Mode (range)	Top 3 genres	Experience of listening	Feeling after listening
1	Control	8 weeks	19:13 (07:13, 20:07)	Classical Pop Instrumental	7.25	7.38
2	Control	8 weeks	14:55 (06:01, 18:00)	Classical Electronic dance Instrumental	7.10	7.73
3	Control	4 weeks, 2week break, 4 weeks	14:18[b] (09:57, 19:32)	Pop Electronic dance Other	7.55	7.95
4	Control	4 weeks, 1week break, 4 weeks	09:29 (07:55, 19:05)	Pop Classical Folk	8.56[a]	8.36[a]
5	Intervention	8 weeks	18:23 (09:29, 22:42)	Other Electronic dance Rock	7.22[a]	7.16[a]
6	Intervention	8 weeks	13:28 (08:58, 22:33)	Pop Country Musical theatre	7.28	7.56
7	Intervention	8 weeks	15:55 (09:36, 20:51)	Classical Rock Folk	8.21[a]	7.72[a]

[a] missing data from log, [b] mean calculated as no modal value.

Table 6.4

Listening times across the study period

Participant	Arm	Intervention week							
		1	2	3	4	5	6	7	8
		Mean (range)							
1	Control	16:10 (12:38, 17:53)	15:33 (07:13, 18:05)	16:45 (07:49, 19:44)	17:35 (10:22, 19:54)	18:19 (13:43, 19:49)	16:13 (12:47, 19:01)	19:30 (18:35, 20:07)	19:20 (18:41, 20:01)
2	Control	10:31 (08:07, 14:42)	09:27 (06:49, 12:22)	12:25 (06:59, 15:46)	09:46 (06:23, 14:55)	08:55 (06:28, 12:21)	11:54 (06:01, 18:00)	08:50 (06:13, 12:05)	08:27 (06:33, 11:58)
3	Control	13:57 (11:13, 17:22)	14:34 (12:18, 17:30)	14:29 (10:17, 16:19)	13:04 (10:55, 16:44)	14:00 (09:57, 17:03)	15:55 (13:24, 19:32)	14:29 (11:04, 19:15)	13:54 (10:05, 16:05)
4	Control	10:03 (07:55, 15:43)	10:56 (09:16, 13:28)	09:32 (08:05, 12:39)	10:19 (08:06, 14:02)	12:54 (09:24, 19:05)	12:36 (10:28, 15:14)	12:37 (09:19, 15:15)	09:07 (08:27, 09:52)
5	Intervention	17:30 (13:37, 20:04)	18:11 (12:18, 22:13)	19:40 (17:43, 22:08)	19:27 (16:12, 21:33)	16:41 (09:29, 19:44)	18:28 (17:44, 19:14)	17:48 (12:19, 19:33)	20:45 (18:23, 22:42)
6	Intervention	14:05 (13:20, 16:40)	19:32 (13:23, 22:33)	20:52 (20:19, 21:44)	19:01 (11:54, 21:02)	20:58 (20:13, 22:17)	20:34 (20:07, 20:56)	19:30 (12:50, 22:08)	18:08 (08:58, 20:43)
7	Intervention	14:43 (13:07, 18:20)	18:06 (15:56, 20:28)	14:59 (09:36, 17:26)	15:52 (11:10, 19:09)	17:40 (15:16, 20:51)	19:23 (18:30, 20:19)	18:36 (15:50, 20:23)	18:48 (17:42, 19:10)

Qualitative feedback on the feasibility and acceptability of the intervention in the workplace

Participants who completed the intervention provided information on their music choices during the intervention period. The majority of responses indicated that participants used a small selection of genres in the intervention. “Disco music has been uplifting while classical music has been helpful to be reflective. Both are relaxing to me in different ways. Useful to know how music helps.” and “Initially tried to mix up the genres but then mostly stuck to classical and alternated between familiar works and new ones.” and “I find electronic dance music or slow Indy music the best. The Magnetic Fields are pretty wonderful for music mindfulness”.

One participant commented on the feeling they associated with their music choices and the resulting impact on their stress levels,

“My choice of music was predominantly upbeat as it is uplifting, motivates me and helps me to destress. My music choices included new material from favourite artists. This was uplifting and took me back to my younger days where I would excitedly head to my bedroom with a new cassette tape and immerse myself in the music and lyrics”.

One participant noted the beneficial effect of the intervention on their sense of relaxation, “There were a few sessions where I just fell asleep on the sofa, and that was nice giving myself permission to just stop and relax.”

Two participants provided ideas on future direction for research.

“I would be interested if one also would combine (at least) 30 minutes’ walk outside with listen to the music. I did everyday in addition, and this reduces considerably my "stress" feelings.” and “It would be interesting to see differential effects of e.g.,

classical (piano) versus trance/dance music or instruments only versus a song by a singer".

Two participants provided further positive feedback. "Really enjoyed taking part. I'll miss hearing the Breath and Body Scan exercises!" and "Very useful and appropriate to most situations now that portable music is so prevalent". This feedback indicated, overall, the experience was positive, and participants explored a range of genres and were able to find ones they found had a positive and desired impact on their mood and wellbeing.

All participants who completed the intervention requested a summary of the results and copies of the mindfulness audio files which will be provided to them via email. Wider dissemination of the findings will be shared with the UEA Health and Social Care Partners and the Pro Vice-Chancellor for Research and Innovation, who supported the project's change in recruitment from NHS to UEA employees and a poster presentation at the UEA Doctorate in Clinical Psychology Research Conference, 2021.

Chapter Seven

Extended Discussion and Critical Evaluation

Extended Discussion and Critical Evaluation

This chapter will synthesise the findings from the systematic review and empirical paper, giving consideration to how they relate to the wider literature. A critical evaluation of both is given, including ideas on how the work could be improved. Learning from both papers is discussed alongside future directions and clinical implications.

The thesis portfolio aimed to understand the use of music as a workplace intervention for stress and wellbeing and to pilot a mindful music listening intervention in the workplace and test its effect on promoting wellbeing, cognitive function, compassionate leadership and reducing stress. This topic is of increasing importance as work-related stress and subsequent mental health difficulties are increasing in prevalence within the NHS workforce (NHS, 2020) and the need to explore and employ interventions to support staff has been propelled to the fore since the COVID-19 pandemic. In response to the pandemic, in March 2020, all non-essential research was halted in the NHS. Therefore, this study was adapted to consider how music interventions are used across workplace settings and the empirical study focused on university staff, who are also facing increases in work-related stress and mental health difficulties (Morrish, 2019; Urbina-Garcia, 2020).

To answer the first objective, understanding the use of music as a wellbeing intervention in the workplace, a systematic review and meta-analysis were conducted to review the current literature on workplace music interventions for stress reduction and improving wellbeing. This included an assessment of the quality of the current evidence, provided a pooled estimate of effect on wellbeing and narrative synthesis. This was followed by an empirical study which aimed to pilot a mindful music

listening intervention and assess the acceptability and feasibility of the intervention in the workplace, to answer the second objective.

The systematic review found the use of music interventions in the workplace is an area of interest and potential use in relation to reducing employee stress and improving wellbeing with significant effects of music listening found for reducing stress. This is in line with previous reviews which found medium and large effects of music interventions on reducing stress from a variety of sources and across settings (de Witte et al., 2020; Pelletier, 2004). The review found some evidence of effect of music listening on stress and wellbeing and active music making on wellbeing in the narrative synthesis. Two studies (Bittman et al., 2003; Wachi et al., 2007) followed a specified group protocol (HealthRHYTHMS) across both single and multiple sessions and found significant effects on wellbeing. However, studies using other group active music making methods showed mixed evidence for effects on wellbeing, irrespective of intervention length. The meta-analysis, including four studies, found no significant effect of music interventions on wellbeing from studies employing a randomised control trial design. This is in contrast to previous reviews which found positive effects of music listening and singing on adult's wellbeing (Daykin et al., 2018).

The empirical paper took a novel intervention, mindful music listening, from the stroke-rehabilitation literature (Baylan et al., 2019) and sought to explore its' use as an intervention in the workplace to reduce stress, improve wellbeing, cognitive performance and compassionate leadership. The main finding from the pilot questions was that no significant effect was identified on any social, emotional, or cognitive outcomes measured. Estimated effect sizes indicated non-significant medium effects for depression, compassionate leadership, verbal working memory

and large effects for wellbeing. The verbal working memory finding and feasibility of the intervention is in line with research employing mindful music listening (Baylan et al., 2019) and music listening in clinical populations (Baylan et al., 2016; Särkämö et al., 2014). This is supported by brain imaging which showed listening to music led to grey matter volume increases in frontal and limbic areas in comparison to listening to audiobooks and control groups (Särkämö et al., 2014). Although the current study did not find significant changes on outcomes it is not appropriate to state that there is not an effect, and this may be seen with a larger sample size. These studies drew on clinical populations in their samples. This may have been a factor leading to different effects being seen as participants drawn from clinical populations were also receiving post-stroke rehabilitation and were perhaps more motivated to regularly engage in the intervention as part of the wider rehabilitation.

Although the main objective of the original pilot study was not met it did provide valuable information on the feasibility and acceptability of mindful music listening as an intervention in the workplace with a non-clinical sample. It was clear from the qualitative feedback from both participants who withdrew/disengaged and completed that this was an acceptable and feasible intervention. As discussed in the empirical paper, participants enjoyed the intervention, requested continued access to the mindfulness exercises and many felt it was beneficial.

Overall, this thesis has taken a step towards understanding the use and effect of music interventions in the workplace for stress, wellbeing, cognitive performance, and compassionate leadership. It has outlined the potential of music listening and making as workplace interventions for stress and wellbeing and mindful music listening for mood, cognitive performance, compassionate leadership, and wellbeing. A moderate risk of bias was identified in all included studies; this along with

methodological weaknesses and small sample sizes means the conclusions drawn should be viewed with caution. The methodological issues highlighted, implications for clinical practice and ideas for future research will be discussed in this chapter. This thesis adds to the evidence base as it widens the scope of understanding from previous reviews which have been limited to music listening only, randomised control trials, limited time periods, or are not focussed on workplace interventions (Daykin et al., 2018; de Witte et al., 2020; Pelletier, 2004). It also provides directions for future research into the area drawing on the feasibility results outlined.

Given the initial plans for the empirical study, to pilot mindful music listening in NHS staff, it is important to consider what can be learnt from both studies for this population. Many of the studies included in the meta-analysis and systematic review used samples from healthcare professions. Therefore, the conclusions drawn are likely to be generalisable to this population. The outcomes measured in the empirical paper relate to skills used daily by healthcare workers, for example trait emotional intelligence, verbal working memory and executive function. The pandemic has led to an increase in stress and mental health difficulties across employment sectors. Therefore, drawing on a population, university employees, who have experienced changes to their working lives and subsequent stressors, albeit with a reduced risk of infection and contact with patient deaths, increases the generalisability of the estimated effects and feasibility and acceptability data to the NHS workforce.

Conclusions from participants completing the intervention period

Further analysis of the seven participants who completed the intervention period was conducted. Levels of previous music listening, playing/creating and education were low and therefore not suggestive of a moderating effect. In

comparison to normative data (Kocalevent et al., 2013; Löwe et al., 2008) the mood measures for both groups fell below that of approximately 80% of the population for anxiety and 70% of the population for depression following the intervention. Mindful music listening saw a greater reduction in anxiety than music listening. Two participants in the experimental arm saw a reduction from the 77.5th percentile to 50.4th and 38.7th percentiles post-intervention, indicating a reduction in anxiety scores. This finding was also supported by the reliable change finding; the same two participants' change was deemed reliable using the reliable change index (Jacobson et al., 1984). One participant in the control arm saw a reduction from the 82.7th to 70.5th percentile. Three participants (control =2, intervention =1) saw an increase in anxiety, one control participant remained static. However, this was not the case for depression. All participants in the experimental arm saw an increase in depression scores and two participants in the control arm saw a reduction in depression scores, from 72.3rd and 63.1st percentiles to the 39.3rd percentiles, indicating at post-intervention 60.7% of the population had higher levels of depression. No reliable change was found for depression. These preliminary findings are in contrast to the findings of Baylan et al. (2019) who saw no change in mood measures post-intervention. However, it is likely this is due to variation in the data due to a small sample size, therefore no conclusions can be drawn.

Participant music choice was reviewed. Participant's choices ranged from classical to rock, this is of interest as they do not match with the evidence of musical features and subsequent effects on underlying physiology. Many participants listened to upbeat, uplifting music stating they found it aided motivation and reduced stress. Listening to music with stimulative features (faster tempo, complex melody) has previously been found to lead to increases in physiologic measures, for example,

heart rate, blood pressure and breathing, and the opposite when listening to more sedative music (Bernardi et al., 2006; Blood & Zatorre, 2001; Geden et al., 1989; Oyama et al., 1987a; Savan, 1999; Updike & Charles, 1987). Pelletier (2004) also found preferred music may be too stimulating and distracting for individuals rather than relaxing. However, preferred music was favoured by participants in this study and align with findings from the systematic review (Eslami et al., 2018; Lai & Li, 2011; Lesiuk, 2005, 2008, 2010). However, the measures in the current thesis were limited to subjective measures and cannot account for objective, physiologic measures. Given this, further understanding of the physiologic effect of the music and mindful music intervention would have been useful to compare to the subjective accounts and further the understanding of how genre and musical features affect the outcomes measured.

Analysis of the listening logs provided supplementary acceptability evidence of the intervention during working hours. The most common for participants to listen to music mindfully was early evening (mode = 19:08, range= 05:11, 23:27). The most common listening time was 14:54 (range = 06:01, 00:24). Traditionally, this would be considered outside of the typical 0900-1700 working hours. However, it is not clear if participants were working flexibly due to changes in working practices as a result of the pandemic or not. Therefore, conclusions about the acceptability of the intervention in the workplace remain unclear. It could be hypothesised that the music listening group found the intervention more accessible during the working day. Reviewing the means and ranges of the listening times across the weeks, three participants in the control arm listened within the working day most consistently across the intervention period. Listening times for all participants varied across the intervention period with trends towards an increase in listening after work.

However, the range of times around the modal values were large for both groups (05:11 – 00:24), indicating participants were not always following the intervention instructions and therefore this may not be the most accurate indication of acceptability.

Methodological considerations

Heterogeneity was prominent across studies included in the meta-analysis and narrative synthesis. The measures used to assess stress and wellbeing were varied and included both validated and non-validated outcomes. The evidence for music listening either individually or as a group suggested significant effects on subjective and objective measures of stress (Eslami et al., 2018; Lai & Li, 2011). The evidence for the effect of music listening on wellbeing was mixed; shorter interventions appearing to have a more robust effect, with lengthier interventions, up to 15 weeks, finding no effect (Delerue & Rabusseau, 2020).

Heterogeneity was also present in the operationalisation of outcomes. Wellbeing is defined in different ways in the literature. Positive psychology defines wellbeing through the lens of 'flourishing' and draws on five pillars of wellbeing (Seligman, 2011). Whereas the World Health Organisation (WHO) define wellbeing in a more holistic way, incorporating physical, social, and mental wellbeing (WHO, 2020). Dodge et al. (2012) argue that previous literature has clarified dimensions of wellbeing rather than defining it. However, Stewart-Brown (2013) reviewed definitions across social science research and concluded that an agreed definition of wellbeing is more than the absence of illness, is holistic and focuses on the importance of relationships. The lack of an agreed definition impedes homogeneity in the literature and synthesis of the current evidence base.

A lack of shared operationalisation of wellbeing is evident in the included studies. Wellbeing is measured using outcomes focused on burnout or compassion fatigue (Maslach Burnout Inventory) or mood (Hospital Anxiety and Depression Scale, State Positive Affect, Trait Anxiety Inventory, Profile of Mood States, Beck Anxiety Inventory). These are aligned with the WHO definition used for the purposes of this review (WHO, 2020). However, it could be said that this is too inclusive and does not separate wellbeing from affect or mood.

Using a different operationalisation of wellbeing may have meant a meta-analysis would not have been possible and fewer studies included in the narrative synthesis. The same could be said of the stress measures as these include outcomes which are open to subjectivity on completion. For example, two studies used stress outcomes specific to work and two used measures drawing on stress not specific to the work environment. It would not be possible to understand how much weighting participants would have given to the impact of work on their stress levels. There is also potential crossover between stress and wellbeing as some of the measures used in assessing wellbeing could be understood as resulting from stress, for example, insomnia, anxiety, and depression. Using wide operationalisations of concepts could be considered a limitation of the review.

Descriptive statistics were calculated to explore the results of the empirical study. It was not appropriate to undertake inferential statistics as the study sample size was small, with a large proportion of missing or imputed data, the data did not meet the assumptions of parametric statistical tests and the descriptive statistics indicated very little change and large confidence intervals for several of the outcomes measured. Confidence intervals provide information on the range in which one can be 95% confident the ‘true’ finding lies. Larger sample sizes lead to smaller

confidence intervals on results and therefore we could be more confident of the 'true' effect of the interventions. The confidence intervals reported in the empirical paper are large, affecting the accuracy and robustness of the estimated effects. Small sample size was also detected in a number of the studies in the systematic review (Delerue & Rabusseau, 2020; Giordano et al., 2020; Hilliard, 2006; Kacem et al., 2020; Lesiuk, 2008, 2010; Phillips et al., 2020). Typically, this was overcome by the use of randomised crossover, quasi-experimental or interrupted time series designs which are not deemed as strong as RCT designs in the hierarchy of evidence (Evans, 2003).

The pandemic negatively impacted on the study. The empirical study was conducted three months after the first UK national lockdown in response to the pandemic. The first national lockdown led to a number of significant changes to the working habits of employees and pressures on public sector workers and researchers. The initial plans for the pilot study were changed; participant group, remote introductory session, consenting and collection of outcomes and no objective measures of stress (heart rate variability). It is unclear what impact this had on recruitment, engagement and attrition, but it is likely this was negative. The research team found that participants required regular prompts, particularly during the summer period. Five participants completed the intervention across eight consecutive weeks. Sixteen participants included in the empirical study did not complete the intervention without more than one break of five days and many did not report if they had planned to take annual leave at short notice. This is known from out of office email responses to study engagement reminders and emails advising participants had been on annual leave and would continue participating.

This study had a low recruitment rate (1.6%) and high attrition rate (88%). In comparison to studies of similar music listening interventions this is large. Kacem et al. (2020) reported an attrition rate of 27.1% and Giordano et al. (2020) a rate of 15%. Models of understanding high attrition rates will now be explored.

The high attrition rate and lack of completion in all but seven participants could be understood by the wheel of change model (Prochaska et al.,1992). This model understands behaviour change in six stages: pre-contemplation, contemplation, preparation, action, maintenance and relapse. Participants who expressed an interest in the study and completed the screening measures were likely to have moved from pre-contemplation through to preparation/action. However, at this stage they disengaged from the intervention, which could be understood as a relapse from undertaking a behaviour change. Those who engaged in the intervention and withdrew or disengaged struggled to stay in the maintenance stage and embed their new behaviour into their routine.

Given the high attrition rate in this study it would be important to consider how future interventions could be designed in a way that may reduce the risk of this. The behaviour change wheel (Michie & Johnston, 2012) could aid this development. The behaviour change wheel has at its centre, three core elements which are required for behaviour change to occur: capability, motivation and opportunity. The framework suggests in order for behaviour change interventions to be successful it is important to understand the context in which the intervention is going to be undertaken and describes the APPEASE tool to inform intervention design. This tool looks at assessing the affordability, practicability, effectiveness and cost-effectiveness acceptability and side effects/safety of interventions.

It could be hypothesised that those who withdrew or disengaged from the study saw a reduction in one or more of these elements, particularly given the changes to many aspects of working and wider life in response to the pandemic.

The mindful music intervention studied in the empirical paper was reviewed prior to recruitment by two public sector workers, with secondary aims of further developing understanding of the feasibility and acceptability of it. It would be important for future studies to consider behaviour change models and tools when designing interventions to support them to have the best chance at success. The current findings suggest key issues to consider would be employees feeling they have support from managers, for example agreements on time to set aside, frequent reminders and ease of access to the intervention.

Some participants mentioned that they did not feel confident spending time out of work engaging in the intervention. This is a common theme noted in research seeking to understand how engagement can be supported in workplace initiatives. Research has also identified perceived support from co-workers and managers and working in human resources to be predictors for engagement in workplace wellbeing initiatives (Talati et al., 2020). Laverack (2017) state that for behaviour change and health promotion interventions to be successful strong policy frameworks and supportive environments need to be in place.

Stress has been shown to negatively impact on our cognitive abilities, particularly during times of increasing uncertainty and where safety can feel threatened, for example during a global pandemic (Boals & Banks, 2020). This may impair flexible thinking, planning and organisational skills. One mechanism through which this could be understood is mind wandering (Banks & Boals, 2017). Mind wandering may help explain the high attrition rate and irregular engagement seen in

the empirical study. It could be hypothesised that when perceived levels of stress increase it becomes more difficult to problem solve and engaging in new activities, particularly ones which require attentional focus becomes more difficult. It could be said that participants were too stressed to have the capacity to think about how they could address their stress. This is in line with research which has shown pressurised environments and a lack of time act as barriers to implementing and engaging in workplace health and wellbeing initiatives (Quirk et al., 2018).

Researching cognition and emotion in relation to interventions present methodological challenges. Emotion and cognition can fluctuate across time and be affected by a number of individual and environmental factors, for example, tiredness, distraction, substances, stress, noise, hunger. Typically, research is reliant on subjective measures which may be bias by the participant, extraneous variables, or demand characteristics. A pre-post design also presents challenges in measurement, particularly for cognitive assessments. Cognitive assessments typically rely on novelty as a key cognitively challenging feature and many assessments use alternates or specify a time-period between assessments. It is possible that practice effects could skew the results of Trails B cognitive task although no change was seen from pre- to post-intervention assessment, but this would be important to consider in future studies. The use of objective measures to supplement subjective reports would have strengthened the methodology and results, particularly in relation to stress and this would further the understanding of the mechanisms of mindfulness. However, this was not possible during the intervention period as face-to-face research was not permitted.

Theoretical implications

Previous research has suggested that psychological changes seen as a result of music interventions are through the mediation of mood and emotion (Landay & Harms, 2018). Mindfulness is said to mediate psychological changes through increasing attention to internal and external experience and promoting emotional regulation (Grecucci et al., 2015). The findings in this portfolio may show some support for these understandings; a positive effect of workplace music interventions was found on stress and estimated medium effects on depression and wellbeing and reliable change was seen in two participants from the intervention group for anxiety. Both groups saw increases in overall wellbeing and trait emotional intelligence, albeit non-significant. These findings suggest, with a larger sample size there may be an effect of the both the intervention and active control on mood and wellbeing. Although the changes were not analysed for significance, it is likely this was due to the small sample size and large proportion of data imputed via intention-to-treat analysis, these results may add to the larger understanding of the mechanisms of music and mindfulness in social, emotional and cognitive domains.

Implications for clinical practice

Stress and wellbeing can be viewed as indicators of future mental health and chronic stress and poor wellbeing can lead to more severe and enduring mental health difficulties as well as cognitive decline (Arango et al., 2018; Lupien et al., 2018; Mukhara et al., 2018; Ouanes & Popp, 2019; Särkämö & Soto, 2012; Sheth et al., 2017). As work-related stress and subsequent mental health difficulties continue to increase (Health & Safety Executive, 2020), the role of employers, mental health services and clinical psychologists to identify and provide evidence-based treatments becomes more imperative.

The current evidence reviewed demonstrates that music interventions have scope to support employee mental health, but more is to be learnt about the most effective interventions, minimum intervention periods and the possible effect of untrained facilitators. The strongest evidence is for individual music listening interventions where a level of choice is given over music selection. Cost-effectiveness and ease of accessibility are particularly important as staff support services are increased across the NHS and clinical psychologists offer effective, evidence-based interventions. Preliminary evidence suggests music interventions are cost-effective in healthcare settings (Bittman et al., 2003).

These findings demonstrate there is more space for creativity and the use of creative art, which can be personalised and culturally inclusive, when addressing staff wellbeing and mental health interventions more widely. This is in line with the wider literature on the positive effects of arts interventions in the workplace (Phillips & Becker, 2019). In clinical practice it would be important to consider service-users' use of music and explore its use alongside psychological interventions. As the need for services increases it will be important to consider how the use of readily available and accessible tools like music can be integrated with evidence-based approaches to support engagement and person-centred care to reduce stress and support wellbeing across both clinical and non-clinical populations.

Strengths and limitations of the thesis portfolio

Even though no significant change was seen on any outcomes measured in the empirical study the thesis has both strengths and limitations to be considered. The feasibility information gathered from the study is useful in considering next steps in research. This allowed for an understanding of recruitment and attrition rates, how participants engaged with the intervention, their experience of it, reasons

for withdrawal and suggested areas for future research. The methodological design of the study is a strength. Employing a randomised control design is seen as the most rigorous way of determining cause and effect between interventions (Kendall, 2003). The use of an active control allowed for the 'active' ingredient of mindful music listening to be understood in comparison to music listening and controlling for extraneous variables. The pilot element of the design has allowed for the intervention to be trialled and difficulties to be highlighted. A larger scale study may be warranted for the outcomes with medium and large estimated effects. The findings from both the systematic review and empirical paper have added to the evidence-base by synthesising and understanding the effect of a wide range of workplace music interventions on stress and wellbeing and piloting a novel intervention in the workplace. The findings can be used to inform the future development of creative and accessible music interventions for employees.

The small sample size meant the empirical paper was underpowered and is a limitation of the study. However, participants who expressed an interest were from a range of roles within the university, supporting the sample being representative of and generalisable to the population from which it is drawn. Limited sample sizes or use of crossover design to ensure sufficient sample size for power was noted in the wider literature reviewed, suggesting it may be a difficulty faced by other researchers. Increasing uptake and sustained engagement in interventions would be imperative to improving understanding and the quality of the research. This could be addressed by continuing to recruit until a sufficient sample is gained, promoting the study widely and repeatedly across multiple research sites and minimising exclusion criteria.

Missing data from the neuropsychological tests is a further limitation. Whole outcome missing data at baseline was not included in the calculation of descriptive statistics. If participants did not complete post-intervention, last observation carried forward was used. Partial missing data within measures was treated using mean substitution, this was chosen as the data was missing completely at random and the mean is a reasonable estimate of a random observation. Data imputation methods were chosen as they allowed for the variance of analyses to be lower and avoid reducing the sample size. It was also felt beneficial as the analysis was limited to descriptive statistics and therefore additional bias was not added to inferential statistical analysis. Although this is of benefit to the sample size and power of the study, data imputation methods also negatively impact on the quality of the data, for example underestimating variance and reducing the true representativeness of the sample.

The use of remote, computerised neuropsychological assessments present benefits and weaknesses for this study. This allowed the study to continue and for ease of engagement during a time when it was not possible to gather data from face-to-face participant contact. Research has shown strong associations (r=0.49-0.66), ecological and construct validity between self-administered assessments via computer programs compared to face-to-face assessments (Chaytor et al., 2020; Lunardini et al., 2019) and may reduce errors of test administration (Galindo-Aldana et al., 2018); but this is a relatively new way of working that requires thorough investigation as it is likely nuances in the assessment may be missed and does not align with the experience of missing data in this study. Other issues including data security and ensuring understanding, particularly for individuals presenting with cognitive difficulties continue to be debated (Miller & Barr, 2017). However, as

demonstrated in this study, it is imperative that data collection methods are robust and do not lead to missing data or incorrect tests being assigned. This could be addressed by thoroughly piloting data collection systems, having live interpretation of remote assessments to ensure the participant had understood task instructions and datasets are complete. The pilot data could also be included in the larger trial which would increase sample size.

Suggestions for future research

As the prevalence of work-related stress and mental health difficulties increase it is important to synthesise the current literature base to work to improve accessibility and engagement in interventions. The evidence for effect of workplace music interventions on stress and wellbeing remains unclear and a large proportion of the evidence was not quantitatively reviewed by meta-analysis due to the level of heterogeneity in design, intervention, and outcome measures. Future research should seek to understand and expand on the current understanding, by considering larger scale RCTs, reported in line with CONSORT guidance and seek to minimise potential bias.

Research should seek to explore which types of interventions are most effective; group, individual, active, passive, led by trained music professional or untrained facilitator. Within this exploring effect of musical genre, prescribed vs self-selected music and greater use of standardised measures. Detailing instructions provided to participants and compliance with these would be important to understand, for example listening to music via headphones or facilitation by a trained professional compared to self-guided. Qualitative findings from the empirical paper suggested that participants found the use of headphones helpful in minimising distractions and supporting focus and this may have an important role in engagement

with and adherence to intervention. Group sessions employing a protocol and facilitated by trained professionals were found to be effective in the measures of wellbeing (Bittman et al., 2003; Wachi et al., 2007). Further exploration of potential moderating variables could support the design of the most efficacious evidence-based interventions.

Further supplementary analysis of physiological markers of stress could be further investigated to act as an objective measure alongside the more subjective measures of questionnaires. Utilising both subjective and objective measures could give a clearer understanding of the 'true' effect of interventions including music and mindfulness, although it is recognised these are often invasive and can in themselves elevate the natural stress responses.

Individual factors and music factors which may also have a mediating role could be further explored. Previous musical training and music listening habits may have a mediating role in the effect of music-based interventions. Future research conducted into music-based interventions should seek to gather this information as part of the demographic data and explore this in analysis. Further analysis of the music listened to, including; tempi, melodic content, rhythmic content, genre could be useful as this could inform any possible physiological effects of the music being listened to by participants and how this may interact with any other possible effects of the intervention.

Once the most effective interventions have been described it would be useful to further this by understanding the minimum intervention period required. As noted in the behaviour change literature and from qualitative feedback in the empirical study support from managers and co-workers is likely to support engagement in workplace wellbeing initiatives. Trialling interventions for different periods would

further the understanding of minimum intervention periods required. Longer periods of interventions may be scrutinised by employers and employees and negatively affect uptake of intervention in trials or in practice. The behaviour change wheel (Michie & Johnston, 2012) could be used to inform how best to engage workplaces with interventions. Without motivation, one of the three key elements outlined, it is unlikely capability and opportunity will be found.

To support organisational uptake of potential interventions, further analysis of economic impact of music interventions on staff wellbeing and turnover across industries is required. It would be important to ensure that employers understand the potential productivity and economic benefit alongside the staff wellbeing evidence. Preliminary evidence has shown music interventions to be economically beneficial. Statistical modelling showed that as a result of the improvement in wellbeing seen in staff following the music intervention a reduction of employee turnover (18.3%) could be expected, resulting in an annual cost-saving of $89,100 (Bittman et al., 2003). Supporting evidence such as this could be invaluable to engaging employers and wider systems in the use of music as a workplace intervention.

As with much scientific research, utilising cross cultural study designs would aid the robustness of the scientific literature. Many countries and businesses are becoming multicultural and it would be important to understand if there are any potential confounding variables which may negatively influence the effectiveness of interventions. Research has shown that we become encultured to our local music in childhood (Morrison et al., 2008) and along with the research showing positive benefits of individually chosen music on affect and cognitive performance (Lesiuk, 2010; Krause et al., 2015; Liljestrom et al., 2013; Sloboda, 2010) it would be important not to ignore culture as a potential moderator, for example familiarity with

musical genres and features such as tonality, which may alter physiologic responses and engagement and to ensure future interventions are as inclusive as possible.

Conclusion

Work-related stress is increasing in prevalence and has been shown to have high rates for those working in the public sector, including healthcare and education (HSE, 2020). There is a growing evidence base which seeks to understand the effect of music interventions as a means of addressing this issue. This thesis has found preliminary evidence for positive effects of music interventions on stress and wellbeing and mindful music listening on mood, cognitive performance, compassionate leadership, and wellbeing in the workplace. However, results from both the systematic review and empirical study should be interpreted with caution. The evidence reviewed in the systematic review and meta-analysis lacks high-quality, large sample size research which investigates the specifics of interventions. The review included a large amount of heterogeneity across studies and the empirical paper faced challenges in recruitment, retention, and engagement with the intervention. Learning should be taken from the behaviour change models; often when individuals are stressed it can be difficult for them to see how adding something into their time may reduce their stress levels (Boals & Banks, 2020). There is a need and appetite for creative and accessible workplace interventions which combine the benefits of mindfulness and music listening. Preliminary evidence suggests that arts-based interventions are beneficial to employee wellbeing and may reduce employee turnover and subsequently result in employer cost savings. Therefore, it feels appropriate that researchers and clinicians continue to seek to find creative, accessible, enjoyable and cost-effective ways to alleviate stress and prevent

the potential for development of severe and enduring mental health difficulties and cognitive decline in workforces.

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Appendix A

Publication Guidelines for *Journal of Occupational and Organizational Psychology*

SUBMISSION

Authors should kindly note that submission implies that the content has not been published or submitted for publication elsewhere except as a brief abstract in the proceedings of a scientific meeting or symposium.

Once the submission materials have been prepared in accordance with the Author Guidelines, manuscripts should be submitted online at http://www.editorialmanager.com/joop

Click here for more details on how to use **Editorial Manager**.

All papers published in the *Journal of Occupational and Organizational Psychology* are eligible for Panel A: Psychology, Psychiatry and Neuroscience in the Research Excellence Framework (REF).

Data protection:

By submitting a manuscript to or reviewing for this publication, your name, email address, and affiliation, and other contact details the publication might require, will be used for the regular operations of the publication, including, when necessary, sharing with the publisher (Wiley) and partners for production and publication. The publication and the publisher recognize the importance of protecting the personal information collected from users in the operation of these services, and have practices in place to ensure that steps are taken to maintain the security, integrity, and privacy of the personal data collected and processed. You can learn more at **https://authorservices.wiley.com/statements/data-protection-policy.html**.

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This journal will consider for review articles previously available as preprints. Authors may also post the submitted version of a manuscript to a preprint server at any time. Authors are requested to update any pre-publication versions with a link to the final published article.

2. AIMS AND SCOPE

The *Journal of Occupational and Organizational Psychology* aims to increase understanding of people and organisations at work including:

- industrial, organizational, work, vocational and personnel psychology
- behavioural and cognitive aspects of industrial relations
- ergonomics and human factors
- industrial sociology

Innovative or interdisciplinary approaches with a psychological emphasis are particularly welcome. So are papers which develop the links between occupational/organisational psychology and other areas of the discipline, such as social and cognitive psychology.

3. MANUSCRIPT CATEGORIES AND REQUIREMENTS

We welcome the following varieties of paper:

- empirical research papers, containing new quantitative or qualitative data which address significant theoretical and/or practical concerns;
- papers which offer new theory and conceptualisation, perhaps accompanied by a critique of existing approaches;
- narrative and/or quantitative reviews of existing research which lead to new conclusions or insights into a field of research and/or practice;
- prescriptive articles advocating changes in research paradigms, methods, or data analytic techniques;
- analyses of practice in occupational and organizational psychology, where such analyses are driven by theory and/or sound data.

Please refer to the separate guidelines for **Registered Reports**.

All systematic reviews must be pre-registered.

The word limit for papers submitted for consideration to JOOP is 8000 words and any papers that are over this word limit will be returned to the authors. The word limit does not include abstract, references, figures, and tables. Appendices however are included in the word limit. The Editor retains discretion to publish papers beyond this length in cases where the clear and concise expression of the scientific content requires greater length (e.g., a new theory or a new method). The authors should contact the Editor first in such a case.

Short Research Notes

In order to supplement innovative research produced in full paper format, the journal provides access to a wider range of investigation through the publication of research in Short Research Note format. Papers submitted as Short Research Notes will be subject to the normal double-blind review process. Short Research Notes should be largely empirical studies. Typically, they will do one of the following:

- replicate existing findings in a new context;
- develop new measures and report on their reliability and validity;
- report contradictory findings that sharpen the interpretation of existing research;
- present new applications of an existing measure;
- report descriptive findings or case studies that will significantly develop professional practice;
- offer an informed and focused challenge to key elements of an existing study, theory or measure.

Papers submitted as Short Research Notes should not exceed 2000 words, including the abstract but not including references or tables. It is normally expected that any tables will take up no more than two printed pages, and there should be no more than about 15 references. With the exception of the items of a new or substantially revised measure, appendices are discouraged.

A paper submitted as a Short Research Note will not necessarily receive positive reviews simply because it falls into one of the categories listed above. Papers need to

be located in a conceptual/theoretical context, with rigorous method and appropriate reporting. The issues they raise and/or the findings they report must be deemed to be contributing significantly to the knowledge and understanding of academics and/or practitioners in occupational and organizational psychology. Short Research Notes are not a facility for publishing on the basis of weak data and/or weak conceptual underpinning. In the majority of cases, authors will have submitted the paper in the Short Research Note format. In some instances, however, the Editors may feel that a full paper is best reviewed in a Short Research Note format, or the referees may only recommend publication under this format. All articles in this format will be officially designated and published with the preface 'Short Research Note:' These are placed towards the back of the journal. Acceptance for publication on this basis will be indicated in writing to the authors by the Editor or Associate Editor if the original submission was in full paper format.

Cross-sectional self-report data

Studies conducted using only cross-sectional self-report data will be considered only in exceptional circumstances. For example; if the sample is exceptionally large, representative or multiple. In all other cases, cross-sectional self-report data should form part of a wider selection of data, including other measures such as longitudinal or experimental elements, corroborating or comparison data, third party records or psycho-physiological data.

For more details on the use of cross-sectional self-report data please see the **December 2011 Editorial**.

Non-working Populations

Papers based entirely on non-working populations (e.g., student samples) will only be considered in rather unusual circumstances. The Editor retains discretion to publish this kind of data, for instance where it is clearly demonstrated that the data obtained can be generalised to working populations.

4. PREPARING THE SUBMISSION

Free Format Submission

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Author Guidelines updated April 2019

Appendix B

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Appendix C

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Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	19
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	19
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	22
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	25
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	26
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	27
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	26
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	26
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	27
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	27
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	26

Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	27
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	27
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	28

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	27
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	28
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	29
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	32
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	37
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	32/40/41
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	40
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	37
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	41
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	50
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	53-55

Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	57
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	N/A

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit: **www.prisma-statement.org**.

Appendix D

Papers excluded at detailed screening with reasons

Author(s), (Year)	Reason for exclusion
Alberdi, M., & Schlesinger, J. (2017)	Not a research paper
Alexander, F. (2018)	Not in workplace
Altivo Marques, D., da Silva Alves, M., da Costa Carbogim, F., de Vargas, D., Lonardoni de Paula, G., & Borges de Almeida, C. P. (2020)	No quantitative measure of stress/wellbeing
Baharum, A., Ali Pitchay, S., Ismail, R., Fzlinda Fabeil, N., Rusli, N. M., Azura, I., & Bahar, A. (2018)	No quantitative measure of stress/wellbeing
Baines, S., & Danko, G. (2010)	No quantitative measure of stress/wellbeing
Barton, L., Candan, G., Fritz, T., Zimmermann, T., & Murphy, G. C. (2019)	No quantitative measure of stress/wellbeing
Beck, B. D., Hansen, Å. M., & Gold, C. (2015)	Not in workplace
Bensimon, M., Amir, D., & Wolf, Y. (2008)	No quantitative measure of stress/wellbeing
Berk, L. (2003)	Not a research paper
Burrows, T. V. (2009)	No quantitative measure of stress/wellbeing
Cabrera, I. N., & Lee, M. H. M. (2000)	Systematic review
Canga, B., Long Hahm, C., Lucido, D., Grossbard, M. L., & Loewy, J. V. (2012)	No quantitative measure of stress/wellbeing
Campos, N.L., & Kantorskil, L.P. (2008)	No quantitative measure of stress/wellbeing
Castillo, E. M. (2018)	No quantitative measure of stress/wellbeing
Catlin, A., Cobbina, M., Dougherty, R., & Laws, D. (2019)	No quantitative measure of stress/wellbeing
Cheek, J.R., Bradley, L.J., Parr, G., Lan, W. (2003)	Music not the main intervention
Christensen, D. (2019)	Not a research paper

Cooke, M., Holzhauser, K., Jones, M., Davis, C., & Finucane, J. (2007)	Music not the main intervention
Davis, C., Cooke, M., Holzhauser, K., Fellow, A. R., Jones, M., & Finucane, J. (2005)	Music not the main intervention
Dimopoulos-Bick, T., Clowes, K. E., Conciatore, K., Haertsch, M., Verma, R., & Levesque, J.-F. (2019)	No quantitative measure of stress/wellbeing
D'Souza, S.R.B., Kamath, P., Fernandes, S.J., Noronha, J.A., Karkada, S., Kamath, S., & Lewis, L.E. (2017)	No quantitative measure of stress/wellbeing
DuRousseau, D. R., Mindlin, G., Insler, J., & Levin, I. I. (2011)	Not in the workplace
Esplen, M. J., Foster, B., Pearson, S., Wong, J., Mackinnon, C., Shamsudeen, I., & Cecchin, K. (2020)	No quantitative measure of stress/wellbeing
Evangelista, K., Macabasag, R.L., Capili, B., Castro, T., Danque, M., Evangelista, H., Rivero, J.A., Gonong, M.K., Diño, M.J., & Cajayon, S.B. (2017)	Student population
Fallon, V.T., Rubenstein, S., Warfield, R., Ennerfelt, H., Hearn, B., & Leaver, E. (2020)	Student population
Gatti, M. F., da Silva, M. J. (2007)	No quantitative measure of stress/wellbeing
George, S., Ahmed, S., Mammen, K. J., & John, G. M. (2011)	No quantitative measure of stress/wellbeing
Gimpel, T., (2016)	Not a research paper
Gromska, J., Domoslawska, B., & Koczurowska, J. (1975)	Not in the workplace
Gunderson, F. (2001)	No quantitative measure of stress/wellbeing
Haake, A. B. (2011)	No quantitative measure of stress/wellbeing
Halliday, A. J. (2018)	Not a music intervention
Hammer, S. E. (1996)	Clinical population
Harrop-Allin, S., Hume, V., Fabian, J., Etheredge, H., & McCallum, M. (2017)	No quantitative measure of stress/wellbeing

Hartmann, K. (1983)	No quantitative measure of stress/wellbeing
Huang, R. H., & Shih, Y. N. (2011)	No quantitative measure of stress/wellbeing
Kalliodi, C. (2016)	Not in the workplace
Karageorghis, C. I., Hutchinson, J. C., Jones, L., Farmer, H. L., Ayhan, M. S., Wilson, R. C., Rance, J., Hepworth, C. J., & Bailey, S. G. (2013)	Student population
Keville, S., Nutt, K., Brunton, I., Keyes, C., & Tacconelli, E. (2018)	No quantitative measure of stress/wellbeing
Kikuta, F. (2010)	Not available in English
Kim, H.J., & Kim, E.J. (2017)	Not available in English
Kim, J., & Stegemann, T. (2016)	Systematic review
Kume, S., Nishimura, Y., Mizuno, K., Sakimoto, N., Hori, H., Tamura, Y., … Kataoka, Y. (2017)	No quantitative measure of stress/wellbeing
Lai, H. L., Liao, K. W., Huang, C. Y., Chen, P. W., & Peng, T. C. (2013)	No quantitative measure of stress/wellbeing
Lane, D., Palmer, J. B., & Chen, Y. (2019)	No quantitative measure of stress/wellbeing
Lee, J., Davidson, J., & McFerran, K. (2016)	No quantitative measure of stress/wellbeing
Lesiuk, T. L (2003)	No quantitative measure of stress/wellbeing
Lesiuk, T. (2011)	Not a research paper
Lesiuk, T., Pons, A., & Polak, P. (2009)	No quantitative measure of stress/wellbeing
Lindquist Bonny, H. (1983)	Clinical population
Liu, S., Schad, D. J., Kuschpel, M. S., Rapp, M. A., & Heinz, A. (2016)	No quantitative measure of stress/wellbeing
Loizou, G., & Karageorghis, C. I. (2015)	No quantitative measure of stress/wellbeing
Lowis, M. J. (2002)	Not a music intervention

Makama, J. G., Ameh, E. A., & Eguma, S.A. (2010)	No quantitative measure of stress/wellbeing
Maschi, T., MacMillan, T., & Viola, D. (2013)	Student population
McFerran, K. S., & Rickson, D. (2014)	Not a research paper
Moss, H., Nolan, E., & O'Neill, D. (2007)	No quantitative measure of stress/wellbeing
Nakhodkin, V. V., Prokopyeva, M. M., Sokorutova, L. V., Vorotilkina, I. M., & Byankina, L. V. (2017)	Student population
Narayanan, A., & Gray, A. R. (2018)	No quantitative measure of stress/wellbeing
Newman, R. I., Hunt, D. L., & RHODES, F. (1966)	No quantitative measure of stress/wellbeing
Nomura, S., Tanaka, H., & Nagashima, T. (2005)	Not in the workplace
Nguyen, K.D., & Bingener-Casey, J. (2014)	Not a research paper
O'Callaghan, C. (2001)	No quantitative measure of stress/wellbeing
O'Callaghan, C., & Magill, L. (2009)	No quantitative measure of stress/wellbeing
Palmer, J. B. (2016)	No quantitative measure of stress/wellbeing
Pölkki, T., Korhonen, A., Saarela, T., & Laukkala, H. (2011)	No quantitative measure of stress/wellbeing
Porter, S., McConnell, T., Clarke, M., Kirkwood, J., Hughes, N., Graham-Wisener, L., Regan, J., McKeown, M., McGrillen, K., & Reid, J. (2017)	No quantitative measure of stress/wellbeing
Raglio, A., Bellandi, D., Gianotti, M., Zanacchi, E., Gnesi, M., Monti, M. C., Montomoli, C., Vico, F., Imbriani, C., Giogi, I., & Imbriani, M. (2020)	Not in the workplace
Robertson, E., Korczynski, M., & Pickering, M. (2007)	Not a research paper
Rui, M., Lee, J. E., Vauthey, J. N., & Conrad, C. (2018)	No music intervention
Sármány, J., Kálmán, R., Staud, D., & Salacz, G. (2006)	Not available in English

Scheufele, P. M. (2000)	Not in the workplace
Scholz, S., Darius, S., & Böckelmann, I. (2019)	Not available in English
Shambo, L., Umadhay, T., & Pedoto, A. (2015)	Systematic review
Shih, Y.-N., Chien, W.-H., & Chiang, H. (2016)	No quantitative measure of stress/wellbeing
Siedliecki, S. L., & Good, M. (2006)	Not in the workplace
Sorensen, S., Steindl, S. R., Dingle, G. A., & Garcia, A. (2019)	Not employees only
Stevens K. M. (1992)	Not in the workplace
Stewart, K., Silberman, R., Loewy, J., Schneider, S., Scheiby, B., Bobo, A., Scott-Moncrieff, S., Beckford, B., & Salmon, D. (2005)	Not a research paper
Stratton, V.N., & Zalanowski, A.H. (1997)	No music intervention
Stratton, V. N., Zalanowski, A. H., Penn, M. A., & Altoona, S. (n.d.)	Incorrect population
Taets, G. G. de C., Borba-Pinheiro, C. J., de Figueiredo, N. M. A., & Dantas, E. H. M. (2013)	Not available in English
Thorgaard, P., Ertmann, E., Hansen, V., Noerregaard, A., & Spanggaard, L. (2005)	No quantitative measure of stress/wellbeing
Transforming lives through music. (2011)	Not a research paper
Tseng LP., Liu YC. (2018)	Not a research paper
Vaag, J., Saksvik, P. Ø., Theorell, T., Skillingstad, T., & Bjerkeset, O. (2013)	No quantitative measure of stress/wellbeing
Wenzel., J.L. (2018)	Not a research paper
Whipple, J., (2003)	No quantitative measure of stress/wellbeing
Wlodarcyzk, N. (2008)	Not a research paper
Yamasaki, A., Mise, Y., Lee, J. E., Aloia, T. A., Katz, M. H., Chang, G. J., Lillemoe, K. D., Raut, C. P., & Conrad, C. (2016)	No quantitative measure of stress/wellbeing
Zoteyeva, V., Forbes, D., & Rickard, N. S. (2016)	No active music intervention

Appendix E

Faculty of Medicine and Health Sciences Ethics Committee Approval

Faculty of Medicine and Health Sciences Research Ethics Committee

University of East Anglia

NORWICH MEDICAL SCHOOL
Bob Champion Research & Educational Building
James Watson Road
University of East Anglia
Norwich Research Park
Norwich NR4 7UQ

Email: fmh.ethics@uea.ac.uk
www.med.uea.ac.uk

Sheryl Parke
Department of Clinical Psychology
Norwich Medical School
University of East Anglia
Norwich Research Park
NR4 7TJ

4th June 2020

Dear Sheryl

Title: Listen to the Music: A pilot study into music listening and the effects on cognitive performance, stress, wellbeing and compassionate leadership in university staff

Reference: 2019/20 – 128

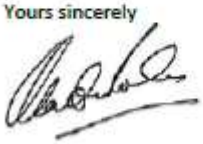
The submission of your application has been considered by a Sub-Committee of the Faculty Research Ethics Committee and I can confirm that your proposal has been approved.

Please could you ensure that any amendments to either the protocol or documents submitted are notified to us in advance, and that any adverse events which occur during your project are reported to the Committee. Please could you also arrange to send us a report once your project is completed.

Approval by the FMH Research Ethics Committee should not be taken as evidence that your study is compliant with GDPR and the Data Protection Act 2018. If you need guidance on how to make your study GDPR compliant, please contact your institution's Data Protection Officer.

I would like to wish you good luck with your project.

Yours sincerely



Prof Alastair Forbes
Chair
FMH Ethics Committee

COVID-19: *The FMH Research Ethics Committee procedures remain as normal. Please note that our decisions as to the ethics of your application take no account of Government measures and UEA guidelines relating to the coronavirus pandemic and all approvals granted are, of course, subject to these. If your research is COVID-19 related it will naturally be expedited. If the current situation means that you will have to alter your study, please submit an application for an amendment in the usual way.*

Faculty of Medicine and Health Sciences Research Ethics Committee

University of East Anglia

Sheryl Parke
Department of Clinical Psychology
Norwich Medical School
University of East Anglia
Norwich Research Park
Norwich
NR4 7TJ

NORWICH MEDICAL SCHOOL
Bob Champion Research & Educational Building
Rosalind Franklin Road
University of East Anglia
Norwich Research Park
Norwich NR4 7UQ

Email: fmh.ethics@uea.ac.uk
www.med.uea.ac.uk

27th October 2020

Dear Sheryl

Project title: Listen to the Music: A pilot study into music listening and the effects on cognitive performance, stress, wellbeing and compassionate leadership in university staff

Reference: 2019/20 – 128

Thank you for your email of 19th October 2020 notifying us of the amendments you would like to make to your above proposal. These have been considered and I can confirm that your amendments have been approved.

Please can you ensure that any further amendments to either the protocol or documents submitted are notified to us in advance, and that any adverse events which occur during your project are reported to the Committee.

Approval by the FMH Research Ethics Committee should not be taken as evidence that your study is compliant with GDPR and the Data Protection Act 2018. If you need guidance on how to make your study GDPR compliant, please contact your institution's Data Protection Officer.

Please can you arrange to send us a report once your project is completed.

Yours sincerely

Dr Jackie Buck
Chair
FMH Research Ethics Committee

COVID-19: The FMH Research Ethics Committee procedures remain as normal. Please note that our decisions as to the ethics of your application take no account of changes in Government measures and UEA guidelines relating to the coronavirus pandemic and all approvals granted are, of course, subject to these.

Appendix F

CONSORT Checklist

CONSORT 2010 checklist of information to include when reporting a pilot or feasibility trial*

Section/Topic	Item No	Checklist item	Reported on page No
Title and abstract			
	1a	Identification as a pilot or feasibility randomised trial in the title	76
	1b	Structured summary of pilot trial design, methods, results, and conclusions (for specific guidance see CONSORT abstract extension for pilot trials)	77
Introduction			
Background and objectives	2a	Scientific background and explanation of rationale for future definitive trial, and reasons for randomised pilot trial	79
	2b	Specific objectives or research questions for pilot trial	82
Methods			
Trial design	3a	Description of pilot trial design (such as parallel, factorial) including allocation ratio	83
	3b	Important changes to methods after pilot trial commencement (such as eligibility criteria), with reasons	n/a
Participants	4a	Eligibility criteria for participants	84
	4b	Settings and locations where the data were collected	84
	4c	How participants were identified and consented	84/88
Interventions	5	The interventions for each group with sufficient details to allow replication, including how and when they were actually administered	84
Outcomes	6a	Completely defined prespecified assessments or measurements to address each pilot trial objective specified in 2b,	85

		including how and when they were assessed	
	6b	Any changes to pilot trial assessments or measurements after the pilot trial commenced, with reasons	n/a
	6c	If applicable, prespecified criteria used to judge whether, or how, to proceed with future definitive trial	n/a
Sample size	7a	Rationale for numbers in the pilot trial	n/a
	7b	When applicable, explanation of any interim analyses and stopping guidelines	n/a
Randomisation:			
Sequence Generation	8a	Method used to generate the random allocation sequence	88
	8b	Type of randomisation(s); details of any restriction (such as blocking and block size)	88
Allocation concealment mechanism	9	Mechanism used to implement the random allocation sequence (such as sequentially numbered containers), describing any steps taken to conceal the sequence until interventions were assigned	89
Implementation	10	Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions	89
Blinding	11a	If done, who was blinded after assignment to interventions (for example, participants, care providers, those assessing outcomes) and how	89
	11b	If relevant, description of the similarity of interventions	n/a
Statistical methods	12	Methods used to address each pilot trial objective whether qualitative or quantitative	90
Results			
Participant flow (a diagram is strongly recommended)	13a	For each group, the numbers of participants who were approached and/or assessed for eligibility, randomly assigned, received intended treatment, and were assessed for each objective	92
	13b	For each group, losses and exclusions after randomisation, together with reasons	92

Recruitment	14a	Dates defining the periods of recruitment and follow-up	90
	14b	Why the pilot trial ended or was stopped	90
Baseline data	15	A table showing baseline demographic and clinical characteristics for each group	94
Numbers analysed	16	For each objective, number of participants (denominator) included in each analysis. If relevant, these numbers should be by randomised group	94
Outcomes and estimation	17	For each objective, results including expressions of uncertainty (such as 95% confidence interval) for any estimates. If relevant, these results should be by randomised group	102
Ancillary analyses	18	Results of any other analyses performed that could be used to inform the future definitive trial	102
Harms	19	All important harms or unintended effects in each group (for specific guidance see CONSORT for harms)	n/a
	19a	If relevant, other important unintended consequences	n/a
Discussion			
Limitations	20	Pilot trial limitations, addressing sources of potential bias and remaining uncertainty about feasibility	103
Generalisability	21	Generalisability (applicability) of pilot trial methods and findings to future definitive trial and other studies	103
Interpretation	22	Interpretation consistent with pilot trial objectives and findings, balancing potential benefits and harms, and considering other relevant evidence	103
	22a	Implications for progression from pilot to future definitive trial, including any proposed amendments	107
Other information			
Registration	23	Registration number for pilot trial and name of trial registry	n/a
Protocol	24	Where the pilot trial protocol can be accessed, if available	n/a

Funding	25	Sources of funding and other support (such as supply of drugs), role of funders	n/a
	26	Ethical approval or approval by research review committee, confirmed with reference number	84

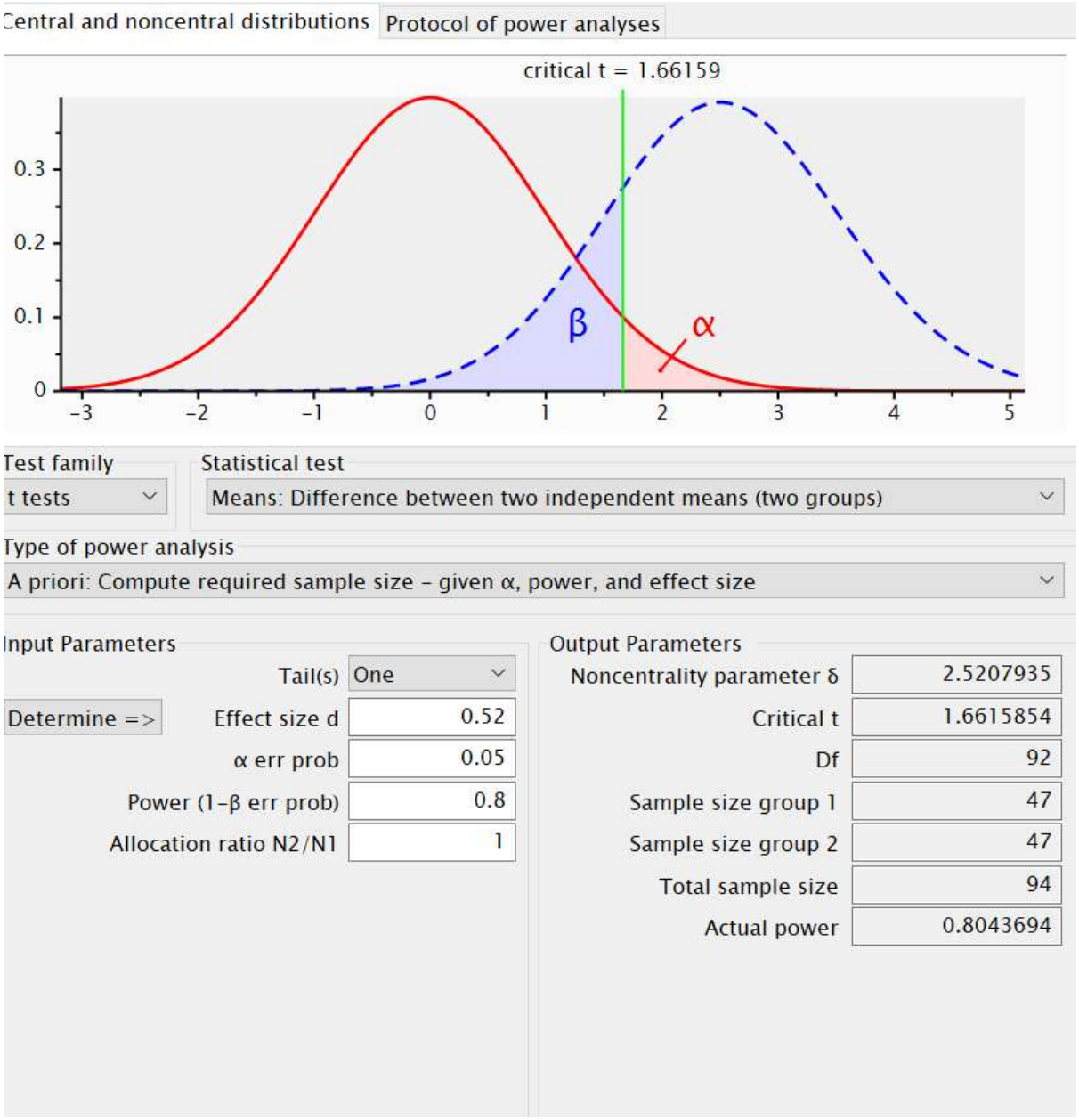
Citation: Eldridge SM, Chan CL, Campbell MJ, Bond CM, Hopewell S, Thabane L, et al. CONSORT 2010 statement: extension to randomised pilot and feasibility trials. BMJ. 2016;355.
*We strongly recommend reading this statement in conjunction with the CONSORT 2010, extension to randomised pilot and feasibility trials, Explanation and Elaboration for important clarifications on all the items. If relevant, we also recommend reading CONSORT extensions for cluster randomised trials, non-inferiority and equivalence trials, non-pharmacological treatments, herbal interventions, and pragmatic trials. Additional extensions are forthcoming: for those and for up to date references relevant to this checklist, see www.consort-statement.org.

Appendix G

Study Advert

Appendix H

Sample Size Calculation



Appendix I

Participant Information Sheet

University of East Anglia

Study Title: Listen to the Music: A pilot study into music listening and the effects on cognitive performance, stress, wellbeing and compassionate leadership in university staff.

Thank you for showing an interest in participating in this study. Before you consent to take part, please read this information sheet carefully.

This study is part of a Doctorate in Clinical Psychology thesis and has ethical approval from the UEA Faculty of Medicine and Health Sciences Research Ethics Committee (Ref: 2019/20-128). If you require further information, please contact the research team on the email address below.

This information sheet is designed to give you enough information about the research to support you to make an informed decision about whether or not you wish to participate.

Who can take part?

You are eligible to participate in this study if

- You are over 18 years old
- You are able to hear (including with the use of hearing aids)
- You work at the University of East Anglia

You are not eligible to participate in this study if

- You are currently practicing mindfulness or have previously had a routine mindfulness practice
- You are depressed (we will conduct a mood screening test)
- You have any diagnosed (untreated) severe mental health difficulties or recent/unresolved trauma

What would taking part involve?

This research is looking at if there is an effect of listening to music on stress, wellbeing, cognition and emotional intelligence. Research, in different populations, has shown this to be an effective tool for stress management and cognitive performance.

Once you have read this information sheet and want to take part you will be asked to complete two questionnaires. These will be used to check if there is any reason it may not be a good idea for you to participate, for example if you are very depressed or anxious. If the questionnaires suggest there is serious concern for your mental health, the research team have a duty of care, and will contact you, via email, to encourage you to seek support from your manager, GP and/or occupational health department.

You will be randomised to a way of listening to music; listening to music on its own or in other conditions. You will then be asked to watch an introductory session, lasting approximately 30 minutes, and to listen to music over a course of eight weeks, up to 25 minutes per day, five days per week. If this shows you have not listened to music for three consecutive days, a reminder email will be sent to you.

You will be asked to complete assessments of stress, wellbeing and thinking skills before and after the eight-week period. The questionnaires will take at most 45 minutes to complete.

If you are interested in following up or continuing any of the exercises included in the study these will be made available to you at the end of the study.

If you are interested in receiving information about the results of the study; a summary will be made available to you at the end of the study.

What are the possible benefits of taking part?

We are not able to guarantee any specific benefits. However, research is a means of testing out new tools and this study is interested in supporting the wellbeing and performance of the workforce.

What are the possible disadvantages and risks of taking part?

We feel there are minimal risks associated with taking part in this research. A small number of people might find the intervention unpleasant. It may be that completing the questionnaires brings up concerns about mental health, if this is the case you will be signposted to the appropriate support services, for example; GP, A&E, third sector support. Contact will be maintained with the research team throughout the eight weeks, should any problems arise.

What if I want to withdraw from the study after I start?

Your participation in the study is voluntary. If you do choose to participate, you may withdraw from the study at any time without giving a reason. If you decide you no longer wish to take part, please tell the research team and you can stop participating. If you withdraw from the study, we will keep the information about you that we already have, to allow for the assessment of feasibility of the study within NHS manager/leaders. This information will be held for at least 10 years until it is destroyed in line with UEA Research Data Management Policy (2019). All identifiable information will be destroyed.

How will my information be used?

We will need to use information from you for this research project.

This information will include:

- your name
- email address

We will use this information to do the research or to check your records to make sure that the research is being done properly.

People who do not need to know who you are will not be able to see your name or contact details. Your data will have a code number instead.

We will keep all information about you safe and secure. All identifiable participant information will be gathered and stored in accordance with the Data Protection Act (2018) and General Data Protection Regulation (2018).

All research data; demographic information and data from questionnaires and assessments will be pseudonymised and stored on the secure remote research portal, accessible only to the research team.

At completion of the study all identifiable participant information will be destroyed.

Once we have finished the study, we will keep some of the data so we can check the results. All anonymised research data will be kept in the custody of the primary supervisor at UEA for at least 10 years, before being destroyed, in line with the UEA Research Data Management Policy (2019), Once the study is complete we will erase any information that could identify you, so it is impossible to identify you from the data stored or reported. . Anonymised data may be used in further research.

Anonymised data from the thinking skills assessments will be stored by NeurOn, a secure remote research portal, indefinitely, to support the development of norms for these assessments.

Anonymised results from the study will be reported in a Doctoral thesis, which will be available via the UEA thesis repository and may also be published in a relevant journal.

What are your choices about how your information is used?

- You can stop being part of the study at any time, without giving a reason, but we will keep information that we already have.
- We need to manage your records in specific ways for the research to be reliable. This means that we won't be able to let you see or change the data we hold about you.

Where can I find out more about how your information is used?

You can find out more about how we use your information

- by asking one of the research team, or
- by emailing the UEA's Data Protection Officer dataprotection@uea.ac.uk

For further information please contact;

Chief investigator: Sheryl Parke: Sheryl.Parke@uea.ac.uk

Primary Supervisor: Michael Grey: M.Grey@uea.ac.uk

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For any concerns or complaints in relation to this study:

Head of Department: Niall Broomfield: N.Broomfield@uea.ac.uk

Appendix J

Consent Form

Participant Identification Number for this trial:

University of East Anglia

CONSENT FORM

Title of Project: Listen to the Music. A pilot study into music listening and the effects on cognitive performance, stress, wellbeing and compassionate leadership university staff,

Name of Researcher: Sheryl Parke

Please select boxes

1	I confirm that I have read the information sheet dated … (version …) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	
2	I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason.	
3	I understand and agree that the data I provide for the screening measures and any further measures will be anonymised and stored by the research team, even if I am excluded from the study or withdraw.	
4	I understand and agree that the information collected about me will be stored confidentially and anonymously by the research team and UEA for at least ten years after the completion of the study.	
5	I understand and agree that the anonymised information collected about me may be used to support other research in the future and may be shared anonymously with other researchers.	
6	I understand that if there are any serious concerns about my mental health the research team have a duty of care and will contact me and encourage me to seek support from my manager, GP and/or occupational health team for further support.	
7	I understand and agree that the information held and maintained by University of East Anglia may be used to help contact me or provide information about the study.	
8	I understand and agree that the anonymised information held by NeurOn relating to tests of thinking skills will be stored in line with the Data Protection Act (2018), indefinitely, to support the development of norms for thinking skills.	
9	I am employed by the University of East Anglia.	
10	I agree to take part in the above study.	

Name of Participant	Date	Signature
Name of Person taking Consent	Date	Signature

Appendix K

Participant signposting information

If you have any concerns about your mood or mental health please contact your GP, HR service, staff counselling service and/or one of the services below for support:

Norfolk

Wellbeing Service	www.wellbeingnands.co.uk
	0300 123 1503
Samaritans	jo@samaritans.org
	116 123

Suffolk

Wellbeing Service	www.wellbeingnands.co.uk
	0300 123 1503
Samaritans	jo@samaritans.org
	116 123

Cambridgeshire

Wellbeing Service	https://www.cpft.nhs.uk/services/pws/psychological-wellbeing-service.htm
	0300 300 0055
Samaritans	jo@samaritans.org
	116 123

If you feel any immediate risk to yourself or others due to your mental health please contact your GP, A&E or Samaritans for more immediate sources of help.

If serious concerns for your mental health are raised from the screening measures, the research team will contact you, via email, to encourage you to seek support from your manager, GP and/or occupational health department.

If you have any questions regarding the study, please contact the chief investigator Sheryl Parke (sheryl.parke@uea.ac.uk)

Appendix L

Mindfulness scripts

The Body Scan

So, begin by bringing yourself into a comfortable position, allowing yourself to feel relaxed, yet alert, present and awake and during this practice, we will move our attention through different parts of the body, and whilst doing this, you may notice areas that are tight or tense, you may notice tingling or numbness or perhaps even areas that are painful. It is natural to want to avoid these experiences, but during this practice, try to stay present with any uncomfortable or challenging sensations approaching and with a sense of curiosity, openness and acceptance.

Let's begin by dropping your attention away from the head and right down to the feet, bringing your awareness to the physical sensations in both of your feet. Including the soles of your feet, toes and ankles. Noticing any sensations arising at this moment in time. Noticing the changing nature of these sensations and also noticing how these sensations arise and dissolve in this awareness. If you do not notice any sense of sensations, this is fine also, you're not trying to create sensations, but simply be present to whatever is naturally arising in your body at this moment in time. Simply paying attention to whatever is already occurring with a gentle kindness, with an acceptance and with curiosity.

Now, expand your awareness to both legs. Softening and releasing. Softening and releasing, and the rest of your legs and just hold both legs in the centre of your awareness, breathing into this area on the inbreath and allowing this area to dissolve on the outbreath and gradually expanding this awareness up the body to the pelvic area, the hips, the lower back on the abdomen again, gradually expanding this awareness further up the body into the torso, bringing your attention to the chest, the

back and then up to your shoulders. Softening and releasing. Just gently observing any and all of the physical sensations that arise as you move through the different parts of the body and just relaxing into these sensations. Resting your awareness here and just noticing the quality of the sensations without judgment.

Now expand your attention to include both arms, elbows, forearms right down into your hands and fingers and gently expanding the awareness to the neck, the face, the head. Extending to the jaw, breathing into this area, on the in breath and allowing this area to dissolve on the outbreath, expanding this awareness to include your eyes, allowing your eyes to soften and release the brow. Again, softening the full head, the back of the head and the back of the neck, again, just noticing any sensations that come into your awareness, be present with your body. Be present in your body and now just getting a sense of the whole body and see if you can hold the whole body in complete awareness. Just being present with any and all sensations, just as they are. Refraining from trying to control this process, allowing things to be just as they are at this present time. Sitting in this pure awareness of what you are observing at this particular moment in time and now moving into listening to your chosen music.

Maintaining that sense of calmly focusing your attention this time on the music. Whenever you notice other thoughts or sensations arising, just allowing them to pass at their own pace and gently bringing your attention back to the music. Noticing that the meditation has ended, but your experience of mindfulness is still present.

Sitting practice, noticing the breath.

Just beginning by bringing your body into a comfortable seated position where you feel a sense of being awake, alert and present and perhaps letting the gaze

of your eyes drop towards the floor or if possible, and it feels comfortable just allowing your eyes to close fully. Again, whatever feels comfortable for you and slowly, just allowing the focus of your attention to drift inside away from any external distractions and gently guiding your attention to your breath. Allowing your attention to rest on the movement of your breath.

Observing the natural flow of your breathing, becoming aware of the rhythm. Feeling the chest area rise and expand as you inhale and noticing how it generally contracts as you exhale. There is no need to alter this rhythm. Just resting your attention on this natural movement. Perhaps even noticing times when your mind becomes distracted and your attention wanders. This is OK. There is no need to judge this experience or respond or react to any thoughts that enter your awareness any time you find your mind becoming distracted or you find that your attention has wandered. Just gently guide your focus back to your breath. Using the breath as an anchor, if the mind wanders off, use the breath to bring you back to the present moment. Entering this awareness with a curiosity, with patience, with a sense of wonder. Slowing down. Breathing into this moment. Noticing what is passing through your awareness? Any thoughts, sensations, feelings, allowing yourself to be open to these experiences? Trying not to cling on to any sensations that arise, just noticing and releasing. Noticing and releasing. Watching the new and change and if you get distracted, always returning to the breath. Using the breath as an anchor to the present moment.

Cultivating a capacity to be present, noticing what it feels like to be present, to be here, to be in the moment. There is nowhere else that you need to be at this moment in time. Just allowing yourself to settle into the here and now. Giving yourself permission to be present. Making the point of caring for yourself. Allowing

the self to rest completely in this moment and it may help to imagine your thoughts and emotions like white clouds floating through a still clear, beautiful blue sky and every time your mind becomes distracted, just gently bringing it back to your breath. Building upon your own capacity to concentrate and focus your mind. Actually being curious and interested, caring about your experience. Giving your mind the chance to breathe freely and moving now into listening to your chosen music.

Maintaining that sense of calmly focusing your attention this time on the music. Whenever you notice other thoughts or sensations arising. Just allowing them to pass at their very own pace and gently bringing your attention back to the music. Noticing that the meditation has ended. But that your experience of mindfulness is ever present.

Appendix M
Data analysis output (SPSS) Empirical paper

Baseline comparisons for age and gender

Table M.1

Tests of normal distribution

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Arm	Statistic	Df	Sig.	Statistic	df	Sig.
Age	Control	.159	9	.200*	.972	9	.911
	Intervention	.207	12	.163	.927	12	.345
Gender	Control	.471	9	.000	.536	9	.000
	Intervention	.323	12	.001	.780	12	.006

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

The assumption of normal distribution is met for age. Therefore, a test of homogeneity was conducted.

Table M.2

Tests of homogeneity for age

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					
								95% Confidence Interval of the Difference	
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Age	Equal variances assumed	.149	.704	-.923	19	.367	-3.36111	3.64065	-10.98108	4.25886
	Equal variances not assumed			-.883	14.180	.392	-3.36111	3.80478	-11.51184	4.78962

The independent samples t-test shows no statistically significant difference between groups in relation to age at baseline (t (19) =-0.923, p=0.367).

A Chi-Square test was conducted to compare groups at baseline for gender as the data are categorical. The data did not meet the assumption of five cases per cell for Chi-Square and therefore Fisher's exact test was reported. The groups were not significantly different at baseline for gender, p=0.796.

Table M.3

Chi Square Crosstabulation

Arm * Gender Crosstabulation

			Gender			
			Male	Female	Non-binary	Total
Arm	Control	Count	2	7	0	9
		Expected Count	2.6	6.0	.4	9.0
		% within Arm	22.2%	77.8%	0.0%	100.0%
		% within Gender	33.3%	50.0%	0.0%	42.9%
		% of Total	9.5%	33.3%	0.0%	42.9%
	Intervention	Count	4	7	1	12
		Expected Count	3.4	8.0	.6	12.0
		% within Arm	33.3%	58.3%	8.3%	100.0%
		% within Gender	66.7%	50.0%	100.0%	57.1%
		% of Total	19.0%	33.3%	4.8%	57.1%
Total		Count	6	14	1	21
		Expected Count	6.0	14.0	1.0	21.0
		% within Arm	28.6%	66.7%	4.8%	100.0%
		% within Gender	100.0%	100.0%	100.0%	100.0%
		% of Total	28.6%	66.7%	4.8%	100.0%

Table M.4

Chi Square test

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.264[a]	2	.532	.796		
Likelihood Ratio	1.636	2	.441	.796		
Fisher's Exact Test	1.236			.796		
Linear-by-Linear Association	.014[b]	1	.907	1.000	.613	.311
N of Valid Cases	21					

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is .43.

b. The standardized statistic is -.117.

Baseline comparisons for primary outcomes

Table M.5

Tests of normal distribution

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Arm	Statistic	df	Sig.	Statistic	df	Sig.
GAD7	Control	.185	9	.200*	.912	9	.333
	Intervention	.261	12	.023	.892	12	.126
PHQ9	Control	.197	9	.200*	.914	9	.342
	Intervention	.269	12	.017	.780	12	.006
PSS10	Control	.144	9	.200*	.977	9	.946
	Intervention	.186	12	.200*	.871	12	.067
PERMA	Control	.203	9	.200*	.953	9	.720
	Intervention	.159	12	.200*	.918	12	.272
TEIQueSF	Control	.230	9	.188	.852	9	.078
	Intervention	.174	12	.200*	.905	12	.186
Digit span backwards	Control	.240	9	.144	.831	9	.046
	Intervention	.168	10	.200*	.908	10	.269
Trails B	Control	.274	7	.122	.784	7	.028
	Intervention	.217	8	.200*	.894	8	.253

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Table M.6

Test of homogeneity and independent samples t-tests

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
GAD 7	Equal variances assumed	.406	.532	-.880	19	.390	-.8333	.9472	-2.8158	1.1492
	Equal variances not assumed			-.870	16.661	.396	-.8333	.9574	-2.8565	1.1898
PSS10	Equal variances assumed	.033	.858	-.221	19	.827	-.3611	1.6327	-3.7784	3.0561
	Equal variances not assumed			-.217	16.103	.831	-.3611	1.6631	-3.8849	3.1627
PERMA	Equal variances assumed	2.016	.172	1.570	19	.133	.70667	.45019	-.23559	1.64893
	Equal variances not assumed			1.715	17.076	.104	.70667	.41198	-.16224	1.57557
TEIQueSF	Equal variances assumed	2.626	.122	2.143	19	.045	.52139	.24330	.01215	1.03062
	Equal variances not assumed			2.055	14.361	.058	.52139	.25366	-.02137	1.06415

TEIQue-SF was found to be statistically significant at baseline (t (19) =2.143, p=0.045).

PHQ-9, Digit span backwards and Trails B do not meet the assumption of normal distribution. Therefore, Mann-Whitney U tests were completed for baseline comparisons. The PHQ-9 data were similarly distributed on the histograms and therefore a Mann-Whitney U was conducted to compare the medians.

Figure M.1

Mann-Whitney U test

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of PHQ9 is the same across categories of Arm.	Independent-Samples Mann-Whitney U Test	.651[1]	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

[1]Exact significance is displayed for this test.

Mean depression scores, as measured by thePHQ-9 were not statistically different, U = 47.50, z = -.477, p = 0.651 using an exact sampling distribution for U.

For digit span backwards and Trails B the data were not similarly distributed and therefore mean ranks were reported.

Table M.7
Mann Whitney U Digit span backwards

Ranks

	Arm	N	Mean Rank	Sum of Ranks
Digit span backwards	Control	9	8.72	78.50
	Intervention	10	11.15	111.50
	Total	19		

Test Statistics[a]

	Digit span backwards
Mann-Whitney U	33.500
Wilcoxon W	78.500
Z	-.963
Asymp. Sig. (2-tailed)	.336
Exact Sig. [2*(1-tailed Sig.)]	.356[b]

a. Grouping Variable: Arm

b. Not corrected for ties.

For digit span backwards the groups did not differ significantly at baseline; control (mean rank = 8.72), intervention (mean rank = 11.15), $U = 33.5$, $z = -.963$, $p = 0.356$.

Table M.8

Mann Whitney U Trails B

Ranks

	Arm	N	Mean Rank	Sum of Ranks
Trails B	Control	7	7.79	54.50
	Intervention	8	8.19	65.50
	Total	15		

Test Statistics[a]

	Trails B
Mann-Whitney U	26.500
Wilcoxon W	54.500
Z	-.174
Asymp. Sig. (2-tailed)	.862
Exact Sig. [2*(1-tailed Sig.)]	.867[b]

a. Grouping Variable: Arm

b. Not corrected for ties.

For Trails B the groups did not differ significantly at baseline; control (mean rank = 7.79), intervention (mean rank = 8.19), $U = 26.5$, $z = -.174$, $p = 0.867$.