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Music performance anxiety and higher education teaching: A systematic literature review

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Abstract

This systematic review includes a search of the literature covering the period 2005-2021 to understand what preventative teaching approaches and interventions have been developed in higher education to reduce music performance anxiety (MPA). The focus here is on identifying interventions that are applicable to higher education teaching practice, in an attempt to support music educators to reduce the negative effects of MPA, and, by so doing, support better learning outcomes. A systematic review of the literature on MPA (2005-2021) was undertaken to explore the teaching strategies that are used to help students in higher education. The researchers performed independent assessments of the literature based on the inclusion criteria. Discrepancies between the two reviewers were resolved through discussion. Each of the articles that met the research conditions was classified using four treatment modalities: cognitive interventions, behavioural interventions, pharmacological treatment and complementary. The initial scoping resulted in a total of 116 research articles. This was reduced to 18 articles that fully met the inclusion criteria. There is a wealth of literature exploring MPA; however, very few teaching approaches or interventions have been found that can easily be embedded in music education. The findings indicate that interventions deriving from promising reactive treatment have been developed, but that these are rarely generalisable to typical teaching practice.

Practitioner Notes

1. Higher education music teachers should be aware of the potentially disastrous outcomes of music performance anxiety (MPA) on performing students.
2. The impact of MPA is well researched, but there are very few papers that offer practical interventions to address it.
3. Higher education music teachers should engage in action research-type investigations to develop practical solutions to address MPA.
4. Higher education music teachers may wish to encourage performing students to regulate their emotions by writing their thoughts and feelings before performing.
5. Other educators, particularly those in performance-based subjects, will benefit from greater insight into student anxiety.

Keywords

MPA, anxiety, intervention, performance

Introduction

Music has the capacity to stir the emotions of the listener. It is also an emotionally driven and rooted activity for performers themselves. Composition and performance exist within human social experience, and the factors that make humans expressive creatures can also lead to a musician's anxiety while sharing their gift. One such factor is "music performance anxiety" (MPA). MPA can be described as an experience of "marked and persistent anxious apprehension related to musical performance that has arisen through specific anxiety conditioning experiences" (Paliaukiene et al., 2018, p. 390). The impact of MPA cannot be overstated and Diaz (2018, p. 154) suggests that "MPA can lead to potentially catastrophic outcomes for performing musicians". Zinn et al. (2000) posit that MPA is a psychophysiological event in which the interaction of mind and body affects a musician and leads to negative outcomes such as tremors, palpitations, and perspiration. This is a natural human response that Kirchner (2003) relates to the feeling of being threatened. Different individuals perceive different levels of threat, and different individuals subsequently produce different behaviours.

This article explores MPA in the context of higher education with a particular focus on accessible pedagogical interventions that can be implemented without requiring specialist knowledge or training. The emphasis is on teaching approaches that support students in raising their awareness, and developing competencies and skills for recognising, coping, managing, and/or reducing MPA. Here the term "higher education" is used to encompass taught and formally assessed provision at the post-compulsory level. It is recognised that much of this taught provision takes place in environments such as colleges and academies, and this review of the literature addresses this breadth of delivery. Taking higher education as a synonym for such provision, this paper asks, "What interventions have been developed in higher education to support and/or develop students' competencies to address MPA?"

Literature review

Lacking a clear definition (Brugués, 2019; Kenny, 2011a), MPA is more than simply "butterflies in the stomach". It is an "experience of marked and persistent anxious apprehension related to musical performance that has arisen through specific anxiety conditioning experiences and which is manifested through combinations of affective, cognitive, somatic and behavioural symptoms" (Kenny, 2011b, p. 433). It has also been defined as a concern that can result "in lowered performance quality, premature termination of performance careers, and reduced overall life happiness for musicians" (Ryan & Andrews, 2009, p.109). According to Kenny (2011a), "Music performance anxiety is no respecter of musical genre, age, gender, years of experience, or level of technical mastery of one's art" (p. 11). Music performance anxiety has been reported as being highest when there is an audience and/or in the context of an examination (Papageorgi et al., 2013; Taborsky, 2007), and it has been found to increase with the perceived technicality of the performance (Osborne et al., 2005). All musicians have the potential to experience MPA (Güven, 2016) to different degrees before, during, and after performances (Spahn et al., 2021), and at any stage of their career. However, MPA tends to be higher in students (Biasutti & Concina, 2014), especially when facing an audience or an assessed task (Hamann & Sobaje, 1983; Taborsky, 2007). This could be because performing might be a more emotionally taxing experience for a student than for a professional musician, as they are at a stage of their development where they are likely to receive more negative feedback about their abilities. This kind of feedback can affect their level of confidence and emotional well-being (Sternbach, 2008).

A range of factors has been proposed in the literature to explain the increased likelihood of some groups experiencing MPA to a greater extent than others. Kaspersen and Gøtestam (2002)

found, for instance, that soloists had higher levels of MPA in comparison to ensemble performers, linking anxiety to the soloist's perception that they are under intense personal scrutiny. Ryan and Andrews (2009) identified that the perceived difficulty of the music, the musician's capacity for performing from memory, and the perceived importance to the musician of the performance were key factors impacting MPA levels. Some differences in the experience of MPA may be attributable to gender. For instance, female musicians have been found to show higher levels of anxiety than their male peers during performances, and have reported different expectations of success (Güven, 2017; Wehr-Flowers, 2006). However, Robson and Kenny (2017) found no difference between genders regarding MPA and concert performance and rehearsals. These factors hint at the role of learned responses. As a developmental space, higher education has a responsibility to prepare students for their professional roles in the music industry. As such, there is an increasingly acknowledged need to develop a variety of preventative pedagogical approaches that will improve students' use of metacognition, raise their awareness of MPA, and foster their competencies and skill to address it (Clark & Williamon, 2011; Cohen & Bodner, 2019; Kenny, 2005; Patston, 2014).

Music performance anxiety tends to be experienced on a continuum, dependent on many of the factors listed above and "there is a possibility that MPA [changes] over time and could increase in certain situations" (Paliaukiene et al., 2018, p. 94). For instance, manageable levels of MPA may have a positive effect, stimulating an emotional connection and facilitating performance (Simoens et al., 2015; Wilson, 2002). Wilson (2002) proposes that whether anxiety is detrimental or beneficial depends on the interplay of three sources of stress: personal characteristics, environmental pressure, and task mastery, where achieving the right balance finds the musician in the "sweet spot" of optimal performance. But such optimisation is likely to be impaired or impeded if music teachers do not recommend self-coping strategies to their students or if the student is unable to develop these successfully on their own (Sternbach, 2008).

Anxiety is a psychiatric disorder that can impair an individual's cognitive abilities (McNally, 2019). Anxiety also has physical presentations such as headache, nausea, shortness of breath, shakiness, or stomach pain (Simpson et al., 2010). Anxiety may even increase the risk of cardiovascular disease (Alvares et al., 2016). Actions to reduce anxiety are not without issue. There are several barriers to reducing student anxiety and improving their academic performance, including a lack of specialist services and specialist training. There is also an increasing need to consider the support that can be easily embedded into academic practice (Egan et al., 2022). In their meta-analysis of the effectiveness of meditation, yoga, and mindfulness regarding symptoms of depression, anxiety, and stress in tertiary education students, Breedvelt et al. (2019) found that these activities only had a moderate positive effect and that the quality of the studies they examined was low. In their examination of measures to reduce anxiety in science students, Cooper et al. (2018) found that active learning can both increase and decrease students' anxiety depending on the way it is applied, thus emphasising the link between the intervention itself and its implementation.

Barlow (2000) proposed a "theory of anxiety" composed of a triple threat of vulnerabilities involving the interplay of biological factors with both generalised and specific psychological weaknesses. In this situation, a musician may have a pre-determined biological bias towards MPA that is exacerbated through a global sense of helplessness and reinforced through their reflections on specific negative experiences. Thus, individual musicians can find themselves in a self-fulfilling negative spiral. Abril's (2007) study of anxiety and singing supports Barlow's theory in identifying two factors that underlie MPA. The first is the individual's background, including their family, school, training, etc. The second is their perception of the likelihood that they will experience success or failure. The interplay of various psychological factors is a key determinant of MPA. Barlow's theory can be likened to those based on the concepts of trait and state anxiety (Spielberger, 2013). Hong and Karstenson (2002) report that state anxiety is a transitory, anxious affect provoked by a specific situation, whereas trait anxiety refers to a

tendency to be anxious in any situation. Several studies have shown that individuals with high levels of trait anxiety are less likely to engage in risky activities (Giorgetta et al., 2012; Mitte, 2007; Miu, Heilman & Houser, 2008), and musical performance can certainly be thought of as a risky activity. Trait anxiety is the normal condition that a person experiences, whereas the anxiety that is brought about by specific environmental factors, such as performance, is known as state anxiety. These psychological factors are not fixed and Altenmüller et al. (2000) report that music education may change and influence brain activation patterns. Since higher education teaching staff can influence psychological factors, it seems reasonable to suggest that pedagogical approaches could be applied to help performers address MPA.

Purpose of the study

The purpose of this systematic review is to examine interventions that seek to address MPA, with the intention of discovering interventions that can be generalised in typical higher education teaching. The overarching research question is: “What interventions have been developed in higher education to support and/or develop students’ competencies to address MPA?” Supplementary questions were drawn from the Critical Appraisals Skills Programme (CASP, 2018), which asks authors to consider three questions when undertaking this type of review: Are the results of the study valid? What are the results? Will the results help locally?

Theoretical foundation

Some strategies used to address MPA have been identified in the literature but not all of them seem to be appropriate to the higher education environment. Orejudo Hernández et al. (2018, p. 2) report that MPA “constitutes one of the greatest problems that musicians face” and that this might account for the high levels of substance abuse through musicians’ use of beta-blockers, herbal remedies, alcohol, cigarettes, and illegal drugs. Around 10 percent of musicians have been found to use some form of pharmacological approach for the management of MPA (Steptoe, 2001; Studer et al., 2011). In a study of 377 musicians from the eight professional symphony orchestras in Australia, Ackermann et al. (2014) found that as many as 31 percent of musicians had used beta-blockers. Alcohol seems to be the substance that is least used to alleviate MPA (Fehm & Schmidt, 2006; Orejudo Hernández et al., 2018), perhaps because the negative effects of alcohol misuse on performance are widely known. Certainly, in the world of higher education teaching, it is unethical for teaching staff to explore many of these avenues as coping strategies; however, teaching staff should be aware of such methods as their students may be self-medicating.

Behavioural and cognitive interventions have often been made in the context of teaching and some of the strategies highlighted in the literature have pedagogical applicability, are accessible to teachers and can easily be implemented by them, but others need specialist training or equipment. For instance, Orman (2003) introduced saxophonists to virtual reality (VR) as a means of bridging the gap between solo practice and performance to a live audience. Using this game-based approach, it was found that in the virtual environment there was a reduction in MPA, experienced subjectively, even though participants still showed signs of discomfort, according to objective measures including heart rate. However, the likelihood of teaching staff in higher education using strategies such as these might be quite low because, for example, most will not have access to VR software, hardware, and professional development to utilise it.

In their systematic reviews of MPA, Kenny (2005) and Brugués (2019) identified four treatment modalities: cognitive interventions, behavioural interventions, pharmacological treatment, and complementary approaches. Although neither Kenny nor Brugués focused solely on interventions in the higher education context, their work forms a basis for understanding MPA. Each of the treatment modalities is problematic at some level. Kenny (2005, p. 204) found that

“standard [cognitive and behavioural] treatments for anxiety [did] not seem directly transportable” and that the best outcomes seemed to come from more specific practices where musicians were asked to take control or develop self-coping systems through practices such as cognitive restructuring and self-instruction, and the rehearsal of specific behaviours. Both Kenny and Brugués outline the range of pharmacological treatments on offer to reduce MPA; however, it would be highly irregular for those teaching in higher education to apply such pharmacological treatments. Finally, while complementary, reflective, or other approaches such as mindfulness, meditation, and yoga have been found to lower levels of MPA among active performers (Diaz, 2018; Lin et al., 2008), as have other more individual approaches such as prayer, deep breathing, and visualisation (Ryan & Andrews, 2009), these strategies are not easy to implement as they require the teacher to develop new areas of expertise before they can be applied.

Methods

This paper offers a systematic review of the literature, following the guidance of Newman and Gough (2020), Peters et al. (2015), and Xiao and Watson (2019), to explore the teaching strategies that are used to help students in higher education cope with MPA.

Inclusion criteria

The inclusion/exclusion criteria used in the initial review of the extant literature are listed below.

- Topic. Articles were included where the topic was clearly MPA.
- Context. Articles were included where there was a clear description of the context of teaching and learning as a higher education setting, signified by variants of the keywords “university”, “college”, “higher education”, “HE”, or “post-compulsory education”.
- Intervention. Articles were included where there was a reference to teaching strategies used to cope with MPA, signified by variants of the keywords “teaching”, “approach”, “pedagogy”, “guidance”, “coaching”, “training”, “music education”, “mentoring” or “tutoring”
- Target population. Articles were included where there was a clear description of interventions that were designed to reduce MPA.

Scope

To focus on MPA within the context of higher education teaching, the following criteria were applied to the first tranche of literature searched to refine the selection of articles:

- Study design. Articles reporting original research using both quantitative and/or qualitative methodologies.
- Rigour. Articles had to be peer-reviewed. Editorials, reports, book chapters or essays were excluded.
- Year of publication. Articles from 2005 to 2021 were included.
- Language. The search was limited to articles published in English.

In establishing the scope, a starting date of 2005 was chosen, as that was the date of one of the key previous systematic reviews (Kenny, 2005). Whilst Kenny does not specifically address higher education, their work on music performance anxiety has been central to the discussion in the field of music education more generally. Furthermore, their use of four treatment modalities offers a clear organising framework for work on MPA. The end date of 2021 was

selected as this was the last full year of available data. The date range of 2005-2021 also ensures a focus on recent developments in the literature.

Searching and evaluation

The systematic review included a search covering the period (2005-2021), and a Boolean search using the following keywords: music performance; anxiety; teaching; pedagogy; and higher education, as well as their synonyms mentioned above. The search was conducted on databases frequently used for education including Web of Science, EBSCO, and ProQuest. The search resulted in a total of 116 research articles. To ensure the relevance of the articles, the researchers performed independent assessments of the abstracts based on the inclusion criteria. Discrepancies between the two reviewers were resolved through discussion.

The initial review of 116 full-text research articles using the four-phase PRISMA screening process (Moher et al., 2009) revealed three groupings in the literature: articles that reported on MPA but did not offer any discussion of pedagogical interventions; articles that fell outside the scope of enquiry; and articles that offered a discussion of pedagogical interventions to address MPA. The first and largest group of articles ($n=78$) was excluded because although they described the various issues associated with MPA, reported research investigating MPA, or provided scores for MPA among different groups, they did not introduce any means of addressing MPA. Another 20 articles were excluded as they fell outside the research parameters. These studies were conducted at summer music camps or private, non-regulated institutions that were outside the norm of higher education. In the end, 18 articles met the inclusion criteria, were considered relevant for the review, and were included in the dataset. Figure 1 below shows a flow diagram of the steps involved in the PRISMA screening process.

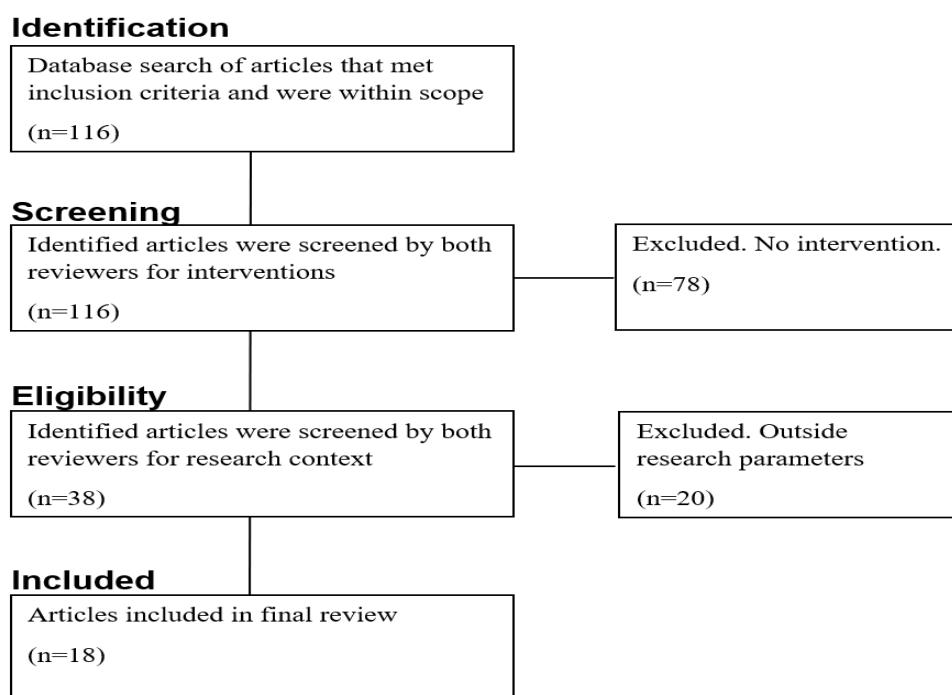


Figure 1

The PRISMA screening process

Classification of articles

Each of the articles that met the research conditions was read and classified using the four treatment modalities outlined by Kenny (2005) and Brugués (2019): cognitive interventions, behavioural interventions, pharmacological treatment, and complementary. Articles describing cognitive interventions or cognitive behavioural therapy such as performance psychology or mental skills training were classified as “cognitive”. Articles describing behavioural interventions such as breathing and muscle relaxation, and biofeedback using heart-rate monitors, were classified as “behavioural”. Articles describing the application of two or more interventions from the above categories were classified as “combined”. Articles that described interventions that could not be classified by reference to cognitive, behavioural, or pharmacological interventions were classified as “complementary”. These describe interventions that are complementary, including well-being activities such as mindfulness, meditation or yoga, or other approaches that stimulate reflection to address MPA. Articles describing interventions involving pharmacological treatments involving medication and self-medication were classified as “pharmacological” and were excluded from the review for the reasons given above. To ensure consistency in the coding of the dataset, both researchers read and coded all the data, and maintained communication during the classification and coding using a shared database of articles, notes and spreadsheets. To limit bias, articles were reviewed by both researchers, offering inter-rater checking. Bias was further reduced by having a transparent process that followed the guidelines outlined by PRISMA (Moher et al., 2009) and the Critical Skills Appraisal Program (CASP, 2018). This is not to say that all bias has been removed, but that steps have been taken to reduce it. Methodological bias in the articles was assessed by examining selection and sampling issues.

Results

The research question asked, “What interventions have been developed in higher education to support and/or develop students’ competencies to address MPA?” In attempting to answer this question, 18 articles were included in the final review. Alongside the literature published before 2005, these articles demonstrate that while MPA is a focus of research, few measures have been undertaken to address it and reduce its impact through higher education teaching practice.

Building on the classification used by Kenny (2005) and Brugués (2019), it was found that four articles reported the application of cognitive interventions (Clark & Williamon, 2011; Hoffman & Hanrahan, 2012; Osborne et al., 2014; Spahn et al., 2016); three articles reported the application of behavioural interventions (Cohen & Bodner, 2019; Silvana et al., 2008; Thurber et al., 2010); three articles reported the application of a combination of behavioural and cognitive interventions (Clarke et al., 2020; Juncos & Markman, 2016; Shaw et al., 2020); and eight articles reported the application of complementary interventions (Bissonnette, 2015; Czajkowski et al., 2020; Lin et al., 2008; Kim, 2005, 2008; Stern et al., 2012; Sulun et al., 2018; Tang & Ryan, 2020).

Table 1 presents an overview of the articles included in the review showing the intervention applied, the research methods used in the study, and the number of participants in each study. The guidance on systematic reviews provided by the CASP (2018) asks authors to consider three questions when undertaking this type of review: Are the results of the study valid? What are the results? Will the results help locally? Table 1 and the Discussion section that follows address the first and second questions. The Conclusion section addresses the third question.

Table 1*Articles included in the review*

Author(s)	Year	Title	Intervention	Modality	Research methodology	Participants
Clark & Williamon	2011	Evaluation of a mental skills training program for musicians	Mental skills training	Cognitive	Pre- and post-review of the impact of 9-week mental skills training	Treatment group (19); Control group (9)
Hoffman & Hanrahan	2012	Mental skills for musicians: Managing music performance anxiety and enhancing performance	Cognitive and imagery strategies	Cognitive	Randomised sample and control group using pre-and post-assessments	Treatment group (15); Control group (18)
Osborne, Greene & Immel	2014	Managing performance anxiety and improving mental skills in conservatoire students through performance psychology training: a pilot study	Performance psychology training	Cognitive	Pre- and post-review of the impact of lectures and masterclass on performance psychology	31 participants - no Control
Spahn, Walther & Nusseck	2016	The effectiveness of a multimodal concept of audition training for music students in coping with music performance anxiety	Multimodal coping strategies	Cognitive	Pre- and post-review of the impact of a three-part intervention on coping strategies	Treatment group (13); Control group (8)
Silvana, Nada & Dejan	2008	Simultaneous EEG and EMG biofeedback for peak performance in musicians	Biofeedback training	Behavioural	Pre- and post-review of the impact of 20 sessions of Biofeedback alongside EEG/EMG monitoring	Treatment group (6); Control group (6)
Thurber, Bodenhamer-Davis, Johnson, Chesky & Chandler	2010	Effects of heart rate variability coherence biofeedback training and emotional management techniques to decrease music performance anxiety	Heart rate/biofeedback and emotional refocusing	Behavioural	Randomised sample comparing the pre-and post-intervention assessment	Treatment group (7); Control group (7)
Cohen & Bodner	2019	Music performance skills: A two-pronged approach—facilitating optimal music performance and reducing music performance anxiety	Music performance skills course	Behavioural	Graduate students, assessed pre- and post- 11-week, 90-minute group music performance skills course	Treatment group (12); Control group (12)
Juncos & Markman	2016	Acceptance and Commitment Therapy for the treatment of music performance anxiety: A single subject design with a university student	Acceptance and commitment therapy	Combined	Single-subject design, using pre- and post-assessment	1 participant – no Control
Shaw, Juncos & Winter	2020	Piloting a new model for treating music performance anxiety: Training a singing teacher to use acceptance and commitment coaching with a student	Acceptance and commitment to coaching and	Combined	Pre- and post-review of the impact of seven hours of ACC training on teachers and	Phase 1 (1 teacher); Phase 2 (1 student) - no Control

Author(s)	Year	Title	Intervention	Modality	Research methodology	Participants
			training of the teacher.		subsequent six one-hour ACC coaching of student	
Clarke, Osborne & Baranoff	2020	Examining a group acceptance and commitment therapy intervention for music performance anxiety in student vocalists	Group-based acceptance and commitment therapy	Combined	Pre- and post-survey of six weekly sessions of group ACT	6 participants – no Control
Lin, Chang, Zemon & Midlarsky	2008	Silent illumination: a study on Chan (Zen) meditation, anxiety, and musical performance quality.	Chan (Zen) meditation course	Complementary	Pre- and post-review of the impact of the 8-week meditation course	Treatment group (9); Control group (10)
Czajkowski, Greasley & Allis	2020	Mindfulness for musicians: A mixed-methods study investigating the effects of 8-week mindfulness courses on music students at a leading conservatoire	Mindfulness course	Complementary	Pre- and post-review of the impact of the 8-week mindfulness course	25 participants – no Control
Stern, Khalsa & Hofmann	2012	A yoga intervention for music performance anxiety in conservatory students	Yoga	Complementary	Pre- and post-yoga intervention using questionnaires	24 participants – no Control
Kim	2005	Combined treatment of improvisation and desensitization to alleviate music performance anxiety in female college pianists: A pilot study	Desensitisation	Complementary	Pre- and post-testing of six weekly sessions of rhythmic breathing exercises, free improvisation, and desensitisation exercises	6 participants – no Control
Kim	2008	The effect of improvisation-assisted desensitization, and music-assisted progressive muscle relaxation and imagery on reducing pianists' music performance anxiety	Desensitisation	Complementary	Two treatment groups (randomly assigned) with seven pre-and post-assessments	Treatment group 1 (15); Treatment group 2 (15) – no Control
Bissonnette, Dubé, Provencher & Moreno Sala	2015	Virtual reality exposure training for musicians: Its effect on performance anxiety and quality	Virtual Reality Exposure	Complementary	Pre- and post-review of the impact of six sessions of virtual exposure	Treatment group (9); Control group (8)
Sulun, Nalbantoglu & Oztug	2018	The effect of exam frequency on the academic success of undergraduate music students and comparison of students' performance anxiety levels	Exam scheduling	Complementary	Quantitative analysis of pre-and post-exam scores of a semi-representative sample	59 participants – no Control
Tang & Ryan	2020	Music performance anxiety: Can expressive writing intervention help?	Expressive writing	Complementary	Two groups (no Control) assessed pre-and post- expressive writing intervention	35 participants (16 piano majors and 19 minors)

Discussion

This review set out to discover how those who teach in higher education might support and develop students' competencies and skills to address MPA. There is a broad discussion of MPA in the literature and there seems to be a consensus as to its sizeable impact (Ackerman, 2014; Diaz, 2018; Lin et al., 2008; Orejudo Hernández et al., 2017; Paliukiene et al., 2018; Sternbach, 2008; Zinn et al., 2000). Raising awareness and encouraging preventative approaches to MPA through the integration of pedagogy, practice, and performance in the early stages of an individual's musical education can lay the foundation for management and coping strategies that might help to mitigate the effect of entering a highly stressful profession; however, the first conclusion of this systematic review is that pedagogies designed to address MPA have received relatively little attention in the published literature. One hundred and sixteen research articles were identified in the initial scoping of the literature, but, upon further scrutiny, this was reduced to a mere 18 papers where there were clear interventions that explicitly aimed to address MPA.

Examining the methods used in the studies reported, it was found that 10 of the 18 did not use a control group and most had very small numbers of participants, with an average of 18 participants in each study; indeed, one was a case study with only one participant. While these factors are not in themselves markers of research quality, they make it hard to draw valid generalisations and derive solid implications for pedagogical practice in higher education. In line with the recommendations of Kenny (2005) and Brugués (2019), there is clearly scope for further investigation using larger numbers of student participants, across different cohorts, and in different musical disciplines within the higher education setting. Brugués (2019) emphasises the need for further randomised control studies and the use of standardised measurement scales to develop a theoretical understanding of MPA. While this is appropriate, considering the work that has been undertaken to describe and generalise the nature of MPA, its frequency of occurrence and potential treatments (see Güven, 2017; Orejudo Hernández et al., 2017; Wehr-Flowers, 2006), Brugués' approach to MPA is based on a medical epistemology that is reactive and corrective rather than a pedagogical one that is proactive and preventative. Considering the limited work undertaken to date in the higher education sector, further exploratory studies could bring potentially fruitful pedagogies and interventions to the fore and describe their implications for teaching practice.

Treatment modalities

In the 18 articles identified in the systematic review, various interventions, the majority of which were derived from promising treatments used in fields such as cognitive, behavioural, and sports psychology, were trialled to address MPA among students (see Clark & Williamon, 2011; Hoffman & Hanrahan, 2012; Silvana et al., 2008). Four articles were classified as cognitive (Clark & Williamon, 2011; Hoffman & Hanrahan, 2012; Osborne et al., 2014; Spahn et al., 2016), reporting interventions that drew on cognitive psychology and therapeutic interventions using cognitive and imagery strategies to manage or treat MPA. However, these cognitive interventions tended to rely heavily on specialist training. For example, Clark and Williamon's (2011) intervention was supported by three certified psychologists. Hoffman and Hanrahan's study (2012) involved a trainee psychologist working alongside a fully registered and accredited psychologist. The study by Osborne et al. (2014) was run by a leading expert in the field and the study by Spahn et al., (2016) was reliant on a specialist physician. While in all these cases there was some evidence of success in reducing MPA, it would be almost impossible for a music educator to introduce any of these interventions into their everyday practice without a significant level of training or support.

Each of the three behavioural articles reported evidence of decreased MPA, but all three interventions are hard to replicate in a typical higher education teaching environment. Silvana et al. (2008) reported that 20 sessions of alpha Electroencephalogram (EEG)/Electromyography (EMG) biofeedback led to a reduction in MPA, but considerable technical expertise is required to use the EEG/EMG equipment and to interpret any resultant data. Thurber et al. (2010) also examined therapeutic interventions in which students took part in a series of training sessions including computerised heart rate variability biofeedback, emotional-regulation exercises, and the use of hardware to measure heart rate variability. This intervention resulted in a significant decrease in MPA and led to an improvement in performance, measured subjectively; however, the intervention took place under the supervision of a certified trainer, making it difficult to replicate in the form of an accessible and implementable pedagogical intervention. The third behavioural intervention (Cohen & Bodner, 2019, p. 527) involved an 11-week music performance skills course that was led by a "music therapist with 20 years of performing experience and training in cognitive behavioural therapy", a factor that significantly reduces the generalisability of this approach.

The three combined articles (Clarke et al., 2020; Juncos & Markman, 2016; Shaw et al., 2020) reported studies in which the intervention used was acceptance and commitment therapy (ACT). However, none of them used a control group, making it difficult to assess the potential of this intervention. One article reported a case study with only one participant (Juncos & Markman, 2016). A second (Shaw et al., 2020) reported a study in which one teacher was trained in acceptance and commitment coaching (ACC), which was then applied to one student vocalist. While the findings of this study suggest that music teachers could be trained to support students, removing the need to hire specialist ACC coaches, certain aspects of this research reduce its generalisability. For instance, music teachers must commit considerable time to being trained in ACC methods. In this study, the teacher devoted seven hours to training and made regular post-training reports to the trainer, although seven hours is just a fraction of the time it takes to become a fully trained ACC coach. Music teachers trained in this way would therefore be able to fulfil only limited roles compared to fully trained ACC coaches. This is made explicit by Shaw et al. (2020, p. 11), who “discourage the idea that training a music teacher in ACC will lead to developing the same professional competencies as earning a professional certificate or degree in performance coaching would”. The third combined article reported a study with a larger group of participants ($n=6$), in which a combination of interventions was delivered (Clarke et al., 2020). Again, the study required the involvement of “a clinical psychologist in training who is ACT-trained and co-facilitated by a registered psychologist with over 18 years of clinical experience” (Clarke et al., 2020, p. 5).

Three of the eight complementary articles reported interventions that showed some evidence of reducing MPA, applying well-being approaches such as mindfulness, meditation, and yoga. As in the cognitive, behavioural, and combined interventions, they relied on specialist support. Lin et al. (2008) reported on an 8-week meditation course, after which MPA was found to have decreased by one standard deviation. Still, this success may be attributable, in part, to the fact that a fully qualified meditation instructor led the course. Likewise, Czajkowski et al. (2020) reported on a study examining the effects of an 8-week mindfulness course. The results showed a decline in reported MPA, but a trained mindfulness teacher delivered the intervention, and the study did not have a control group. To address MPA, Stern et al. (2012) offered conservatory students a yoga intervention. Without a control group, an experienced trainer delivered yoga classes over nine weeks, which was found to be successful in reducing MPA. While an experienced trainer had given this intervention, these researchers (2012) concluded that yoga, like mindfulness, might provide an efficacious addition to the curricula of music schools to cope with performance anxiety.

Kim (2005, 2008) offered two complementary articles that explored the effect of music therapy on MPA. In the first two studies (Kim, 2005), a registered music therapist offered college students six individual therapeutic sessions involving rhythmic breathing exercises, free improvisation, and desensitisation exercises. Kim (2005) found that the combination of improvisation and desensitisation reduced MPA to some extent. In the second study (Kim, 2008), music-assisted progressive muscle relaxation and desensitisation exercises significantly reduced MPA. According to Kim (2008, p. 184), no additional skills are required to apply music-assisted muscle relaxation and desensitisation as “any musician...can learn this technique without difficulty.” Nevertheless, the intervention reported by Kim was delivered by a certified music therapist, which raises the possibility that the success of the intervention was attributable to the therapist.

Within the last three articles classified as complementary, Bissonnette et al. (2020) reported using Virtual Reality Exposure Therapy (VRET) to create a controlled environment using VR headsets. Like Orman (2003), who used large static displays to create a VR environment, Bissonnette et al. (2020) demonstrated that VRET could result in a significant drop in MPA. Although they do not discuss the technological skills required, not all music educators can be assumed to be competent in working with VR technologies or to have access to the hardware needed. Just as success is dependent on having the requisite VRET training and equipment, the authors also warn that “the quality of technology used to create the virtual environment can be a predictive factor” (Bissonnette et al., 2020, p. 176). Nevertheless, considering their proliferation in the commercial sector it can be expected that VR technologies will become more affordable, accessible, and easier to use for learning and teaching in HE (Radianti et al., 2020).

The study by Sulun et al. (2018) which explored whether an increase in the frequency with which examinations were taken would raise students' preparedness and academic achievement, and reduce their exam anxiety, was also classified as complementary and is perhaps more applicable in the context of higher education. This study involved 59 students and found that having to take examinations more often increased students' exam anxiety to such a noticeable degree that the intervention was cancelled after a single semester. Although increasing the frequency of assessments might not be effective, performance preparation is considered important for reducing MPA (Kenny, 2011a; Sternbach, 2008; Taborsky, 2007), and interventions to develop students' assessment and performance literacies might be a fruitful avenue for professional development and further research.

Finally, a study reported by Tang and Ryan (2020) shows scope for the application of an intervention by non-specialists working in higher education. In this expressive writing intervention, two groups of piano students were given 10 minutes to write about their feelings and thoughts regarding an upcoming performance, to stimulate awareness and reflection. They were then asked to give a performance and the results of the study showed reductions in performance errors and lower levels of self-reported levels of anxiety. However, the two groups of participants were not matched. They were subject to slightly different research designs, and no control group was used. Besides these methodological issues, there was little guidance by the researchers on what expressive writing consists of or how this approach can be employed by teachers. However, of all the interventions reviewed this study is perhaps the most helpful in guiding music teachers toward developing an approach that might be applied in a typical higher education teaching environment.

Conclusion

This systematic review of the literature (2005-2021) aimed to find out how those who teach in higher education might develop pedagogical interventions to support and develop students' competencies and skills to address MPA. Very few answers were found. Those that were found are not easily accessible to the average member of the academic teaching staff. Regarding higher education pedagogy, little clear, practicable and transferable evidence was found in the literature. The work of Tang and Ryan (2020) is perhaps the most likely candidate for inclusion in typical teaching practice. These authors found that there was a close association between performance anxiety and self-talk. This self-talk was the space in which performers began to question and reflect on their levels of anxiety. To counter this, these researchers asked students to write out their thoughts and feelings before performing to "regulate emotions, and redirect attention to music-related or more objective thoughts . . . [providing] piano students with a mechanism for staying focused and eliminating unnecessary negative or self-critical conversations while performing" (Tang & Ryan, 2020, p. 8). This simple intervention could well be incorporated into the pedagogy of music teachers.

Aside from the intervention reported by Tang and Ryan (2020), most of the interventions required specialist knowledge, training, equipment, and experience. This finding aligns with the conclusions of Kenny (2005), who also found that many treatments require specialist knowledge and understanding gained through physiological and psychological training, and equipment for treating participants. Although some interventions, such as increasing the frequency of examinations (Sulun et al., 2018) and improvisation exercises (Kim, 2005, 2008), might be implementable by academic staff, the former study was not successful, and some professional development is necessary for teachers to obtain the skills and understanding needed to provide the level of music therapy outlined in Kim's work. Moreover, in the articles identified in the review, the emphasis is on treating and mitigating levels of MPA among higher education students, approaching the phenomenon reactively. Although treatment is undoubtedly an important, if not the most important, aspect of MPA, it exports a medical approach to higher education teaching. Besides treatment, the articles included in the review made only indirect reference to music pedagogy and curricula, signposting areas that could be further explored to develop preventative measures in relation to MPA. Areas for further exploration include: raising awareness of MPA in general and its symptoms in particular; understanding the beneficial and detrimental effects of MPA; exploring the relationship between self-esteem, musical self-efficacy, and professional career pathways; examining the interconnection between individual pleasure and perceptions of judgement, and learning healthy self-management strategies as a means to prepare students for sustainable careers in music (Hoffman & Hanrahan, 2012; Kim, 2005, 2008; Stern et al., 2012; Sulun et al., 2018; Thurber et al., 2010).

The limitations of this review are mainly linked to the scope of this paper. The inclusion criteria were focused on higher education environments and music performance. It is possible that these criteria could have been extended to allow data from wider sources such as music conservatories and professional orchestras to be included. Research focusing on other areas of performance such as dance, sport, and theatre would also have given a broader understanding of anxiety in relation to performance. As it stands, the papers included were able to offer a good overview of the state of MPA in relation to higher education teaching practice. What is evident is that MPA can have a debilitating effect on many performers (Diaz, 2018; Paliukiene et al., 2018; Zinn et al., 2000), and many studies have reactively investigated the strategies used by students and musicians to try to overcome MPA (Lin et al., 2008; Orejudo Hernández et al., 2017; Steptoe, 2001; Studer et al., 2011).

There is clear evidence from the literature that MPA is an issue that needs to be addressed; however, there appears to be little guidance on how to embed this in higher education music teaching. It is recommended that instead of further research on the abundance and impact of MPA, there is a need for a refocusing of effort on introducing and testing interventions that seek to reduce the impact of MPA. This could be through action research-type activity, where typical teaching practice becomes the topic under review. Music teaching has a history of using techniques to enhance performance (Bourne et al., 2011; Talia, 2017). Perhaps a similar focus could be applied to

augmenting the psychology of performance. Music teachers are aware of the situation, but the effort now needs to be concentrated on developing interventions that work to reduce MPA and that can be integrated into typical higher education teaching practice.

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