Is performing music soothing or stressful?

Two perspectives: Music performance anxiety among musicians and the effect of active music-making on seniors' health.

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à Marc-André,

à ma mère Diane et toute la famille.

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Preface

Abstract

This dissertation examines two perspectives on active music-making: Music performance anxiety (MPA) among musicians from different backgrounds and the effects of music-making on seniors' health and wellbeing. The research questions investigated (a) the extent to which performing music yields biological, psychological and social benefits and (b) the extent to which specific biological, psychological and social parameters influence MPA. Using the Biopsychosocial model (Engel, 1980), it was hypothesized that MPA would yield detrimental effects on musicians' wellbeing, whereas music-making would generate multiple benefits that could contribute to promote people's quality of life and healthy aging.

Three studies were conducted for this doctoral thesis. The first study, in Chapter 4, provided a new version of the Performance Anxiety Inventory for Musicians (PerfAIM) and described its validation process. The psychometric properties of the PerfAIM were at first estimated with a sample of 69 musicians. After revision and translation, an exploratory factor analysis was carried out with a sample of 241 musicians that revealed four factors (1- Unpredictability; 2- Anticipation; 3- Threat to the ego; 4- Sense of control) explaining over 52% of the variance when combined.

The second study, in Chapter 5, investigated the extent to which MPA affected cohorts of musicians performing classical music only, popular music only, or both styles of music. Significant differences were found in MPA between women and men; younger

and older performers; people with generalized anxiety and those without; vocalists/arched string players and plucked string/woodwind/brass players, the former reporting higher MPA than the latter. Solo performance setting was considered the most stressful situation, and small ensemble setting the least stressful. Advanced musicians reported more MPA than expert musicians. Classical musicians indicated higher MPA than popular performers and musicians playing both styles.

The aim of the third study, in Chapter 6, was to verify the effects of active music-making on beginner musicians aged 60 years old and over by exploring health-related benefits as well as the potentially deleterious impact of MPA during a concert. An experimental and a control group were followed over 15 weeks. The findings indicated that parameters associated with biological, psychological, and social factors mediated the musicians' levels of MPA and yielded positive outcomes for older adults participating in a community band.

This thesis contributes to the field of music education in many ways. First, it offers the first questionnaire on MPA validated for classical and popular musicians in both English and French. Second, it provides valuable insights on MPA, including a comparison of multiple parameters (i.e. gender, age, trait anxiety, years of training, instrument, level of expertise, and performance settings) from the perspective of musicians playing different musical styles. Third, it reports new findings on older adults' perception of the initial phases of music learning and describes the impact of MPA in elderly beginner performers. On a practical level, the findings are discussed from a pedagogical perspective and applications to musicians are suggested.

Résumé

Cette thèse présente deux perspectives en ce qui a trait à la participation active en musique: celle des effets de l'anxiété de performance musicale (APM) chez les musiciens ayant différents parcours musicaux, et celle de l'impact de la pratique instrumentale sur la santé et le bien-être des aînés. Les questions de recherche visent à déterminer (a) dans quelle mesure la participation musicale apporte des bienfaits biologiques, psychologiques et sociaux et (b) dans quelle mesure certains paramètres biologiques, psychologiques et sociaux influencent les niveaux d'APM. En se référant au modèle Biopsychosocial (Engel, 1980), les hypothèses proposent que l'APM aurait des effets néfastes sur le bien-être des musiciens, alors que la participation musicale apporterait de multiples avantages prônant, auprès des populations âgées, une qualité de vie et un vieillissement en santé.

Trois études, menées au cours de ce doctorat, sont rapportées. La première étude présente, au chapitre 4, une nouvelle version du questionnaire « Performance et anxiété, un inventaire pour musiciens » (PerfAIM) et décrit le processus de validation utilisé. Les propriétés psychométriques du PerfAIM ont d'abord été estimées grâce à un échantillon de 69 musiciens. Après révision et traduction, une analyse factorielle exploratoire, réalisée avec un échantillon de 241 musiciens, révèle que quatre facteurs (1- imprévisibilité; 2- anticipation; 3- égo menacé; 4- contrôle) expliquent plus de 52% de la variance combinée.

La seconde étude traite, au chapitre 5, de l'impact de l'APM chez différentes cohortes de musiciens jouant soit de la musique classique, soit de la musique populaire, ou soit encore des deux styles de musique. Des différences significatives en terme d'APM sont rapportées pour les groupes suivants, les premiers indiquant des niveaux d'APM plus élevés que les derniers : les femmes et les hommes; les jeunes interprètes et les plus âgés; les personnes ayant de l'anxiété généralisée et celles n'en ayant pas; ainsi que les chanteurs/instrumentistes à cordes frottées et les instrumentistes de la famille des bois/cuivres/cordes pincées. Les prestations en solo sont considérées comme étant les plus stressantes alors que celles en petits ensembles suscitent le moins d'anxiété. Les musiciens avancés rapportent des niveaux d'APM plus élevés que les musiciens experts.

Les musiciens classiques indiquent souffrir davantage d'APM que les artistes populaires et ceux jouant des deux styles.

Au chapitre 6, la troisième étude discute des effets de la musique active sur les musiciens débutants âgés de 60 ans ou plus en explorant les avantages liés à la santé ainsi que l'impact potentiellement néfaste de l'APM lors d'une prestation publique. Un groupe expérimental et un groupe témoin ont été suivis pendant 15 semaines. Les résultats indiquent que, même si certains paramètres associés aux facteurs biologiques, psychologiques et sociaux influencent les niveaux d'APM des musiciens, la participation à une harmonie suscite une variété de bienfaits biologiques, psychologiques et sociaux chez les aînés débutant la musique.

Cette thèse contribue au domaine de l'éducation musicale à plusieurs égards. Tout d'abord, elle offre le premier questionnaire sur l'APM validé auprès des musiciens classiques et populaires, en anglais et en français. Deuxièmement, elle fournit des informations significatives concernant l'APM, incluant une comparaison entre musiciens classiques et non-classiques, et ce en fonction de multiples paramètres (tels que le sexe, l'âge, l'anxiété de trait, le nombre d'années de formation, le type d'instrument, le niveau d'expertise, et les contextes de performance). Troisièmement, elle jette la lumière sur les phases initiales de l'apprentissage musical en analysant la perception des participants aînés et en décrivant l'impact de l'APM chez ces musiciens débutants âgés. Sur le plan pratique, les résultats sont abordés d'un point de vue pédagogique et des applications s'adressant aux musiciens sont suggérées.

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Contribution of Authors

This document is formatted as a manuscript-based dissertation and includes three articles. The following articles are considered original scholarship that provides distinct contributions to knowledge:

Chapter 4:
Barbeau, A.-K., & Cossette, I. (To be submitted). Psychometric properties of the Performance Anxiety Inventory for Musicians (PerfAIM).

Chapter 5:
Barbeau, A.-K., & Cossette, I. (To be submitted). Impact of gender, age, general anxiety, musical background, and expertise on levels of MPA among classical and popular performers.

Chapter 6:
Barbeau, A.-K., & Cossette, I. (To be submitted). The effects of participating in community concert band on senior citizens' quality of life, health, and performance anxiety.

My role in these articles consisted in designing and carrying out the research projects, which included developing the research protocols, collecting data, completing quantitative and qualitative analyses, interpreting the results, and preparing the manuscripts for publication. My advisor, Dr Isabelle Cossette, provided guidance throughout the projects, contributing on the study designs and analysis of findings as well as on the writing and editing of the dissertation and articles. She also provided funding, laboratory space (i.e. Music Performance and Body Lab) and equipment.

Introduction

Problem Statement

Researchers in the fields of music education and music psychology have focused on different aspects of music-making, both positive and negative. For instance, studies have been conducted on the benefits derived from learning and playing music at a later stage of life (Creech, Hallam, Varvarigou, & McQueen, 2014), whereas others have focused on the effects of music performance anxiety (MPA) in contexts of public concerts (Kenny, 2011). One is led to wonder: Is performing music more soothing or stressful for musicians? In which context does music-making generate benefits that may overcome the stress load associated with public performances? For instance, are professional musicians less prone to MPA than their non-professional counterparts because of their experience and musical recognition? Does playing music as a hobby guarantee enjoyment and stress-free performances? Do men and women experience music performances the same way? Are young adults more stressed than older people when they have to perform in public, and if so, why? This dissertation seeks to answer these questions by investigating the effects of music-making from two perspectives: the study of music performance anxiety in adults and the health-related benefits of participatory music among people of 60 years of age and over who learned to play a wind instrument.

Prevalence of MPA

Music performance anxiety is defined as "the experience of marked and persistent anxious apprehension related to musical performance", which manifests through "combinations of affective, cognitive, somatic, and behavioural symptoms" (Kenny, 2010, p. 433). One of the earliest surveys on MPA, still regularly cited in the literature, was conducted by Fishbein and Middlestadt (1988) with 2212 professional orchestra musicians. They indicated that stage fright was considered to be a problem in 24% of their sample and a severe problem for another 16% of the musicians. Wesner, Noyes, and Davis (1990) discovered similar findings in their study analyzing 302 music students and faculty members. In fact, they found that 21% of the musicians reported significant distress while performing and 16.5% mentioned that MPA was detrimental to their performances. A few years later, Cox and Kenardy (1993) surveyed 32 music students and determined that 84% of them had debilitating MPA that was high enough to affect the quality of their performances. This surprisingly high number may be attributed to sampling procedures. Because they used a self-reported questionnaire completed on a voluntary basis, it is possible that most students who decided to participate in the study did so because they suffered from MPA. Another explanation is that the authors studied three settings (practice, group performance, solo performance) but it is unclear whether the 84% reported comes from solo performance only or from the combination of group and solo performances. Salmon, Powell Shook, Lombart, and Berenson (1995) investigated MPA in 154 musicians and indicated that 69.5% experienced some form of MPA. In fact, while only 10% of the sample suffered from severe to extreme MPA, 47% showed mild to moderate anxiety and 43% minimal MPA. In their study conducted with 155 professional orchestra musicians, van Kemenade, van Son, and van Heesch (1995) found that 59% of the performers had debilitating MPA affecting performance quality. The quality of performance was also impacted by MPA among 70% of the 56 orchestra musicians examined by James (1998), and 16% of these musicians reported experiencing MPA more than once a week. Miller and Chesky (2004) explored MPA in 71 college musicians and mentioned that 83.1% suffered from MPA. Levy, Castille, and Farley (2011) studied young marching artists (aged between 15 and 21) and determined that

over 50% of them were "excessively worried and self-critical of their performances" (p. 33).

These results show a tendency for music students to report high MPA, between 80% and 85% suffering from it (Cox & Kenardy, 1993; Miller & Chesky, 2004), as well as for professionally trained orchestra musicians, between 40% (Fishbein & Middlestadt, 1988) and 59% (van Kemenade et al., 1995) of them experiencing MPA with detrimental consequences on performance quality. Among older musicians, 11% of professional orchestra players were reported to suffer from severe MPA (Fishbein & Middlestadt, 1988), which is below the percentages reported for other age groups. Several studies have also provided evidence that senior musicians tend to be less stressed about performing than young musicians (Ackermann, Kenny, O'Brien, & Driscoll, 2014; Kenny, Driscoll, & Ackermann, 2014; Wolfe, 1989). In fact, Ackermann et al. (2014) and Kenny et al. (2014) indicated that classical musicians under 30 years of age were more vulnerable to MPA than musicians over 50 years old, and that the latter experienced the lowest levels of MPA overall.

It is worth mentioning that almost no studies are available that focus on the prevalence of MPA among non-classical musicians. Papageorgi, Creech, and Welch (2013) confirm that research on MPA among popular musicians is scarce, making it challenging to determine the exact nature of the MPA experience in non-classical performers and to compare it to their classical counterparts. In fact, most studies conducted with popular musicians are associated with personality (Dyce & O'Connor, 1994; Gillespie & Myors, 2000) or job-related stressors (Cooper & Wills, 1989; Raeburn, 1987a, 1987b), which is further discussed in Chapter 3. Recently, Perdomo-Guevara (2014) demonstrated that classical and non-classical musicians experience performances differently in terms of emotion and cognition, although she did not provide information about the percentages of participants suffering from MPA within each subgroup.

Older Adults in Québec, Canada

In 2013, older adults encompassed 16.6% of the Québec population (ISQ, 2013) and this number is constantly increasing. In fact, it is estimated that 26% of the population will be 65 years old or older by 2031 (ISQ, 2013). This means that in 15

years, more than one person out of four will be considered senior. The Institut de la statistique du Québec (ISQ, 2012a; 2012b) provides a portrait of the older adults currently living in the province, detailing information about gender, education, living situation, self-perceived financial situation, global health, social life, physical activity, and psychological distress (Appendix 1). According to the ISQ reports, there are more women than men in Quebec and the former have a higher life expectancy. Almost half of the older adults possess either a high school diploma or a post-secondary degree. The majority of seniors still live at home and with someone. Most elderly adults have enough money to meet their needs and those of their family, consider themselves to be generally healthy, are satisfied with their social life, and do not report high psychological distress. However, almost six adults out of ten are not physically active, which may have an impact on seniors' global health (ISQ, 2012b).

The prevalence of chronic health disease among older adults varies. For instance, in Québec and Canada (ISQ, 2012b; Ramage-Morin, Shields, & Martel, 2010), the most prevalent conditions affecting seniors include hypertension,[1] arthritis,[2] back pain,[3] heart disease,[4] and diabetes.[5] While respiratory diseases such as Chronic Obstructive Pulmonary Disease (COPD) and asthma are not afflictions highly prevalent in the elderly population, they still affect respectively 18.7% and 7.8%[6] of older adults in Canada (Statistics Canada, 2016a) and 8.2% and 7.2% of seniors living at home in Québec (ISQ, 2012b).

It is worth pointing out that psychological distress, while not a prevailing condition, is reported by almost one older adult in five (Appendix 1), which may be a source of concern. Furthermore, 43.3% of older Canadians suffer from some form of daily stress (Ramage-Morin et al., 2010). Statistics Canada (2015) specifies that 10% of men and 12.3% of women aged 65 and over tend to describe most days as being "quite a bit" or "extremely stressful". Regarding mental health, 5.3% of older Canadians live

[1] 47% in Québec, 53% in Canada
[2] 33.3% in Qc, 43% in Can
[3] 20% in Qc, 29% in Can
[4] 17.8% in Qc, 23% in Can
[5] 17.2% in both Qc and Can
[6] 7.8% is the mean percentage calculated from data provided by gender for two age groups (65-74 yrs and 75+ yrs).

with a mood disorder (4.1% of men and 6.5% of women; Statistics Canada, 2016b). This number may not be impressive, but the Conseil du médicament (2011) estimates that the prevalence of antidepressant medication usage has increased in the last years and that among the new users, 50% are adults of 60 years old or over. These indicators demonstrate that many seniors have to endure psychological distress, daily stress, and mental health issues that may affect their general wellbeing and undermine healthy aging.

In an attempt to counteract these effects, researchers have explored different strategies to promote health through participatory music. Bungay and Skingley (2008) examined the impact of group singing on older adults' wellbeing and found positive effects on mental health, cognition, social interactions, and physical health (breathing, coordination, relaxation and pain management). In a longitudinal study, Creech and colleagues (2014) investigated creative and active music-making through activities including choirs, percussion groups, ukulele or guitar ensembles, steel pan ensembles, rock bands, classes for music appreciation, as well as recorder and keyboard lessons. The authors demonstrated that being involved in musical activities significantly improved older adults' quality of life through increased social-emotional, cognitive, and physical wellbeing. They also identified potential barriers to participation, which include structural constraints (e.g. issues associated with location, timing, transport, and finance), information constraints (e.g. marketing, publicity, outreach), social constraints (e.g. social roles and competing commitments, especially regarding responsibilities as care-givers of grandchildren or relatives), as well as personal and dispositional constraints (e.g. unwillingness to socialize, lack of interest, low self-confidence, or physical illness; Creech et al., 2014).

On the other hand, none of these authors has explored the other side of the wellbeing continuum and considered the deleterious effects that older adults may experience during performances (fast heart rate, memory lapses, hot flashes, panic, etc.). In fact, no studies have been found on the prevalence of music performance anxiety among elderly beginner musicians. This lack of studies suggests that further research is warranted to determine the extent to which music-making may positively and/or negatively affect individuals, particularly among older adults who start playing music later in life.

Need for the Studies

In order to assess musicians' levels of MPA, a psychometrically sound questionnaire had to be used. While a few questionnaires such as the revised Kenny Music Performance Anxiety Inventory (i.e. K-MPAI; Kenny, 2009a) and the Performance Anxiety Scale for Music Students (i.e. PASMS; Çırakoğlu & Şentürk, 2013) already meet some standards for validity and reliability, none of these measures are available in French, nor have they been validated with populations other than classical musicians. Therefore, the first need for the studies is to design a questionnaire on MPA that shows adequate psychometric properties in both its English and French versions and that is able to detect differences between classical and popular musicians. With this questionnaire, it is then possible to study and compare more systematically various populations of musicians, something that has scarcely been done in the literature so far. The second need for the studies is to collect data from both classical and popular musicians in order to compare their levels of MPA and explore whether other parameters may influence performers' stress levels during concerts. Finally, because it has been found that music-making may greatly improve the lives of older adults, the third need for the studies is to assess MPA in a specific cohort of older adult beginner musicians playing in a community concert band and to contrast their concert experience with the benefits they reported following their participation in the regular activities of the group.

Research questions and hypotheses

From a comprehensive point of view, the goal of this thesis is to examine, through the use of the Biopsychosocial model (Engel, 1980), the relationship between music-making and biological, psychological, and social factors among healthy adults. Three main research questions are investigated:

- **Question 1**: Does performing music yield biological benefits for musicians and do biological parameters, such as gender and age, influence levels of music performance anxiety (MPA)?

- **Question 2**: Does performing music yield psychological benefits for musicians and do psychological aspects, such as trait anxiety[7] and identity, influence levels of MPA?
- **Question 3**: Does performing music yield social benefits for musicians and do social aspects, such as interpersonal interactions and the performers' environment, influence levels of MPA?

In the current thesis, the word "performance" is used broadly and encompasses the act of making music both *with* and *for* people. Because performance usually entails a "musical process during which musical ideas are realized and transmitted to a listener" (Thomas, Carr, & Foss, 2011, p. 1), I consider making music *with* people as a form of performance in which all musicians are also listeners within ensembles. Making music *for* people involves all types of performances occurring in front of an audience.

The hypothesis is that performing music generates biological, psychological, and social effects that may be debilitating in the context of public performances, but that they are mostly beneficial otherwise. More specifically, from a biological standpoint, I suggest that music-making may negatively affect performers through somatic symptoms of MPA (such as increased heart rate, trembling, or insomnia) but may also contribute to maintaining, or even improving, respiratory function and blood pressure in older adult beginner musicians. I suspect that MPA levels may be different between men and women and between people of various ages.

From a psychological standpoint, I hypothesize that music may improve wellbeing and the quality of life of seniors, in addition to decrease their general anxiety and depressive symptoms. With regard to MPA, affective and cognitive symptoms might be expected, such as worries or memory lapses, although these manifestations may be mediated by people's appraisal of performance.

From a social standpoint, I postulate that several social benefits may be reported by older adults following 15 weeks of active music-making within a community concert band, among which are an increase in interpersonal interactions and a new sense of

[7] Trait anxiety refers to generalized anxiety or, in other words, to individuals' predisposition to be generally anxious in life. (A full definition is provided on p. 40)

belongingness that may contribute to decrease social isolation. In the context of performance, I suppose that musicians may be concerned by social factors such as the audience's reaction to their performance and the fear of being judged by others. I speculate that the choice of performing style (classical or popular) may significantly influence MPA as it affects the musicians' social environment through specific and distinct musical trainings, working conditions, performance settings, and so forth.

Purpose of the studies

The aim of the first study, presented in Chapter 4, was to create the Performance Anxiety Inventory for Musicians (PerfAIM) and undertake a validation process – including statistical analyses to determine the internal consistency, test-retest reliability, convergent validity, concurrent criterion-related validity, and exploratory factor analysis – in order to demonstrate that the PerfAIM is a measure that effectively evaluates the construct under study and is able to discriminate between populations (for instance, between men and women, between classical and non-classical musicians, or between anxious and non-anxious individuals). The aim of the second study (Chapter 5) was to investigate, through the use of the PerfAIM, the extent to which MPA affects classical and popular musicians. In addition, the impact of specific parameters (such as trait anxiety, gender, age, instrument, performance setting, and level of expertise) was explored. The aim of the third study (Chapter 6) was to examine the effect of participating in an intergenerational and bilingual community band on quality of life, mental health (anxiety and depression), physical health (respiratory function, blood pressure) and performance anxiety of senior citizens 60 years old and over who were beginner musicians.

Limitations

Some limitations must be acknowledged regarding the studies conducted as part of this dissertation. In the first study reported in Chapter 4, an exploratory factor analysis was undertaken, which is a data-driven method recognized to verify the extent to which items of a questionnaire adequately reflect a construct that cannot be measured directly (Beavers, Lounsbury, Richards, Huck, Skolits, & Esquivel, 2013). While being

psychometrically sound in itself, this test could have been complemented by a theory-driven approach called Confirmatory Factor Analysis. Further analysis is thus warranted.

In the second study (Chapter 5), a sample of 241 musicians was used to analyze MPA in classical and non-classical performers. Most statistical analyses undertaken met all the criteria for parametric testing (normality, homogeneity of variance, interval data, and independence; Field, 2009). However, some were classified as "exploratory analyses" when the number of subjects per group did not reach 30 and/or when the sample sizes were not equal among categories. In these cases, the assumptions of normality or homogeneity of variance may have been violated. Therefore, results of the exploratory analyses must be interpreted with caution.

For the study on the benefits of active music-making in older adult novice musicians in Chapter 6, a longer intervention would have been ideal; but due to time constraints, the research project was conducted over only 15 weeks (one semester of music instruction). In addition, due to the small number of participants involved in the Montreal New Horizons Band who were over 60 years old at the time, the sample size (n = 8) was smaller than the one hoped for. It would be interesting to replicate this study on a larger scale and in a longitudinal context, as it would most definitely provide stronger evidence of change.

It is worth mentioning that the studies presented in Chapters 4, 5, and 6 are independent articles. They refer to three distinct research projects, each using different methods, designs, and analyses. Therefore, the relationships among the research questions indicated above and the three studies do not appear within the articles but are rather provided at the end, in Chapter 7, as the conclusive remarks of this dissertation.

Summary of Chapters

In Chapter 1, the biological foundations of stress and MPA are provided to illustrate how stress may have a significant impact on people's health and wellbeing and how music may contribute to decrease or heighten human stress response depending on the contexts. The purpose of this chapter is to help the readers comprehend the origins of stress, anxiety, and MPA, so that they can understand the reasons for which specific

parameters were selected as variables to test in the studies (for instance, trait anxiety in Chapter 5, or respiratory function in Chapter 6).

In Chapter 2, a historical perspective is adopted to present theories on stress and MPA. The chapter aims at providing a broad overview of the various models and frameworks that have been developed over the years, drawing from the fields of psychology, psychophysiology, sports psychology, and music. While many theories are described, only two main models are specifically used in this dissertation: First, the NUTS recipe for stress (Lupien et al., 2006), which is associated with MPA in Chapters 4 and 5; and second, the Biopsychosocial model (Engel, 1980), which is related to the effects of music-making in Chapters 5 (i.e. Appendix 7) and 6.

In Chapter 3, a review of the literature focuses on the current state of research about the two main topics of this thesis: MPA and active music-making. The studies reported are aligned with the variables examined in Chapters 5 and 6. The first section of Chapter 3 examines the relationship between MPA and gender, age, general anxiety, musical background, years of training, level of expertise, performance settings, and instrument played, while the second section presents research on music and its impact on illness and survival, mental health, physical health, and quality of life.

In Chapter 4, the Performance Anxiety Inventory for Musicians (PerfAIM) is introduced as a new measure to assess MPA. In Chapter 5, data collected with the PerfAIM are utilized to understand self-reported MPA in classical and non-classical performers, and the results are compared according to several parameters, including gender, age, trait anxiety, years of training, instrument, level of expertise, and performance settings. In Chapter 6, another perspective is adopted and the benefits of active music-making are examined in a sample of older adult novice musicians. The positive outcomes reported are contrasted with the participants' experience of MPA during the final concert.

Chapter 7 addresses the research questions and hypotheses in the light of the Biopsychosocial model. The impact of biological, psychological, and social factors is analyzed in relation to MPA and active music-making; and pedagogical considerations are explored.

Chapter 1

Definitions and Biological Foundations

The purpose of this chapter is to explore the impacts of stress on human beings from a musical standpoint. Music can generate stress when musicians perform in front of audiences (stage fright), or can calm the body and mind after a stressful day. In both cases, music has an effect on human stress response. Before trying to analyse the extent to which music may influence people's health and wellbeing, it is essential to provide basic knowledge and to distinguish between terms that are sometimes used interchangeably in the literature. Stress and anxiety, for instance, are terms that have often been employed as synonyms, although they differ in key aspects. This chapter presents definitions of the main terms used throughout the thesis – namely stress, fear, anxiety, and depression– and explains their biological foundations, as well as their impact on specific parameters such as blood pressure and respiratory function. These broad overviews prepare for the examination of music performance anxiety (MPA), which is defined and described in the last section of this chapter.

Definitions

Stress. Biologically speaking, stress comes from the brain as a result of a stimulus, be it real or imagined (Bear, Connors, & Paradisio, 2007). Stress is thus a relative concept: it can be induced by a real threat (e.g. earthquake) or by an implied threat (e.g. public speaking; Lupien, Maheu, Tu, Fiocco, & Schramek, 2007). Stress

response can be generated by a physiological stimulus such as blood loss, by a psychological stimulus such as test anxiety, or by an emotional stimulus such as falling in love (Bear et al., 2007). Lazarus and Folkman (1984) define it as a "particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his/her well-being" (p. 19). Once a stress response is triggered, it alters the body's state of equilibrium and stability normally maintained by physiological processes (homeostasis) by forcing the body to use a number of adaptive responses to face the challenge and carry on (Kasper, den Boer, & Ad Sitsen, 2003). Sataloff, Rosen and Levy (1999) describe stress in three different ways:

> 1. Stress as a "stressor"—Stress is often used to refer to one or more stressors, an influence that causes tension, anxiety, or disruption of homeostasis. The stressor(s) may originate from external sources such as danger during wartime or even difficult people. It can also arise from internal thoughts and feelings, such as guilt, daily worries, and unfulfilled expectations.
> 2. Stress as "distress"—Stress may refer to internal feelings of distress, tension, or anxiety caused by a stressor(s). Thus, perturbation of the cognitive status of the subject is an important factor when using this definition.
> 3. Stress as a "biological response"—Some scientists and physicians have defined stress in a more objective manner, by defining it by the existence of measurable and predictable physiologic effects that distress or stressors produce. (p. 122)

Stress responses appear in a variety of forms that affect the physiology, the cognition as well as emotions and behaviours (Table 1.1).

Table 1.1

Major Responses to Stress

Physiological	**Cognitive**	**Emotional**	**Behavioral**
Heart palpitations	Impaired memory	Fear	Crying
Sweating	Disorientation	Worry	Rage
Dry mouth	Unrealistic demands	Panic	Withdrawal
Fatigue	Disasterizing	Guilt	Substance abuse
Insomnia	Illogical thinking	Anger	Self-medication
Nausea	Externalized blame	Denial	Impulsiveness
Dizziness	Obsessiveness	Hopelessness	Phobias
Loss of appetite	Loss of humor	Numbness	Hyperactivity
High blood pressure	Suicidal Ideation	Depression	Lethargy
Personality traits	Surrender	Despair	Aggression
Weight loss or gain	Excessive fantasies	Impatience	Rambling

(Kottler & Chen, 2008, p.18)

Fear. Fear is an emotion inherently negative that originates from a threatening stimulus, also called stressor, and is expressed by an adaptive response called stress response (Bear et al., 2007). While fear is innate, it may also be learned. As explained by Baars and Gage (2007), once a fear is learned, it becomes very difficult to control it:

> Fear learning is a long lasting and stable kind of learning that is remarkably resistant to change and voluntary control. […] While fear learning is adaptive in that it allows us to avoid predictable dangers in the environment, it can become disabling if it is misplaced or exaggerated. (p.381)

Bear and colleagues (2007) confirm that fear is not necessarily an appropriate response in all circumstances and specify that anxiety disorders are characterized by an inappropriate expression of fear. Lane and Nadel (2000) concur and also explain that fear may be transformed into anxiety if one fails to cope with the threat: "Fear is related to active coping (sometimes in the form of immobility or freezing), whereas anxiety takes over when the threat is resilient to coping efforts" (p.300). Elbert and Schauer (2008) specify that fear response "depends on the appraisal of the threat by the victim in relation to its own power to act (i.e. age, gender) as well as the characteristics of the threat/perpetrator" (p.37). Fear is thus closely related to self-appraisal, which also influences coping mechanisms.

Anxiety. In the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V), the American Psychiatric Association (2013) classifies anxiety in different categories such as generalized anxiety disorders, panic disorders, agoraphobia, and so forth, and provides criteria to diagnose each specific disorder. Social anxiety disorder is characterized by a variety of symptoms triggered by interactions with other people, which generate fear and anxiety to a level somewhat disproportional to a given situation. Diagnostic criteria are provided in Table 1.2 and include a component related to performance anxiety (See specifically criteria A and "Performance only").

According to Kirchner, Bloom, and Skutnick-Henley (2008), anxiety is a normal anticipatory response that is essential for physical protection. However, it is not the most adaptive response in the context of musical performance. As they explain, "the threats that musical performers face today are rarely life-threatening. Nevertheless, anxiety can

continue to mobilize the body for a fight-or-flight response" (Kirchner et al., 2008, p.60). As will be demonstrated in the next sections, it is the constant mobilization of the fight-or-flight response that becomes problematic over time.

Table 1.2

DSM-V: Diagnostic Criteria for Social Anxiety Disorder (Social Phobia)

Diagnostic criteria (F40.10)	300.23
A	Marked fear or anxiety about one or more social situations in which the individual is exposed to possible scrutiny by others. Examples include social interactions (e.g., having a conversation, meeting unfamiliar people), being observed (e.g., eating or drinking), and performing in front of others (e.g., giving a speech).
B	The individual fears that he or she will act in a way or show anxiety symptoms that will be negatively evaluated (i.e., will be humiliating or embarrassing; will lead to rejection or offend others).
C	The social situations almost always provoke fear or anxiety.
D	The social situations are avoided or endured with intense fear or anxiety.
E	The fear or anxiety is out of proportion to the actual threat posed by the social situation and to the sociocultural context.
F	The fear, anxiety, or avoidance is persistent, typically lasting for 6 months or more.
G	The fear, anxiety, or avoidance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.
H	The fear, anxiety, or avoidance is not attributable to the physiological effects of a substance (e.g., a drug of abuse, a medication) or another medical condition.
I	The fear, anxiety, or avoidance is not better explained by the symptoms of another mental disorder, such as panic disorder, body dysmorphic disorder, or autism spectrum disorder.
J	If another medical condition (e.g., Parkinson's disease, obesity, disfigurement from burns or injury) is present, the fear, anxiety, or avoidance is clearly unrelated or is excessive.
Performance only	If the fear is restricted to speaking or performing in public.

Anxiety is a multidimensional construct that studies have closely related to depression (Dodson, 1985). General distress is a shared feature of anxiety and depression (Clark & Watson, 1991), as is negative affectivity (Cox, Borger, & Enns, 1999) and phrenophobia[1] (Schmidt, Lerew, Joiner, 1998). In addition, fear of cognitive dyscontrol - a dimension of anxiety sensitivity – has been associated to an increase in depressive symptoms (Cox, Enns, Freeman, & Walker, 2001; Tull & Gratz, 2008).

[1] Defined as the fear of insanity (Walen, 1982)

Depression. Depression is a condition that affects individuals on all levels: how they feel, how they think, how they act, and even how their body reacts. As with anxiety, symptoms of depression are categorized into affective (mood), cognitive, somatic, and behavioral components (Ainsworth, 2000). Depression, clinically classified as a major depressive disorder, is the most common condition among all depressive disorders[2].

The DSM-V provides a list of symptoms (summarized in Table 1.3) and specifies that major depressive disorders are "characterized by discrete episodes of at least two weeks' duration (although most episodes last considerably longer) involving clear-cut changes in affect, cognition, and neurovegetative functions and inter-episode remissions" (American Psychology Association, 2013, n.p.[3]).

Table 1.3

List of Symptoms of Depression Classified into Four Categories

Affective symptoms	Cognitive symptoms	Somatic symptoms	Behavioral symptoms
Sadness	Difficulty to think	Weight loss or gain	Appearing tearful
Hopelessness	Difficulty to concentrate	Fatigue, loss of energy	Decrease or increase in appetite
Worthlessness	Indecisiveness	Insomnia or hypersomnia	Psychomotor agitation or retardation
Feelings of emptyness	Suicidial thoughts		
Irritability			
Exaggerated guilt			
Diminished interest or pleasure			

Symptoms of major depressive disorder (Adapted from the American Psychology Association, 2013).

Stress, fear, anxiety and depression have physiological roots that may significantly impact people's health and wellbeing. As shown above, some responses may be adaptive whereas others may be deleterious for the body. The next section provides information on the stress pathways and explains how they affect physiological parameters.

[2] The list of depressive disorders include disruptive mood dysregulation disorder, persistent depressive disorder (dysthymia), premenstrual dysphoric disorder, substance/medication-induced depressive disorder, depressive disorder due to another medical condition, and other specified or unspecified depressive disorders (American Psychology Association, 2013).

[3] n.p. indicates no page

Biological Foundations

With regard to stress as a biological response, two systems play a major role in understanding the pathway of stress in the body: the activation of the sympathetic branch of the autonomic nervous system and the Hypothalamus-Pituitary-Adrenal (HPA) axis.

Autonomic nervous system: Sympathetic and parasympathetic divisions. The autonomic nervous system mediates the regulation of internal organs and is generally not under direct voluntary control (Watson, 2009). It is divided in two branches – the sympathetic system and parasympathetic system (Figure 1.1) – that control bodily functions such as heart rate, saliva production, digestion, pupillary response, and respiratory rate (Jänig, 1989). These divisions have antagonistic (opposite) effects on the body: "Generally, the sympathetic system has a stimulatory effect, and prepares the body for action, while the parasympathetic system returns body functions to normal" (Boyle & Senior, 2002, p.292)

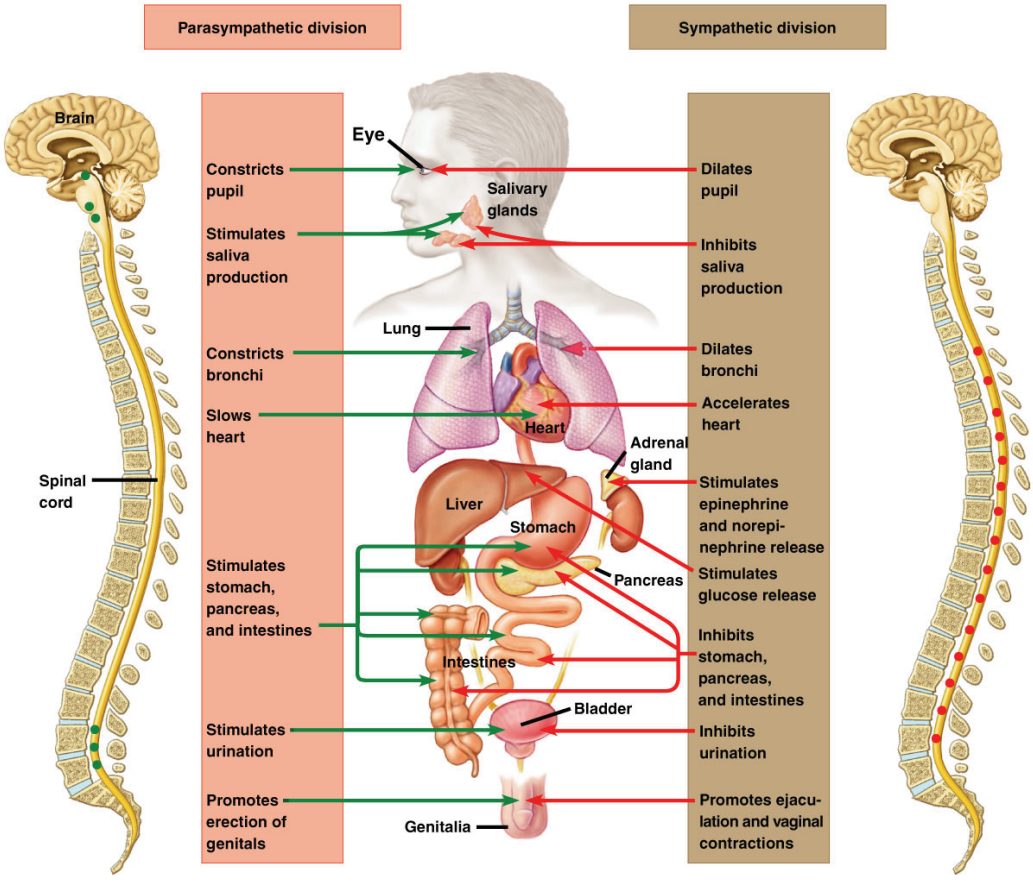

Figure 1.1. Parasympathetic and sympathetic divisions of the autonomic nervous system (Campbell, Reece, Mitchell, & Taylor, 2003, p.575, © Pearson Education). These divisions exert antagonistic actions on bodily functions.

Watson (2009) explains that many symptoms of the stress response originate from the sympathetic nervous system:

> Nerves running to adrenal glands cause the release of adrenaline into the bloodstream. Heart rate increases and blood is directed away from organs such as the gut and toward the muscles of the limbs and trunk. One of the actions adrenaline can have is to produce muscle tremor, a problem many musicians are all too familiar with. The pupils enlarge and the bronchioles in the lungs widen to make it easier to take in air. The hair on the skin may rise, and we begin to sweat in preparation for cooling the body when the expected muscle activity starts. In addition, as the parasympathetic system shuts down, the mouth may become dry as the flow of saliva slows. (p.338)

The activation of the sympathetic branch of the autonomic nervous system explains why musicians experience symptoms such as palpitations, trembling, hot flashes, or dry mouth in performance situations.

Hypothalamus-pituitary-adrenal axis. Under stress, the hypothalamus sends a signal to the pituitary gland, which in turns activates the adrenal glands located just above the kidneys to release the steroid hormone cortisol (Lupien, McEwen, Gunnar, & Heim, 2009). This hormonal circuit is called hypothalamus-pituitary-adrenal (HPA) axis (Figure 1.2), and is considered the main "stress" hormone system (Young, Abelson, &, Liberzon, 2008). More specifically, when an individual experiences physiological, emotional, or psychological stress, corticotropin-releasing hormone (CRH, also called corticotropin-releasing factor or CRF) and vasopressin (AVP) are released by the hypothalamus into the hypothalamo-pituitary portal circulation; this produces a chain reaction that triggers the secretion of adrenocorticotropic hormone (ACTH) from the pituitary gland into the bloodstream, which in turn stimulates the adrenal cortex to produce and release cortisol, a glucocorticoid (Bear et al., 2007; Pariante & Lightman, 2008).

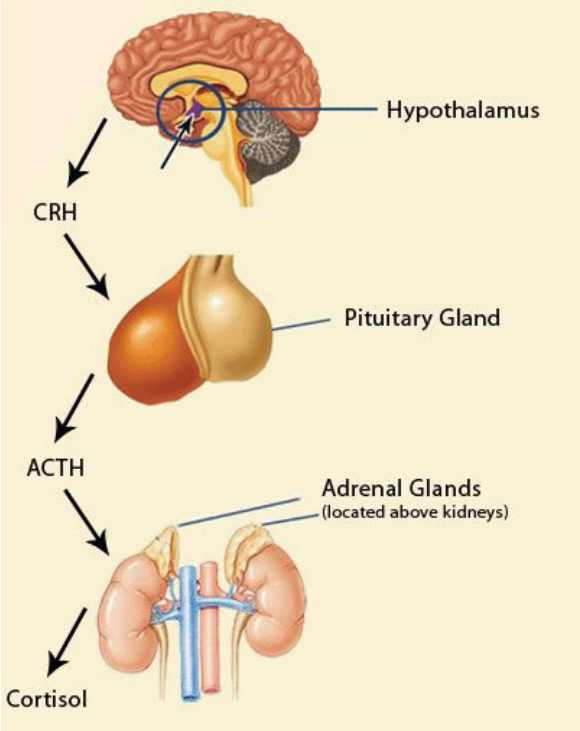

Figure 1.2. The hypothalamus-pituitary-adrenal (HPA) axis, considered the main stress hormone system (Gold, 2015).

While cortisol allows the body to mobilize energy reserves in the first place, it may also suppress the immune system in the long run (Bear et al., 2007). The hippocampus, which is part of the limbic system and is "responsible for the laying down of associative memory" (Watson, 2009, p.229), contributes to regulating levels of cortisol in the body by inhibiting the constant release of corticotropin-releasing hormone:

> The hippocampus contains numerous glucocorticoid receptors that respond to the cortisol released from the adrenal gland in response to HPA system activation. Thus, the hippocampus normally participates in the feedback regulation of the HPA axis, by inhibiting CRH release (and the subsequent release of ACTH and cortisol) when circulating cortisol levels get too high. (Bear et al., 2007, p.669)

As explained by Young and colleagues (2008, p.457), "Negative feedback of glucocorticoids on CRF and ACTH secretion can occur very rapidly, within 5-10 min, and provides real-time inhibition to limit the stress response and prevent over-secretion of glucocorticoids". These feedback loops allow the body to return to homeostasis by shutting down the HPA axis (Lupien et al., 2009) and constitute a normal response to an acute stress (Figure 1.3). However, sometimes the body does not recover as quickly as it

normally would from a stressor. In this case, chronic stress may arise, which may have an impact on health outcomes.

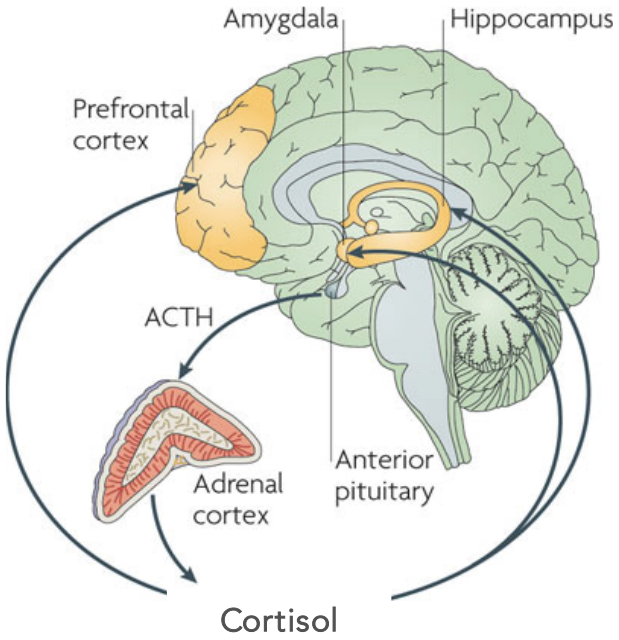

Figure 1.3. Feedback loops contributing to regulate the stress response in the body (Krugers, Hoogenraad, & Groc, 2010). The hippocampus and amygdala are part of the limbic system and are responsible, respectively, for new memory acquisition (factual learning) and emotional appraisal of situations (Pariante & Lightman, 2008; Watson, 2009). The hippocampus regulates the secretion of cortisol by inhibiting the release of CRH.

In their meta-analysis, Dickerson and Kemeny (2002) explain:

> Theoretical models have proposed that chronically experiencing conditions that elicit HPA activation could lead to a wide array of negative physiological changes that can have long-term health effects (e.g., Dienstbier, 1989; McEwen, 1998). This could occur through several pathways, including repeated activation of the HPA system as a result of frequent exposure to stressful conditions or a failure to shut down the response after stressor termination (i.e., lack of recovery). The consequence of this prolonged exposure to stress hormones has been called allostatic load, or a cumulative toll on the body resulting from chronic overactivation of the stress system (McEwen, 1998; McEwen & Stellar, 1993). These response patterns are thought to increase the risk of a number of negative health outcomes, such as diabetes, hypertension, cancer, and cardiovascular disease (McEwen, 1998). (p.380)

According to Dickerson and Kemeny (2002), the concept of allostatic load is used to explain, predict, and measure the effect of chronic stress on the body. Lupien and colleagues (2006) situate allostatic load within the realm of allostasis and homeostasis

concepts. Homeostasis and allostasis concepts are related to the activations of the parasympathetic and sympathetic systems respectively. As defined in Figure 1.4, homeostasis is a state in which body functions are regulated and stable (parasympathetic division), while allostasis is a state in which the equilibrium is challenged and the body needs to adapt to address threats in the most optimal way (sympathetic division). Lupien and colleagues (2006) summarize: "Homeostasis keeps 'set-points' and various boundaries of control (such as pH), whereas allostasis allows for a modification of these set-points in order to face challenges. Consequently, homeostasis involves systems that are essential for life, and allostasis maintains these systems in balance as environmental and life history stage change" (p.581). The allostatic load arises when the body cannot adapt to the stress load. Inability to adapt may occur because the situation is repeated over and over ("repetitive hits"), the person is not able to get used to the situation ("failure to habituate"), the response to stress extends well beyond normalcy ("prolonged response"), or the body's reactions are inappropriate or exaggerated given the situation ("inadequate response"; Lupien et al., 2006, p.586). Allostasis and allostatic load also relate to acute and chronic stress: the former is adaptive and has protective effects in the short run; the latter is not adaptive and has long-term deleterious effects on health (Lupien et al., 2006). Stress thus has the power to generate positive and negative responses in the body.

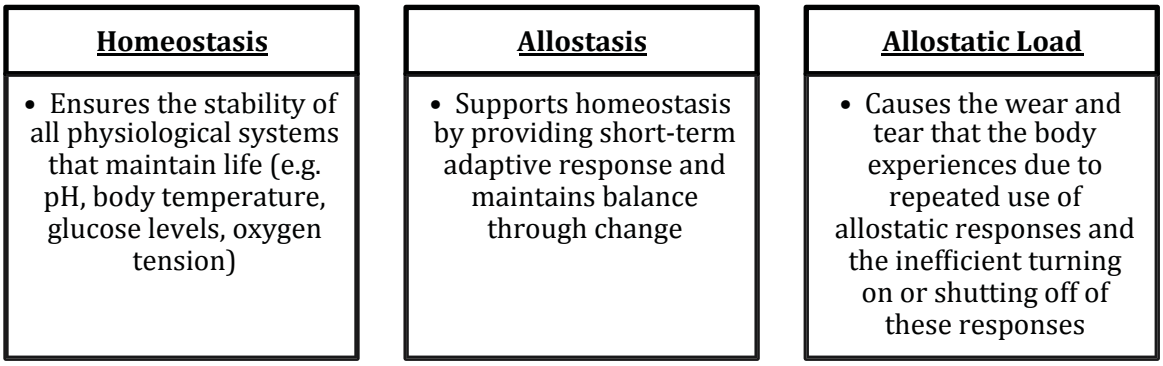

Figure 1.4. Descriptions of terms related to stress: homeostasis, allostasis, and allostatic load (Lupien et al., 2006).

Fear, anxiety, and depression. From a biological standpoint, Young and colleagues (2008) establish a clear distinction between stress, fear and anxiety:

> Stress represents an interaction between a particular type of environmental stimuli (stressors) and a number of specific stress response systems (namely hypothalamic-pituitary-adrenal (HPA) axis and/or catecholamines). Anxiety and fear, on the other hand, constitute a set of behavioral, cognitive and physiologic responses to threatening situations or uncertainty. While fear often constitutes a normal response to a well-defined threat, anxiety is often dissociated from the external stimulus, and is not necessarily associated with a particular physiological response. (p. 455)

Fear. Fear originates from the amygdala and connects to the medial hypothalamus and the dorsal periaqueductal gray matter of the midbrain (Baars & Gage, 2007). Fear is mediated by the sympathetic nervous system, which is known to generate the autonomic fight-or-flight response (Bear et al., 2007). McCarty (2000) confirms:

> Studies suggest that central command neurons within hypothalamic and brain stem nuclei project via sympathetic outflow systems to both the heart and the adrenal medulla. These collections of central command neurons may direct multiple sympathetically controlled neural and endocrine responses that subserve the fight-or-flight response. The midbrain periaqueductal gray region has also been implicated in the physiological and behavioral changes attending the fight-or-flight response. In addition, research on the amygdala has revealed the importance of this brain region for memories of emotionally charged events. (p.63-64)

Freeze is another stress response that has been acknowledged in the literature (Scaer, 2005) along with fright (Bracha, Ralston, Matsukawa, Williams, & Brasha, 2004). Some authors have suggested an additional adaptive response (faint), to create a total defense cascade of five reactions: freeze, flight, fight, fright, and faint (Elbert & Schauer, 2008). This means that when confronted with a threatening situation, the body has to select the most appropriate adaptive response for survival: stopping the action to assess the situation (freeze), running away from the threat (flight), confronting it (fight), or – if there is no way to escape or face the threat – falling into a state of tonic immobility (fright) that may eventually lead to experiencing a dissociative reaction (faint).

Anxiety. Anxiety includes cognitive, affective, behavioural, and somatic components. Barlow (2000) explains that this phenomenon is a

> unique and coherent cognitive-affective structure within our defensive motivational system. At the heart of this structure is a sense of uncontrollability focused on future threat, danger, or potentially negative events… Accompanying this negative affective state is a strong physiological or somatic component that may reflect activation of distinct brain circuits such as the corticotropin-releasing factor system [CRH]. (p. 1249)

Norman, Burrows, and Olver (2003) provide examples of cognitive, affective, somatic, and behavioural symptoms that are associated with the activation of the corticotropin-releasing hormone (CRH) system and the autonomic nervous system:

> Cognitions such as intense worry and uncertainty are coupled with feelings of apprehension and fear. Physiological reactions based on the autonomic nervous system, including increased heart rate, sweating, tremor, vascular and gastrointestinal changes, are frequently accompanied by behavioural changes such as escape, avoidance, or, in extreme cases, paralysis (freezing). This constellation of reactions is normal and adaptive, but in some there are exaggerations to the point where the individual's psychosocial wellbeing is threatened. (p. 657)

When a person's psychosocial wellbeing is affected, it may lead to the development of an anxiety disorder. Bear and colleagues (2007) describe the hallmark of anxiety disorders as "the occurrence of an inappropriate stress response either when a stressor is not present or when it is not immediately threatening" (p.668).

Depression. Establishing the biological foundations of depression is not easy. The American Psychology Association (2013, n.p.) explains in the DSM-V:

> Although an extensive literature exists describing neuroanatomical, neuroendocrinological, and neurophysiological correlates of major depressive disorder, no laboratory test has yielded results of sufficient sensitivity and specificity to be used as a diagnostic tool for this disorder. Until recently, hypothalamic-pituitary-adrenal axis hyperactivity had been the most extensively investigated abnormality associated with major depressive episodes, and it appears to be associated with melancholia, psychotic features, and risks for eventual suicide (Coryell et al., 2006; Stetler & Miller, 2011).

In their review of literature over the last 40 years, Pariante and Lightman (2008) also found that hyperactivity of the HPA axis seems to be a shared biological feature among people suffering from major depression. As mentioned previously, the HPA axis is the main stress hormone circuit and has been associated with fear and anxiety. While a strong relationship exists between emotions and stress response, the HPA axis is also responsible for metabolic regulation, immune function and memory:

> The activated HPA axis not only regulates body peripheral functions such as metabolism and immunity but also has profound effects on the brain. For example, glucocorticoids regulate neuronal survival, neurogenesis, the sizes of complex anatomical structures such as the hippocampus, the acquisition of new memories and the emotional appraisal of events. (Pariante & Lightman, 2008, p.464)

The impact of HPA on brain functions explains why depression may affect emotions as well as cognition, body functioning and behaviors.

In recent years, most of the theories on depression have been developed based on brain chemistry. By studiyng the effects of antidepressant medications on the limbic region of the brain, researchers investigated neurotransmitter levels and noticed that most antidepressants affected levels of norepinephrine and serotonin either separately or simultaneously (Garcia & Petrovich, 2011). The medication acts as a reuptake inhibitor of serotonin and/or norepinephrine to block the reabsorption of the selected neurotransmittor(s) in the brain; this means that more serotonin and/or norepinephrine is available at the synaptic level, which consequently facilitates transmission of chemical messages (Ruhé, Mason, & Schene, 2007). However, these brain chemistry theories have been criticized for their reductionistic view because

> medications focusing on one or two transmitters actually affect many neurological systems at a level of complexity that is poorly understood and because psychosocial events affect neurotransmitter levels (Valenstein, 1998). Psychosocial stress, such as interpersonal loss or environmental stress, may create changes in neurotransmitter levels rather than the reverse. Thus correlation becomes confused with causality (Andreasen, 2001). (Garcia & Petrovich, 2016, p.73)

This means that it is difficult to understand the exact effects of medications at the neurotransmitter levels when psychological and environmental stress may also cause potential changes at the same levels. Therefore, depression is a condition that still needs to be studied further in order to understand its mechanism, its specific neural pathways, and its impact on the brain before agreement is reached within the scientific community.

Impact of stress on specific parameters. ***Blood pressure.*** Stress has been shown to affect blood pressure (BP) levels to the point where it can lead to hypertension (Kulkarni, O'Farrell, Erasi, & Kochar, 1998). Blood pressure is the pressure measured in the arteries when the heart contracts (systolic) and between the contractions (diastolic). The Merriam-Webster medical dictionary defines systolic as the maximum arterial pressure of a cardiac cycle occurring after contraction of the left ventricle of the heart ("systolic blood pressure", n.d.[4]) and diastolic as the minimum arterial pressure of a cardiac cycle occurring during relaxation and dilatation of the ventricles of the heart ("diastolic blood pressure", n.d.). Blood pressure is normally reported in a ratio form where the top number represents systolic pressure, and the bottom number diastolic pressure. Normal blood pressure level is acknowledged to be below 120/80 mm Hg in

[4] n.d. indicates no date.

adults, with higher levels suggesting risks of hypertension (Table 1.4). In Canada, the average BP level at rest has been shown to be 110/70 mm Hg in people aged between 6 and 79 years old, with values a little higher for men (i.e. 112/71 mm Hg) than for women (i.e. 108/68 mm Hg; Statistics Canada, 2013).

Table 1.4

Classification of Blood Pressure for Adults

Classification	Systolic blood pressure (mm Hg)	Diastolic blood pressure (mm Hg)
Low	< 90	< 60
Normal	< 120	< 80
Prehypertension	120-139	or 80-89
Hypertension (Stage 1)	140-159	or 90-99
Hypertension (Stage 2)	≥ 160	or ≥100

Chobanian et al. (2003); University of Ottawa Heart Institute (2016)

Respiratory function. The function of the respiratory system is to inhale air, distribute it in the body, and exhale carbon dioxide. Through gas exchange occurring between the alveoli and the alveolar capillaries of the pulmonary apparatus, oxygen is brought to the cells of the body, while carbon dioxide is expelled (Hixon, 2006). The amount of air that goes in and out of the body is considered in terms of lung volumes and lung capacities (Table 1.5).

Table 1.5

Pulmonary Subdivisions: Lung Volumes and Lung Capacities

Subdivision	**Term**	**Description**	**Values/Computation**
Lung volumes	Tidal Volume (TV)	The volume of air inhaled and exhaled during any single expiratory cycle (an inhalation followed by an exhalation)	Discrete value (approximately 500 ml)
	Inspiratory Reserve Volume (IRV)	The quantity of air which can be inhaled beyond that inhaled in a tidal volume cycle.	Discrete value (approx. 1500 to 2500 ml)
	Expiratory Reserve Volume (ERV)	The amount of air that can be forcibly exhaled following a quiet or passive exhalation	Discrete value (approx. 1500 to 2000 ml)
	Residual Volume (RV)	The quantity of air that remains in the lungs and airways even after a maximum exhalation	Discrete value (approx. 1000 to 1500 ml)

(Table continued)

Subdivision	Term	Description	Values/Computation
Lung capacities	Vital Capacity (VC)	The maximum volume of air that can be inhaled and exhaled from the *resting expiratory level*[*]	TV+IRV+ERV
	Inspiratory Capacity (IC)	The maximum volume of air that can be inhaled from the resting expiratory level	TV+IRV
	Functional Residual Capacity (FRC)	The quantity of air in the lungs and airways at the resting expiratory level.	ERV+RV
	Total Lung Capacity (TLC)	The quantity of air the lungs are capable of holding at the height of a maximum inhalation.	TV+IRV+ERV+RV

[*] "Resting expiratory level refers to a state of equilibrium in the respiratory system. The forces of compression of the lungs are balanced by the forces of expansion of the thorax" (Zemlin, 1998, p.78-79).

Lung volumes are represented by discrete values (there is no overlap possible between lung volumes), whereas lung capacities are made of two or more lung volumes and require computation for measurements (Zemlin, 1998). Spirometry is one of the ways of assessing respiratory function. By measuring the quantity and rate of air in a complete respiratory cycle, it provides a calculation of lung volumes (Booker, 2007). Spirometry tests are commonly used to determine lung volumes (dynamic and static) and airflow (Table 1.6). Lung volume measurements are displayed in absolute values (in liters) and in percentages established from reference values based on age, gender, size, and ethnicity (Booker, 1997). Statistics Canada (2013) estimates that the forced vital capacity of men aged between 6 and 79 years old is around 4.6 liters, and the FVC of women in the same age range, around 3.3 liters. Zemlin (1998) points out that some factors, such as physical fitness and body build, may create considerable discrepancies between individuals. For instance, an adult with severe obesity may have a reduced total lung capacity (Clausen & Wanger, 2003), whereas a male athlete may have a vital capacity as high as 7 liters, which is 40% above normal (Zemlin, 1998).

Table 1.6

Spirometry Tests: Dynamic Lung Volumes and Airflow

Measurement	Type	Description
Dynamic lung volumes	Forced Vital Capacity (FVC)	The maximum volume of air that can be expired from the lungs during *forced and complete* expiration from a position of full inspiration.
	Forced Expiratory Volume in 1 second (FEV_1)	The maximum volume of air that can be expelled from the lung *in the first second of a forced expiration* from a position of full inspiration.
Static lung volume	Relaxed Vital Capacity (RVC or VC)*	The maximum volume of air that can be expired from the lungs during a *relaxed, but complete expiration* from a position of full inspiration.
Airflow	Peak Expiratory Flow (PEF)	The *highest flow achieved* from a maximal forced expiratory manoeuvre started without hesitation from a position of maximal lung inflation.
	Forced Expiratory Ratio (FER or FEV_1/ FVC or FEV_1%)	The *ratio of forced expiratory volume in 1 second to forced vital capacity*, which means the amount of air blown out in the first second of a forced expiration from a position of maximal inspiration expressed as a percentage of the total amount expired (regardless of time) during that forced manoeuvre.

* Most often measured as the *expiratory* relaxed vital capacity.

Adapted from Booker's (2007) chapters on peak expiratory flow measurement (p. 13) and spirometry measurements (p.32-35)

Even though respiratory function is known to decrease with age (Clausen & Wanger, 2003; Hixon, 2006; Zemlin, 1998), it is not subject to fast and drastic changes. In fact, Berry (1974) showed that even when taking into account the effect of time, benefits due to measuring the rate of change more than once or twice a year were small.

While respiratory function is not subject to significant changes over short periods of time, respiratory rate constantly adapts itself to face daily life situations. Depending on the metabolic demand of the body, the rate at which gas is exchanged varies to account for the level of oxygen required and the amount of carbon dioxide that the lungs need to expel (Hixon, 2006). Examples of activities that increase the metabolic demand include exercising, eating, and engaging in cognitive tasks (Hixon, 2006). Emotions, such as crying or being scared, and reflexes, such as coughing or sneezing, are also known to alter respiratory rate (Zemlin, 1998).

According to Hixon (2006), competing drives occur when one wants to exert voluntary control over acts that involve automatic mechanisms:

> The limbic system (the "old brain") has strong connections to the lower (brainstem) respiratory center and has a correspondingly strong influence over its output. Limbic drive under circumstances of laughing or crying is so powerful that it can override nearly any other voluntary act. Consider, for example, the situation of attempting to speak while sobbing. (p.61)

These competing drives are the reasons for which it may be more difficult to speak or sing with adequate respiratory patterns in front of an audience as opposed to alone in a room (Hixon, 2006). In fact, when experiencing strong emotions like stage fright, the metabolic demand increases to the point where it triggers the sympathetic division of the autonomic nervous system: the heartbeats accelerate and stress hormones are released into the bloodstream. As more oxygen is needed, the respiratory rate increases to facilitate gas exchange. While all this prepares the body for action, it also creates competing drives that may prevent further voluntary acts, such as singing or playing a wind instrument, to occur optimally.

Music Performance Anxiety (MPA)

> *- Among the numerous familiar fears of mankind none is more common than "stage fright". Teachers no less than pupils experience stage fright. Public performers of almost every kind may suffer from it. (Hollingworth, 1935, p.173)*

Historically, the first references to performance anxiety have been mostly associated with public speaking. Because the understanding of MPA evolved considerably over the last century, this section examines, in a chronological format, studies that aimed to define performance anxiety.

1930s to 1960s. While the pianist and teacher Bernard Gabriel founded an organization[5] in New York in the late 1930s to help performers cope with stage fright (Deri, 1962), scientific research seemed to focus more on speech anxiety than on MPA. For instance, Clevenger (1959) proposed a synthesis of experimental research on stage fright, in which he focused exclusively on public speaking. That same year, Paivio and

[5] The Society of Timid Souls

Lambert published a study that examined audience anxiety among young adults and described the phenomenon:

> An audience situation (broadly defined as any situation involving the evaluation of an individual's behavior or behavior product by others) whether actual, imagined, or anticipated, is anxiety arousing for the performer because of the possibility of unfavourable evaluation. Audience anxiety (stage fright may be considered as an extreme case) is assumed to mediate the typical behavioral effects noted in studies of group influence, social conformity, and success and failure experiences, the direction and extent of its influence depending on the level to which anxiety is raised or lowered by cues which in the past have been associated with audience situations. Individual differences in anxiety level are accounted for by audience sensitivity, an experientially determined predisposition to react with anxiety in audience situations. (1959, p.1)

Paivio and Lambert (1959) established a distinction between audience anxiety and stage fright. Interestingly, many authors would use the terms anxiety and stage fright interchangeably in the years to come, including in research on MPA.

1970s to 1980s. In the seventies, authors published studies in which they started investigating performance anxiety in music contexts. Some described the phenomenon using specific terms such as "musical performance anxiety" (Goldstein, 1975) or "music performance anxiety" (Wardle, 1975), while others continued to use more generic terms such as "stage fright" and "performance anxiety" (Apple, 1976; Nideffer & Hessler, 1978). In 1982, Hamann studied the effect of anxiety on the quality of musical performance and mentioned the term "performer anxiety" to identify the phenomenon. That same year, Kendrick, Craig, Lawson and Davidson (1982) published a study on the effectiveness of cognitive and behavioural therapy to reduce debilitating MPA that they described as "musical-performance anxiety" (with a hyphen).

As just shown, some disparities existed between authors regarding how to name and how to define MPA. For example, Crask and Craig (1984) described MPA based on Kendrick and colleagues' (1982) definition of test anxiety: "musical performance anxiety is of a pervasive nature, often persists despite repeated exposures, and generally entails worry about performance, preoccupation with feelings of inadequacy, and heightened somatic and autonomic arousal" (p. 268). Sweeney and Horan (1982) interpreted MPA as a specific construct:

> The construct anxiety essentially reduces to a particular pattern of mildly related and possibly interacting behaviors in response to a specific set of internal and/or external stimuli. To illustrate, a pianist experiencing internal stimuli such as "I'm worthless if I'm not perfect" in the context of external stimuli such as an audience's murmur is likely to (a) self-report distractibility and tension, (b) experience elevated autonomic arousal such as heart rate and palmar sweating, (c) manifest anxiety-like behavior such as grimacing and rigid deportment, and (d) perform less competently. These indicators of anxiety may in turn become causes; wrong notes, for example, may lead to increased distractibility, sweating, finger slippage, and a never ending vicious cycle. (p. 487)

These quotations illustrate how in the 1980s, researchers became interested in describing stage fright as clearly and accurately as possible by including details regarding the sources of anxiety, examples of symptoms, and temporal occurrences. For instance, Steptoe and Fidler (1987) explain that both professional and amateur musicians suffer from stage fright and that

> trembling, hyperventilation and nausea are common even in mild cases, while severe difficulties may lead to premature termination of promising careers. Musical performance anxiety is also a useful model for the study of specific fears, since the problem and eliciting circumstances tend to be relatively circumscribed. (p.241)

It is worth pointing out that in this instance, stage fright and MPA seem to be considered synonyms. According to Rappoport (1989), stage fright "appears at the most inopportune and inappropriate times and […] is the term used when describing anxiety and blocked artistic expression, particularly when it is within the bounds of performing arts" (p. 1).

1990s to 2010s. In the 1990s, while a few researchers such as Cox and Kenardy (1993) continued to use the terms stage fright and MPA interchangeably, most authors began to make a distinction between both terms, arguing that stage fright does not take into account the anticipatory component of anxiety, an effect that may occur up to a week prior to the actual performance (Lederman, 1999). Table 1.7 provides a summary of a few definitions appearing in the literature between the 1990s and 2000s.

Table 1.7

Examples of MPA Definitions Published in the Literature Between 1990 and 2010

Authors	Year	Definition
P. G. Salmon	1990	"MPA is defined as the experience of persisting, distressful apprehension about and/or actual impairment of performance skills in a public context to a degree unwarranted given the individual's musical aptitude, training, and level of preparation" (p. 3).
J. J. Nagel	1990	Performance anxiety is a "constellation of attitudes, traits and unconscious conflicts that become activated in particular circumstances such as anticipating or giving a concert" (p. 38).
W. J. Cox & J. Kenardy	1993	"Performance anxiety, or stage fright, is a situational manifestation of anxiety, and is related to the fear of making a mistake or not being able to control one's actions in front of other people" (p. 49).
R. J. Lederman	1999	"Performance anxiety consists of behavioral, cognitive, and physiologic symptoms and signs that may precede and/or accompany a performance or presentation and that seem out of proportion to the specific situation" (p. 117).
K. R. Baker	2005	"Performance anxiety is the exaggerated and sometimes incapacitating fear of performing in public" (p. 1).
J. Kesselring	2006	MPA is "a state of arousal and anxiety occurring before or while a person is performing non-anonymously in front of an audience producing a valuable or evaluated task touching on his/her self-esteem" (p. 309).
D. T. Kenny	2010	"Music performance anxiety is the experience of marked and persistent anxious apprehension related to musical performance that has arisen through specific anxiety-conditioning experiences. It is manifested through combinations of affective, cognitive, somatic and behavioral symptoms and may occur in a range of performance settings, but is usually more severe in settings involving high ego investment and evaluative threat. It may be focal (i.e. focused only on music performance), or occur co-morbidly with other anxiety disorders, in particular social phobia. It affects musicians across the lifespan and is at least partially independent of years of training, practice, and level of musical accomplishment. It may or may not impair the quality of the musical performance" (p. 433).

The first definition, provided by Salmon (1990), has been widely used in the literature on MPA in the 1990s and 2000s (Gill, Murphy & Rickard, 2006; Kirchner et al., 2008; Liston, Frost & Mohr, 2003; Reitman, 2001; Thurber, Bodenhamer-Davis, Johnson, Chesky & Chandler, 2010; Widmer, Conway, Cohen & Davies, 1997), which has not been the case for the other definitions provided by Nagel (1990), Cox and Kenardy (1993), Lederman (1999) and Baker (2005). The fact that Salmon's definition has been used more frequently may be due to the fact that the others' definitions may have lacked some of the important components that are now considered central to the phenomenon of MPA. For example, Nagel's (1990) definition appears broad enough in scope to make it easily generalizable, but by solely focusing on psychological aspects, her definition leaves out physiological elements such as increased heart rate, trembling, or any other symptoms that might contribute to maintain high MPA once it has been activated. Although she explains that MPA is a combination of "attitudes, traits, and

unconscious conflicts" (which are components that relate to behaviours, personality character, and unresolved issues), her definition seems to overlook how exactly these constellations of elements are perceived by the musicians and how MPA interacts between internal and external factors. Cox and Kenardy's (1993) definition claims that the origin of MPA lies in the fear of making mistakes or losing control, which is too restrictive and does not encompass the wide array of causes reported in the literature (Kenny, 2011). In addition, it restricts MPA to situations of performance only occurring "in front of other people" thus excluding musicians playing in pit orchestras, doing professional studio recordings, performing live on the radio, being auditioned behind a screen, and so forth. Lederman's (1999) definition takes into account the anticipation of performance as well as symptoms of MPA, but neglects to mention that MPA may also include affective symptoms such as emotional outbursts or feelings of worthlessness. Baker's (2005) definition refers to the fear of performing in public. Fear was characterized in the previous section as an emotion based on a well-defined threat whereas anxiety could be dissociated from threatening stimuli. In this case, performance anxiety refers to the well-defined threat of performing in public, but leaves out others threats such as being judged, making mistakes, crumpling a career because of one bad performance, etc. Kesselring's (2006) definition recognizes the fact that MPA is related to situations involving high ego investment, but delimits it to non-anonymous performances, which overlooks situations such as classical auditions behind screens for instance. In addition, a musician may not only experience MPA when s/he is "in front of an audience producing a valuable or evaluated task touching on his/her self-esteem", s/he may very well suffer from self-induced MPA without external stimuli.

In 2006, Kenny made a clear distinction between MPA and performance anxiety: "Performance anxiety is the general term for a group of disorders that affect individuals in a range of endeavours, from test-taking, mathematics performance, public speaking and sport, to the performing arts of dance, acting and music" (Kenny, 2006, p. 52). This author reviewed the literature on MPA and published many studies that led her to develop in 2009 a new definition of MPA that is still, to this date, the most complete and accurate so far. Kenny's (2010) definition provides insights on sources of MPA (e.g. anxiety-conditioning experiences, high ego involvement, evaluative threat), symptoms

and manifestations (somatic, behavioral, cognitive, and affective), and factors partially related to the phenomenon (e.g. years of training, level of preparation). It is also the only definition indicating that MPA may not necessarily impact the quality of a performance.

The biological foundations of MPA are similar to those experienced in any other situation inducing a stress response. As interestingly explained by Lehrer (1987) when he discussed stage fright:

> No one needs to tell performers about the physiological symptoms of stage fright. Usually these result from the "fight or flight" reflex, which is normally elicited during anxiety or stress. The fight-flight reflex was designed by nature to mobilize the body for attacking or fleeing enemies and surviving in the wilderness. Perspiring helped the individual to climb trees and run faster. Diminished blood flow to the periphery (which produces cold hands) and to the gastrointestinal tract (which can lead to indigestion) allows a greater blood supply to the large muscles. Increased muscle tension may form a "body armor" for protection against assault. The increase in sensitivity to small noises or movements might help the individual to locate a hidden enemy. Although these responses may be useful for escaping bears and fighting invaders, they can be deleterious to the very delicate and intricate motor and intellectual activity involved in music performance. (p.145)

Conclusion

The aim of this chapter was to provide a basic understanding of concepts that will be used in the next chapters. Stress, fear, anxiety, depression, and music performance anxiety were defined and described. For each phenomenon, biological foundations were also provided. The information presented here demonstrates that stress is primarily considered to be a physiological response to a self-perceived threat, fear and anxiety are associated respectively to real/concrete or imagined/indefinite threats leading to biological changes altering the homeostasis, and depression is a condition characterized by cognitive, affective, and physiological symptoms which threaten a person's well-being. While all these phenomena differ in key aspects, they also share common features, for they all involve the activation of both the HPA axis and the sympathetic division of the autonomic nervous system.

The next chapters will build upon these concepts by identifying major stress theories (Chapter 2) and reviewing the literature (Chapter 3). These introductory chapters will provide a strong basis to support the three main articles of this dissertation (Chapters 4, 5 and 6).

Glossary

- *Adrenal glands*: Two triangular endocrine glands, each of which covers the superior face of the kidney. Each gland has two parts, the medulla and cortex.
- *Adrenal cortex:* The cortex is a yellowish tissue surrounding the medulla […] and is stimulated by pituitary hormones (principally ACTH) to produce three kinds of corticosteroid hormones, which affect carbohydrate metabolism (e.g. cortisol), electrolyte metabolism (e.g. aldosterone), and the sex glands (oestrogens and androgens).
- *Adrenal medulla*: The medulla forms the grey core of the adrenal gland […] and is stimulated by the sympathetic nervous system to produce adrenaline and noradrenaline.
- *Adrenaline (synonym: Epinephrine)*: Important hormone secreted by the medulla of the adrenal gland. It has the function of preparing the body for 'fright, flight, or fight' and has widespread effects on circulation, the muscles, and sugar metabolism.
- *Adrenocorticotropic hormone (ACTH)* [6]: A hormone synthesized and stored in the anterior pituitary gland, large amount of which are released in response to any form of stress. Its release is stimulated by corticotropin-releasing hormone.
- *Amygdala*: One of the basal ganglia and part of the limbic system: a roughly almond-shaped mass of grey matter deep inside each cerebral hemisphere. [It] sends nerve fibers to the hypothalamus; its functions are concerned with perception of threat, fear learning, emotion, and memory.
- *Autonomic nervous system (ANS)*: The part of the peripheral nervous system responsible for the control of involuntary muscles (e.g. heart, bladder, bowels) and hence those bodily functions that are not consciously directed, including regular beating of the heart, intestinal movements, sweating, salivation, etc. The autonomic nervous system is subdivided into sympathetic and parasympathetic nervous systems.
- *Catecholamines:* A group of physiologically important substances, including adrenaline, noradrenaline, and dopamine, having various different roles (mainly as neurotransmitters) in the functioning of the sympathetic and central nervous system.
- *Central nervous system:* The brain and the spinal cord, as opposed to the cranial and spinal nerves and the autonomic nervous system, which together form the peripheral nervous system. The CNS is responsible for the integration of all nervous activities.
- *Corticosteroid (synonym: Corticoid)*: Any steroid hormone synthesized by the adrenal cortex. There are two main groups of corticosteroids. The glucocorticoids (e.g. cortisol, cortisone, and corticosterone) [and] the mineralocorticoids (e.g. aldosterone).
- *Cortisol:* A steroid hormone: the major glucocorticoid synthesized and released by the human adrenal cortex. It is important for normal carbohydrate metabolism and for the normal response to any stress.
- *Corticotropin-releasing factor (CRF) or corticotropin-releasing hormone (CRH)* [4]: A peptide hypothalamic hormone of 41 amino acids stimulating the release of ACTH from the anterior pituitary. Its own release is suppressed by a negative feedback loop involving cortisol.
- *Endocrine gland*: A gland that manufactured one or more hormones and secretes them directly into the bloodstream. Endocrine glands include the pituitary, thyroid, parathyroid, and adrenal glands, the ovary and testis, the placenta, and part of the pancreas.
- *Glucocorticoid:* Steroid hormone synthesized by the adrenal cortex. […] The glucocorticoids (e.g. cortisol, cortisone, and corticosterone) are essential for the utilization of carbohydrate, fat, and protein by the body and for a normal response to stress.
- *Hippocampus:* It contains complex foldings of cortical tissue and is involved, with other connections of the hippocampal formation, in the workings of the limbic system.
- *Homeostasis*: The physiological process by which the internal systems of the body (e.g. blood pressure, body temperature, acid-base balance) are maintained at equilibrium, despite variations in the external conditions.
- *Hormone:* A substance that is produced in one part of the body (by an endocrine gland, such as the thyroid, adrenal, or pituitary), passes into the bloodstream and is carried to other (distant) organs and tissues, where it acts to modify their structure and function.

[6] Different spellings exist for ACTH and CRH. The Concise Medical Dictionary (Martin, 2015) spells ACTH 'adrenocorticotrophic hormone' and CRH 'corticotrophin-releasing hormone' whereas other sources provided in this chapter use the following spellings: 'Adrenocorticotropic hormone' and 'corticotropin-releasing hormone'. Both spellings refer to the same hormone and use the same acronyms.

Glossary *(continued)*

- *Hypothalamus*: The region of the forebrain […] linked with the thalamus above and the pituitary gland below. It contains several important centers controlling body temperature, thirst, hunger and eating, water balance, and sexual function. It is also connected with emotional activity and sleep and functions as center for the integration of hormonal and autonomic nervous activity through its control of the pituitary secretions.
- *Hypothalamus-Pituitary-Adrenal axis (HPA)*: The main ''stress'' hormone system […] Stress-sensitive systems in multiple areas of the brain are activated by stress and integrated at the hypothalamus resulting in a hormonal cascade leading to cortisol secretion by the adrenal.
- *Limbic system:* A complex system of nerve pathways and networks in the brain […] that is involved in the expression of instinct and mood in activities of the endocrine and motor systems of the body. Among the brain regions involved are the amygdala, hippocampal formation, and hypothalamus.
- *Neurotransmitter:* A chemical substance released from nerve endings to transmit impulses across synapses to other nerves and across the minute gaps between nerves and the muscles or glands that they supply. […] In the central nervous system, […] acetylcholine and noradrenaline, dopamine, serotonin, […] and several other substances act as transmitters.
- *Noradrenaline (synonym: Norepinephrine)*: A hormone, closely related to adrenaline and with similar actions, secreted by the medulla of the adrenal gland and also released as a neurotransmitter by the sympathetic nerve endings.
- *Parasympathetic system*: One of the two divisions of the autonomic nervous system, having fibers that leave the central nervous system from the brain and the lower portion of the spinal cord and are distributed to blood vessels, glands, and the majority of internal organs. The system works in balance with the sympathetic nervous system, the actions of which it frequently opposes.
- *Pituitary gland*: The master endocrine gland: a pea-sized body attached beneath the hypothalamus in a bony cavity at the base of the skull. It has an anterior lobe, which secretes thyroid-stimulating hormone, ACTH, the gonadotrophins, growth hormone, prolactin, lipotrophin, and melanocyte-stimulating hormone. The secretion of all these hormones is regulated by specific releasing hormones, which are produced in the hypothalamus. The posterior lobe secretes vasopressin and oxytocin, which are synthesized in the hypothalamus and transported to the pituitary, where they are stored before release.
- *Serotonin*: A compound widely distributed in the tissues, particularly in the blood platelets, intestinal wall, and central nervous system. [It] acts as a neurotransmitter, and its levels in the brain are believed to have an important influence on mood.
- *Sympathetic system:* two divisions of the autonomic nervous system, having fibers that leave the central nervous system, via a chain of ganglia close to the spinal cord, in the thoracic and lumbar regions. Its nerves are distributed to the blood vessels, heart, lungs, intestines and other abdominal organs, sweat glands, salivary glands, and the genitals, whose functions it governs by reflex action, in balance with the parasympathetic nervous system.
- *Vasopressin (AVP, synonym: Antidiuretic hormone):* A hormone, released by the pituitary gland, that increases the reabsorption of water by the kidney, thus preventing excessive loss of water from the body. Vasopressin also causes constriction of blood vessels.

All definitions come from the Concise Medical Dictionary (Martin, 2015), except for *Hypothalamus-Pituitary-Adrenal axis*, which comes from Young and colleagues (2008, p. 457).

Chapter 2

Theories

In the last century, research on stress has made great leaps forward in the scientific community. Before the 1940s, the term "stress" was known and used almost exclusively by engineers (Cooper & Dewe, 2004). It referred to a "pressure or tension exerted on a material object" (Online Oxford Dictionaries). When the fields of psychology and medicine adopted the term, it came to be used in relation to the mind and body.

The following chapter presents a wide array of theories related to health, stress and anxiety, which are associated with MPA and general wellbeing. An historical overview of the research on stress and anxiety, from the beginning of the 20th century to the present day, is provided to situate the various models and describe their evolutions through time. Because theories on stress and anxiety have inspired music researchers to develop specific models to explain MPA, it is important to provide an historical account that shows the relationships between concepts as well as the overlaps between research fields. In addition, this overview allows the reader to better understand why certain models have been selected in this thesis as conceptual frameworks for the studies.

The first section of this chapter explores concepts of stress and anxiety. The first sub-section identifies research published between 1900 and 1949 that became the basic foundations for the development of stress theories. The second sub-section focuses on articles published between 1950 and 1979, in which researchers built on the early research and further explored new concepts. The third sub-section describes multiple theories developed from the 1980s to the 2010s, and how modern research is moving forward. The last sub-section discusses how some theories of stress relate to the

phenomenon of music performance anxiety (MPA) and provides potential applications of some basic theoretical concepts to musicians.

The second section of this chapter focuses on the Biopsychosocial model, a broad theory that is used to explain health and wellbeing (Engel, 1980). When considering factors that may affect health outcomes, most people tend to only consider biological markers, such as genetic vulnerability or stress reactivity. This reductionist view is based in a Western culture that has addressed the science of health from a standpoint that emphasizes dichotomies for centuries, underestimating links between the body and mind (Engel, 1977). In the first sub-section, the Biopsychosocial model is presented as an alternative to the biomedical model, and a comprehensive description is provided, which takes into account the multidimensionality of health. In the second sub-section, the Biopsychosocial model is associated with MPA and also applied to musicians' health, with a special emphasis on older adult musicians.

Historical Perspective on Stress Theories

Stress-related problems did not appear with the 20h century. As reported by Cooper and Dewe (2004), "at various times in history, 'conditions' like hysteria, passions, vapors, nerves, neurasthenia, worry, mental strain, and tension have been put forward as significant contributors of or explanations for disease" (p. 2). They also observed that nonphysical conditions could have an impact on illness and disease and that some relationship existed between humans' health and their environment (Cooper & Dewe, 2004).

1900s-1940s: Building foundations. At the turn of the twentieth century, concepts that had been emphasized by many "progressive" physicians in the past are acknowledged in medicine, and the ideas that the mind plays a role in physical illness and that mental disease may be explained by the notion of "internal conflict" begin to be explored more thoroughly (Cooper & Dewe, 2004). In 1908, Yerkes and Dodson publish a paper in which they study the relationship between habit-formation and strength of stimulus in mice. They conclude that at first, the pace of learning increases rapidly with the increases in stimulus strength, but beyond a certain threshold point, it begins to decrease (Yerkes & Dodson, 1908). In 1955, Hebb suggests that a similar relationship

exists between arousal and performance in humans, claiming that "up to a certain point, threat and puzzle have positive motivating value, beyond that point, negative value" (p.250), which he illustrates by a curvilinear relationship. Eysenck (1955) also makes a comparable link between autonomic drive and task performance, but specifies that this relationship is mediated by level of neuroticism: "increase in autonomic drive level would lead to a decrement in performance on complex tasks in the more neurotic, while it would lead to an improvement in performance in the less neurotic" (p. 51). These postulates lead Broadhurst (1957) to publish an article in which he brings together the Yerkes-Dodson Law and the inverted-U curve, stating that "optimum motivation for a learning task decreases with increasing difficulty" (p.345). This curve is further applied to performance contexts to explain how performance and illness are inversely related, how performance outcomes are dependent on the level of arousal, and how maximum performance could only be achieved when the level of arousal is moderate (Figure 2.1). The Yerkes-Dodson Law also posits that eustress[1] and distress could occur when a person is under- and over-aroused, and that levels of arousal too high or too low lead to poor performance (Kenny, 2011; Seaward, 2004).

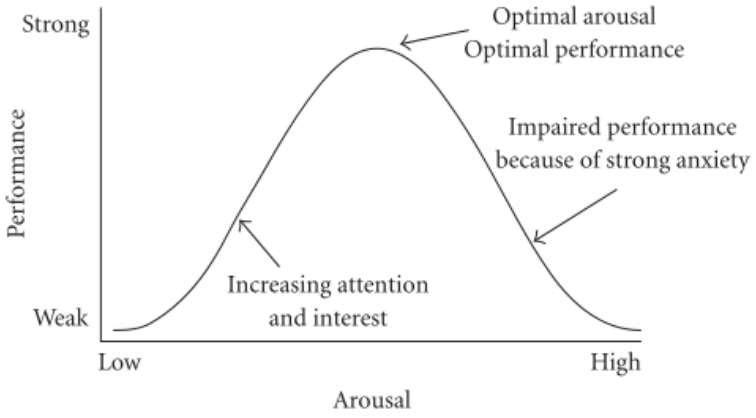

Figure 2.1. Yerkes-Dodson Curve: Inverted-U hypothesis (Diamond, Campbell, Park, Halonen, & Zoladz, 2007). The curve illustrates that moderate stress levels lead to maximum performances and decreased illness, whereas low or high stress levels are detrimental to performance and health.

[1] Eustress is a positive type of stress, characterized as a 'good stress', that may refer to feelings such as anticipation and excitement (Cooper & Dewe, 2004; Kenny, 2011; Seaward, 2004).

In 1929, Walter Cannon, a scientist precursor of the psychosomatic approach, introduces the term "homeostasis" (Selye, 1993; Caccioppo, Tassinary, & Berntson, 2000; Lupien et al. 2006) to explain "the relation of the autonomic system to the self-regulation of physiological processes" (as cited in Cooper & Dewe, 2004, p. 14). A few years later, in 1936, Hans Selye proposes his theory of the General Adaptation Syndrome (GAS; Selye, 1993). The GAS, referring to coordinated patterns of protection triggered by physiological responses in response to noxious stimuli or stressors, includes three stages: an alarm reaction, a stage of resistance, and a stage of exhaustion (Selye, 1993). Although Selye's views have been strongly critiqued for their ambiguities in distinguishing between stress and the GAS, his contribution has been very influential in the history of stress, especially because of its impact on biology and medicine (Cooper & Dewe, 2004).

Hull (1943) proposes the drive theory to support the view that actions and reactions are "the product of a function of habit strength multiplied by a function of the relevant drive" (Hull, 1943, p. 239). This theory is illustrated by a linear relationship (Figure 2.2) that sport psychologists have further applied to athletes' performances (Gould, Greenleaf, & Kane, 2002), specifying that increasing arousal leads to increasing performance quality (Weinberg & Gould, 2007). It is worth noting that drive theory has not been empirically supported (Martens, Vealey, & Burton, 1990).

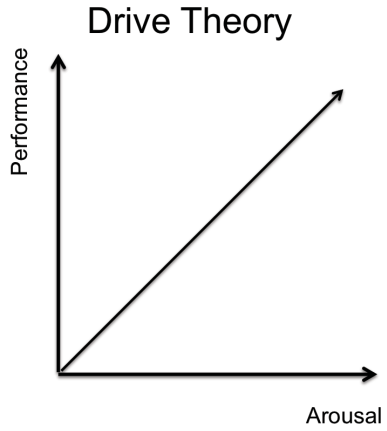

Figure 2.2. Drive theory. This model posits that low arousal is not conducive to good performance and that optimal performance is achieved with high arousal (Gould et al. 2002).

After World War II, research on stress takes another step forward. While the term "stress" referring to a biological phenomenon is not widely used before the war, it gradually becomes more common thereafter. As Cooper and Dewe (2004) report, "the war was critical to public acceptance of the relevance of stress as a legitimate explanatory concept" (p.24). They also explain that

> The refocusing of attention on war neuroses, intertwined with increased talk of "nervous tension" and "war nerves" soon became shorthand for "stresses of war". From here it was just a small step to talk about "reactions to stress", and in this way the word simply became part of everyday language (Cooper & Dewe, 2004, p. 24).

With the concept of stress acknowledged in research, and stress-related expressions used more frequently every day, the foundations are in place to deepen the current understanding and explore new theories.

1950s-1970s: Strengthening foundations and exploring new concepts. By the late 1950s, stress is accepted as a legitimate subject in research and is primarily associated with the study of psychology, although it continues to develop simultaneously in the fields of physiology and psychology until the 1960s (Cooper & Dewe, 2004).

As mentioned previously, Eyseck (1955), Hebb (1955), and Broadhurst (1957) help make the Yerkes-Dodson Law popular by associating it with the well-known inverted-U curve (Corbett, 2015). However, in the 1960s Brown (1965) disproves this model by questioning studies that supposedly proved the validity of the Yerkes-Dodson Law. He explains that a "two-stage proof" is needed: First, to test subjects on more than one task in order to determine "whether or not performance is a function of motivation level"; and second, to compare "the relative difficulty of these tasks with their optimum motivation levels" (p.665). These arguments are further supported by Corbett (2015) in his paper "From law to folklore: Work stress and the Yerkes-Dodson Law", in which he critiques authors that introduce this theory as a "law of behavior (and thus a law of nature)" (p. 746), points out inconsistent findings reported in the literature based on experiments performed on animals, and argues against this "folk model" being applied to "almost every facet of human task performance" (p. 745). He then states that the reason this model is appealing is because it has the potential to provide a representation of data for virtually any outcome, as long as the concept of arousal is not pre-specified (Corbett, 2015).

The year 1966 provides a great deal of research on stress. First, Janet T. Spence and Kenneth Spence adapt Hull's drive theory and propose that "the learning or habit factor (H) combine[d] multiplicatively with drive (D)" predicts performance (Spence & Spence, 1966, p. 295), as expressed by the arousal-performance relationship, $P = H \times D$ (Gould et al., 2002). In a review of 25 studies, Gould and colleagues (2002) indicate that "all but four support the hypothesis that arousal [is] positively correlated to performance" (p. 213). This is also the year that Lazarus proposes his theory of psychological stress based on threat, appraisal, and coping (Lazarus & Opton, 1966). This theory eventually evolves into a theory of cognitive appraisal (see the following sub-section for additional details). Finally, another important event occurs: Spielberger publishes his theory of state and trait anxiety, which defines state anxiety as "subjective, consciously perceived feelings of apprehension and tension, accompanied by or associated with activation or arousal of the autonomic nervous system", and trait anxiety as "a motive or acquired behavioral disposition that predisposes an individual to perceive a wide range of objectively non-dangerous circumstances as threatening and to respond to these with state anxiety reactions disproportionate in intensity to the magnitude of the objective danger" (Spielberger, 1966, p. 17). The theory emphasizes that people with high trait anxiety report higher state anxiety in stressful situations than people with low trait anxiety (Weinberg & Gould, 2007). Spielberger's state-trait anxiety theory eventually leads to the creation of the well-known State-Trait Anxiety Inventory in 1970 (Gould et al., 2002).

In 1968, following his review of psychoendocrine research, John Mason finds that three psychological determinants are associated with stress responses: novelty, unpredictability, and control (Mason, 1968; Lupien, Maheu, Tu, Fiocco, & Schramek, 2007). Two years later, McGrath publishes a four-stage process model of stress (Figure 2.3) emphasizing that "stress occurs when there is a substantial imbalance between the physical and psychological demands placed on an individual and that person's response capability and under conditions in which failure to meet the demand has important consequences" (Weinberg & Gould, 2007, p. 81).

In 1971, Lang proposes his three-system model of fear, in which behavioral, physiological, and verbal components are interactive yet partly independent systems

(Craske & Craig, 1984; Kenny, 2011). In 1976, Borkovec also notes that there are "three separate but interacting response components of anxiety: cognitive, physiological, and overt behavioral" (as cited in Gould et al., 2002, p. 210). It seems important to note that Lang's verbal system and the cognitive component mentioned by Borkovec are sometimes used interchangeably in the literature on MPA (Salmon, 1990; Salmon & Meyer, 1998).

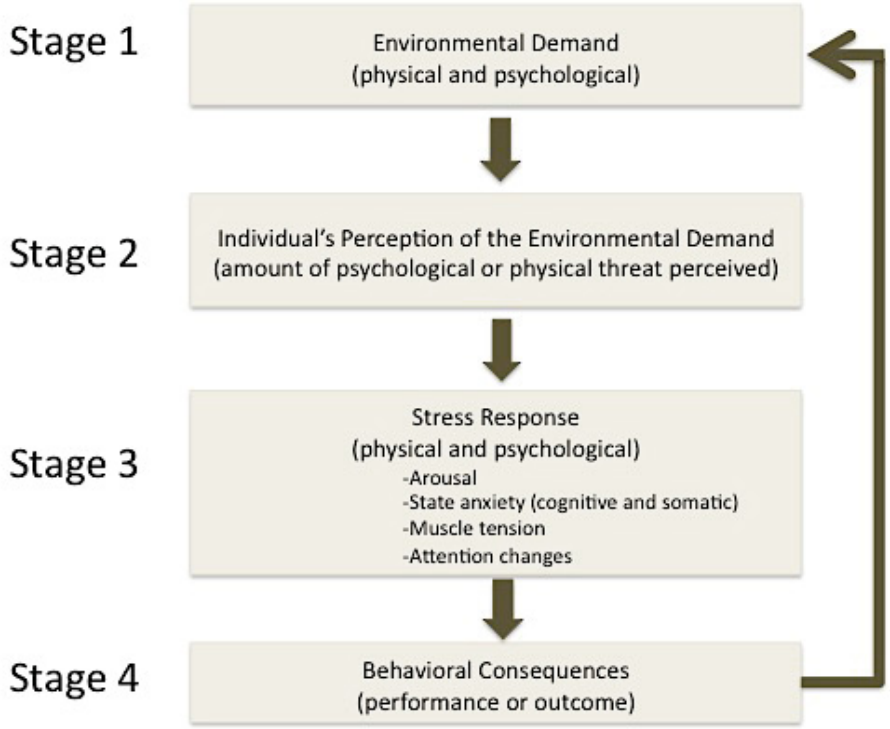

Figure 2.3. Four-stage process model of stress (Weinberg & Gould, 2007, p.82). The model illustrates that stress responses are triggered by individuals' self-perception regarding environmental demands and that behavioral consequences directly impact physical and psychological demands (Stage 1), thus creating a loop of stress which can lead to poor performance quality (McGrath, 1970).

Apter's theory of psychological reversals is developed in 1976 and published in full in 1982 (Figure 2.4). As Gould and colleagues (2002) explain, this theory "focused on the relationship between arousal and emotional affect and was forwarded as a general framework for explaining personality and motivation" (p. 221). Kerr has also adapted the reversal theory to sports psychology (see the following sub-section for additional details).

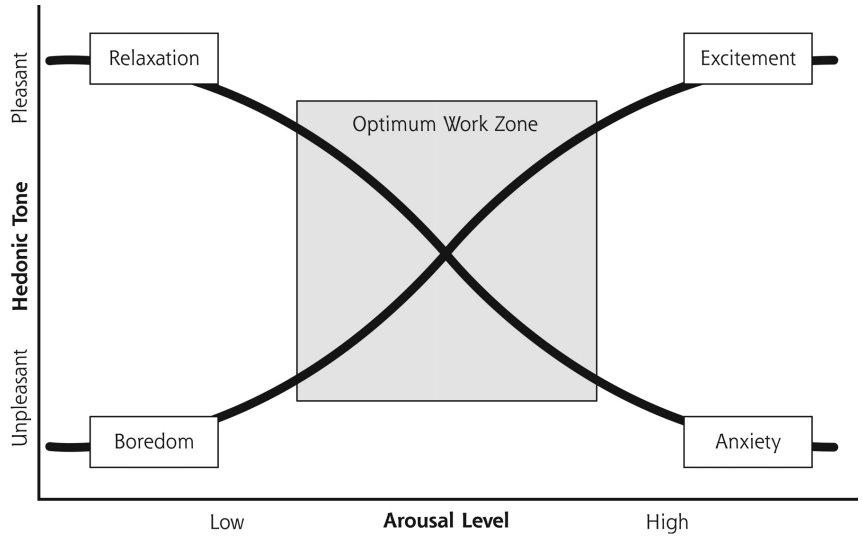

Figure 2.4. The reversal theory states that the optimum work zone is dependent on arousal level and emotional affect, and arises approximately at mid-point between relaxation and anxiety and between boredom and excitement (Borrell-Carrió & Epstein, 2004, p. 313).

In 1978, Yuri Hanin proposes a model for sports psychology: the individual zone of optimal functioning, or IZOF (Hanton & Mellalieu, 2006; Weinberg & Gould, 2007). The IZOF (Figure 2.5) is based on the assumption that athletes whose state anxiety is within their IZOF should "perform better than athletes whose state anxiety [is] outside their IZOF" (Gould et al., 2002, p. 215).

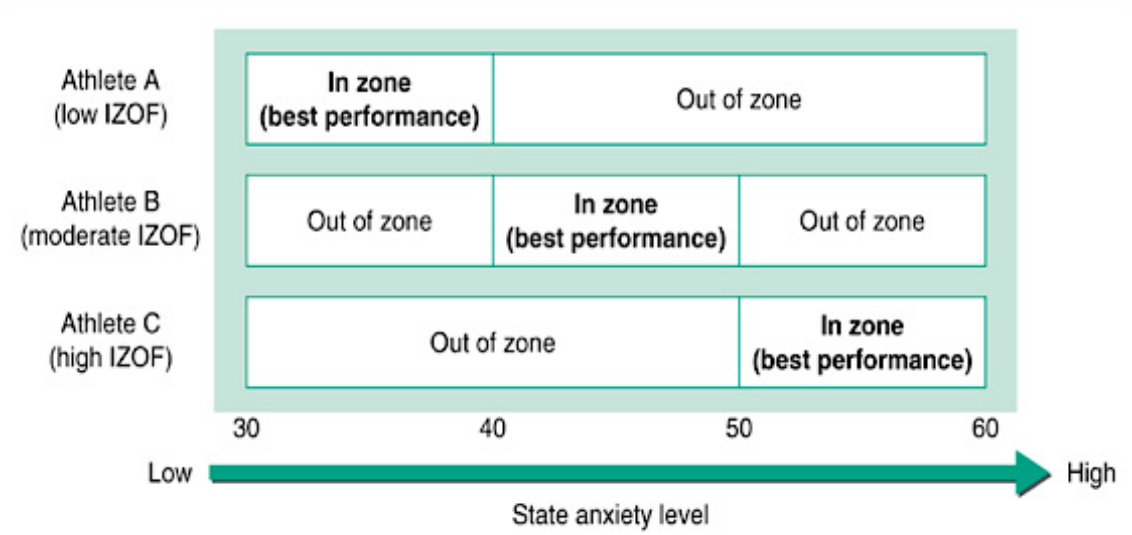

Figure 2.5. The individual zone of optimal functioning, or IZOF, varies in function of performers' tolerance for anxiety: Some athletes may achieve their best performances under low levels of anxiety, some under moderate levels and some under high levels (Weinberg & Gould, 2007, p. 89).

Between the 1950s and the 1970s, a number of new theories on stress, anxiety, and performance appear, including models and concepts specific to the field of sports psychology. However, none of these theories are yet focusing on music performance. It is only in the following decades that some research on music performance anxiety is undertaken. As history moves forward, some existing theories begin to be adapted, modified, and applied to the phenomenon of performance anxiety, both in sports and in music.

1980s-present: Moving forward. Leader in stress research, Lazarus makes a fundamental contribution to the field when he publishes his book introducing the theory of cognitive appraisal (Lazarus & Folkman, 1984). Kenny (2011) summarizes the concept:

> Cognitive appraisal, which is influenced by biological variability, temperament, learning experiences, and sociocultural factors, determines the emotional response (e.g. anxiety, anger, guilt, or shame) to given situations. Appraisal involves an assessment of goal relevance (whether anything is at stake), goal congruence (whether the encounter is appraised as harmful – or threatening if it is future harm – or beneficial), and goal content (the type of ego involvement required). Secondary appraisal involves the determination of the capacity to cope with the situation. (pp. 128-129)

That same year, Craske and Craig (1984) publish a study on music performance anxiety comparing Lang's three-system model with the self-efficacy theory. This article is one of the earliest empirical studies investigating the effectiveness of a theory applied to music performance anxiety. In this instance, tests with anxious and non-anxious pianists provided more support for the three-system model than for the self-efficacy theory.

In 1985, Kerr popularizes Apter's theory of reversals by applying it to sports performance to explain the relationship between arousal and performance. Gould and colleagues (2002) explain:

> Relative to arousal, the basic contention of reversal theory is that the relationship between arousal and affect depends on one's cognitive interpretation of one's arousal level. High arousal may be interpreted as excitement (pleasant) or anxiety (unpleasant), and low arousal may be interpreted as relaxation (pleasant) or boredom (unpleasant). (p. 221)

The catastrophe model is attributed to Hardy and is first published in 1988 (Hardy & Parfitt, 1991; Gould et al., 2002; Williamon, 2004). It is a complex three-dimensional

model (Figure 2.6) that illustrates the relationship between physiological arousal, cognitive anxiety, and performance (McNally, 2002). Weinberg and Gould (2007) summarize the theory, mentioning that

> with low worry, increases in arousal or somatic anxiety are related to performance in an inverted-U manner. With great worry, the increases in arousal improve performance to an optimal threshold, beyond which additional arousal causes a 'catastrophic' or rapid and dramatic decline in performance (p. 90).

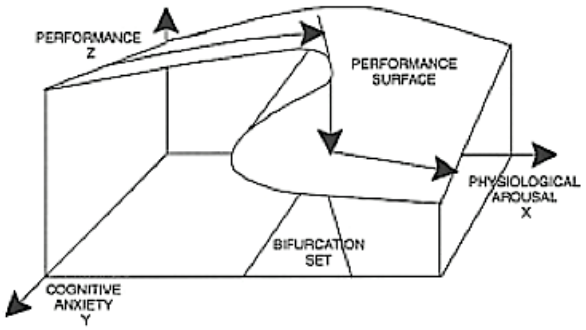

Figure 2.6. The catastrophe model. This model posits that with low cognitive anxiety, performance quality is associated with physiological arousal and this relationship follows an inverted-U curve. With high cognitive anxiety, the relationship between arousal and performance is more complex: physiological arousal may have a positive effect on performance up to a point where any further increase leads to a drastic decline in performance quality (McNally, 2002, p. 14).

In 1990, Martens, Vealey, and Burton create the multidimensional theory (Figure 2.7) as an alternative to the Yerkes-Dodson hypothesis (Gould et al., 2002). This theory focuses on the temporal occurrence of cognitive and somatic anxiety and "predicts that cognitive anxiety will remain high and stable prior to the event, but that somatic anxiety will be low until immediately before the event. […] Both cognitive and somatic anxiety reduce rapidly after the performance" (Kenny, 2011, p. 146).

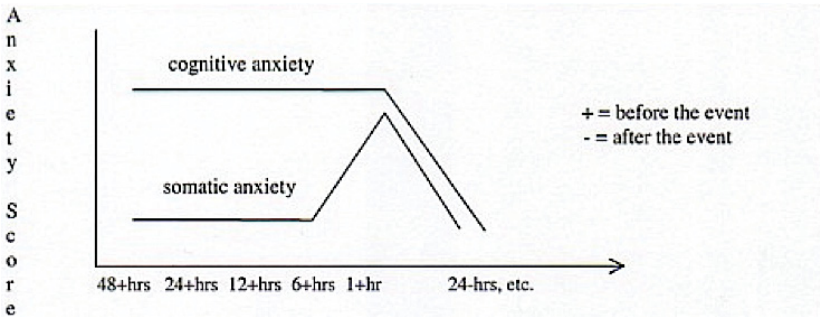

Figure 2.7. The multidimensional theory purports that cognitive and somatic anxiety do not follow the same trend prior to performance: Somatic anxiety tends to remain low up to the point where performance is imminent, whereas cognitive anxiety, which may be associated with feelings of anticipation, tends to stay high all along and decreases only after the performance (McNally, 2002, p.12).

Also in 1990, Salmon publishes an article in which he suggests his theory of MPA:

> 1. MPA comprises a loosely correlated constellation of physiological, behavioral, and cognitive variables. (p. 3)
>
> 2. The physiological component of MPA reflects arousal associated with the autonomic nervous system (ANS) which, largely through conditioning, has become excessively associated with fear. (p. 4)
>
> 3. The anticipation of stressful events, musical or otherwise, can evoke as much (if not more) anxiety than the event itself. (p. 6)
>
> 4. Psychotherapeutic interventions for MPA appear to be successful to the degree that they address specific components (cognitive, physiological, behavioral) of the overall profile of anxiety. (p. 8)

Salmon's theory is based on a literature review and inspired by Lang's three-system model, as suggested by the first component. The other components address the relationship between the physiological, cognitive, and behavioral variables by focusing on the biological response to stress (Component 2), emotional responses due to anticipation (Component 3), and specific stress management techniques (Component 4).

Leblanc (1994) proposes a theoretical model that attempts to convey "all the variables that might influence the level of performance anxiety experienced by a person who prepares and presents a solo performance that he or she considers important" (p.60). This model is structured in 11 levels displaying a hierarchy of variables, and follows a time line that goes from musical preparation to performance and evaluation (Table 2.1). The model starts at level 11 by taking into account the musicians' characteristics and learning history. These characteristics influence performers when they first make the commitment to perform. Levels 10 to seven are associated with the preparation required to perform successfully, levels six and five with the performing environment and musicians' self-perceptions, levels four and three with the act of performance, and finally, levels two and one with the evaluation of performance. After the feedback is received, the model circles back to level 11, creating a loop that could be vicious or virtuous.

Table 2.1

Leblanc's Theoretical Model: Sources of Variation in MPA

	Performer's characteristics and learning history							
11	Age	Musical ability	Musical training	Personality	Amount of performing experience	Quality of performing experience	Memory	Circadian rhythm
	Preparation for performance							
10	Difficulty of music performed					Appropriateness of music performed		
9	Adequacy of musical preparation			Adequacy of instrument			Adequacy of physical conditioning	
8	Emotional health					Physical health		
7	Current affective state							
	Performing environment							
6	Measurement devices & procedures	Physical comfort in environment	Presence and behaviour of : - Audience - Authorities - Educators - Family - Media - Peer group			Memorization requirement	Distractions	Time of day
	Performer's self-perception of...							
5	Difficulty of music	Appropriateness of music	Adequacy of preparation	Own appearance		Amount of individual exposure	Importance of performance	Audience support
	The act of performance							
4	Level of psychological arousal					Level of physiological arousal		
3	Focus of attention							
	Evaluation of performance							
2	Immediate feedback of performance quality							
1	Subsequent feedback of performance quality							

(Adapted from Leblanc, 1994, p.61)

In 1995, Jones proposes a theory that takes into account both positive and negative aspects of performance anxiety in sports (Weinberg & Gould, 2007). His model of facilitative and debilitative anxiety (Figure 2.8) posits that "anxiety is interpreted as facilitative when a person has positive expectancies of coping and achieving the goal [and that] anxiety is proposed to be debilitative when expectancies with regard to coping and goal attainment are negative" (Gould et al., 2002, p. 225). This theory is strongly related to the concepts of cognitive appraisal popularized by Lazarus.

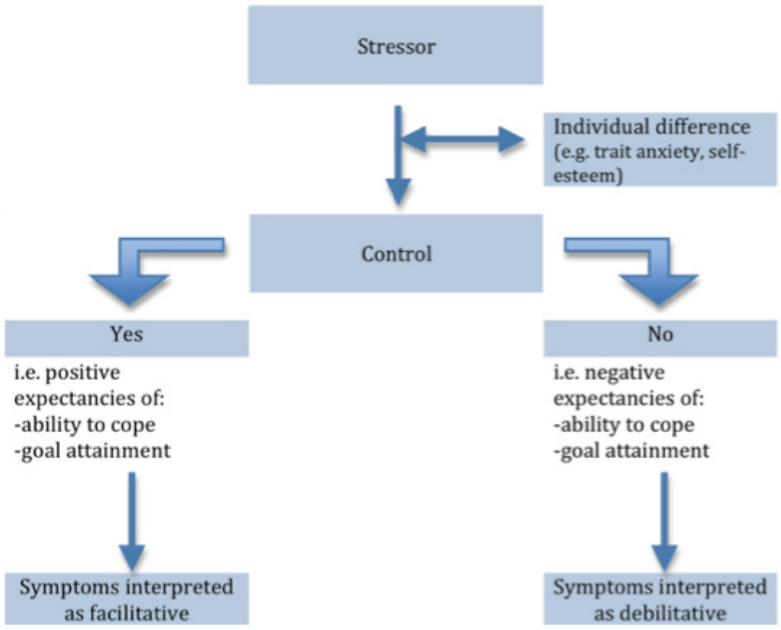

Figure 2.8. Jones's model of facilitative and debilitative anxiety establishes a relationship between stress and control. When confronted by a stressor, individual differences determine whether or not a stress response is triggered. If triggered, then a person's sense of control over the situation determines whether symptoms of anxiety are perceived as facilitative or debilitative (Weinberg & Gould, 2007, p.92).

At the turn of the millennium, Barlow publishes an emotion-based theory (Barlow, 2000). This triple vulnerability model postulates that the following elements explain the development of anxiety and mood disorders: "i) a generalized biological (heritable) vulnerability; ii) a generalized psychological vulnerability; iii) specific life experiences that establish specific psychological vulnerabilities" (Kenny, 2011, p. 129).

Using the Yerkes-Dodson hypothesis, Wilson's three-dimensional model of music performance anxiety is introduced in 2002 (Kenny, 2011). This model suggests that MPA results from three interacting components:

> (i) the trait anxiety of the performer; (ii) the degree of task mastery achieved of the works to be performed; and (iii) the degree of situational stress that accrues to the performance (presence, size, and characteristics of the audience; the 'stakes' of the performance: audition, solo recital, examination, etc.). (Kenny, 2011, p. 157)

Still in 2002, Dickerson and Kemeny complete a meta-analytic review of 208 studies on acute psychological stress. They confirm the three psychological determinants of stress (i.e. novelty, unpredictability, control) based on John Mason's (1968) work and add a fourth one: social evaluative threat (Dickerson & Kemeny, 2002). These four determinants are then used by Lupien to develop the NUTS recipe for stress (Lupien et

al., 2006; Lupien et al., 2007; Marin, Schramek, Maheu, & Lupien, 2009). Lupien's theory postulates that stress is a recipe in which the ingredients (novelty, unpredictability, threat to the ego, and sense of control decreased) may be experienced singly or together; and "the more characteristics present in a given situation, the more stressful the experience" (Marin et al., 2009, p. 168). As shown in Figure 2.9, one may easily associate this model to MPA. In fact, any element surrounding a performance may potentially generate a stress response if perceived as novel, unpredictable, threatening one's ego, or uncontrollable.

Stress Ingredients		
Threat	**Emotions**	**Example with MPA**
NOVELTY	Something new, not experienced before	Unfamiliar venue; Interpreting new repertoire for the first time
UNPREDICTABILITY	Something one had no way of knowing it would occur	Change of lighting; Sudden change of temperature
THREAT TO THE EGO	One's competence as a person is called into question	Competitions; Audition to obtain a position in a professional orchestra
SENSE OF CONTROL	Having little or no control over a situation	Performing under a very demanding conductor; Experiencing symptoms of nervousness such as trembling, rapid heartbeats, or shortness of breath

Figure 2.9. The NUTS recipe for stress consists of four determinants that are acknowledged to induce stress response whether experienced singly or simultaneously (adapted with permission from the Center for Studies on Human Stress, 2016).

In 2007, Papageorgi, Hallam, and Welch propose a conceptual framework to explain MPA (Figure 2.10). The model is based on Wilson's three-dimensional model of MPA – which includes (a) susceptibility to anxiety, (b) task efficacy and (c) environment – and on the Yerkes-Dodson law to explain how debilitative effects may occur under low or high arousal and facilitative effects under moderate arousal levels. This model also addresses the temporal occurrence of MPA. It must be pointed out that, because Yerkes-Dodson hypothesis has been disproved (Corbett, 2015), this framework is automatically biased and unreliable. In addition to being based on an erroneous model of optimal arousal, Kenny (2011) also strongly criticizes Papageorgi et al.'s framework for its conceptual flaws regarding the temporal dimension of anxiety.

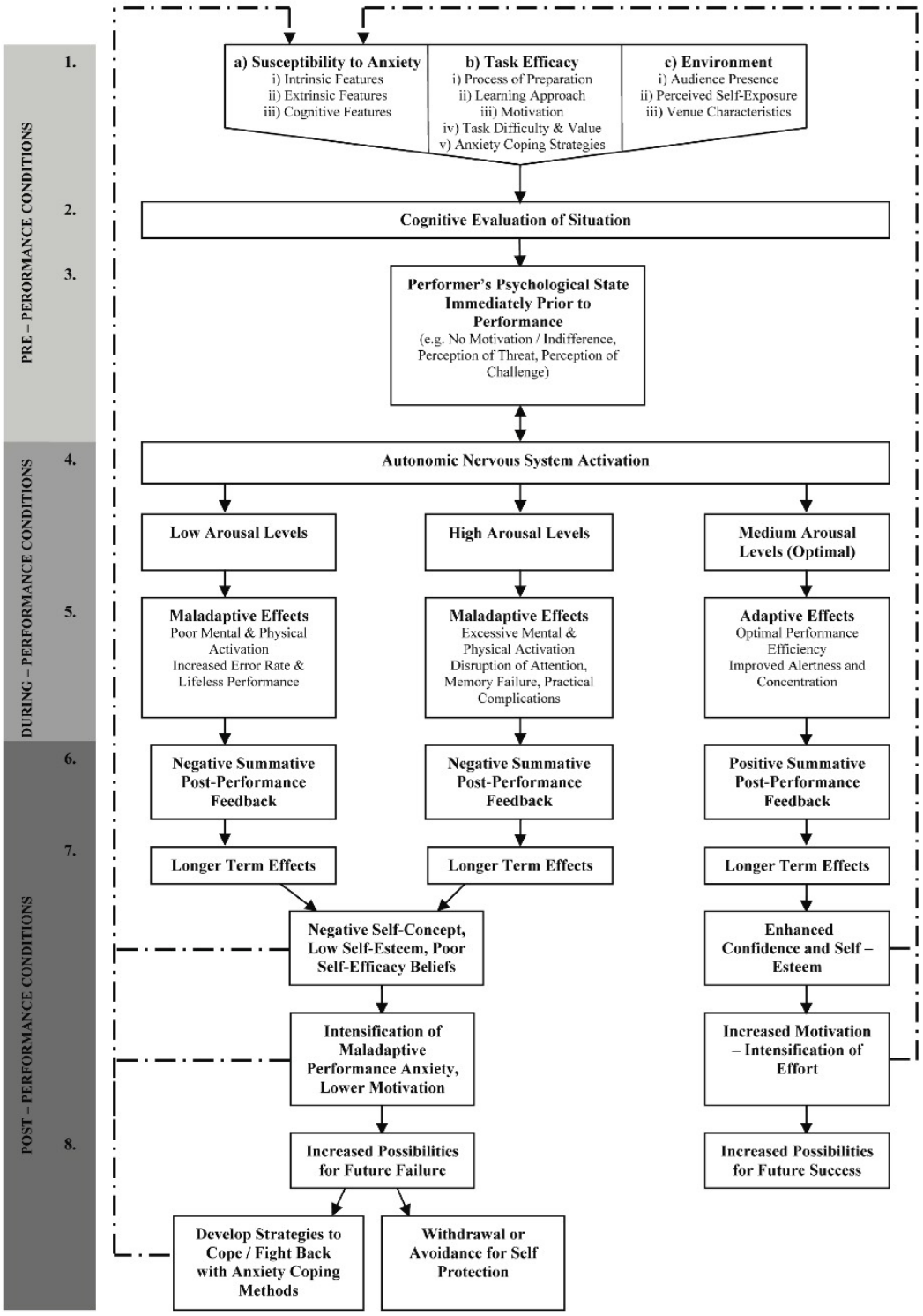

Figure 2.10. Papageorgi, Hallam, and Welch's conceptual framework, which "portrays anxiety within a musical performance context as a process that has an explicit time dimension (pre-, during- and post-performance). The model illustrates the likely processes that occur once a performer agrees to participate in a particular performance and explains how these might give rise to either maladaptive or adaptive forms of performance anxiety" (Papageorgi, Hallam, & Welch, 2007, p. 94).

Recently, Kenny (2011) developed an emotion-based theoretical model of MPA that uses Barlow's (2002) triple vulnerability theory. Kenny's model is interesting in that it explains how MPA appears, persists, and even how it may be avoided (Figure 2.11). It also reflects the phenomenon's complexity as it takes into account components of stress and learned responses (e.g., true and false alarm, classical and operant conditioning, etc.), and considers the impact of biological and psychological vulnerabilities on MPA.

However, this model does not include the adaptive facet of MPA (facilitating anxiety perceived as a form of excitement). In addition, it suggests that the only way to alleviate MPA is to achieve successful performances and that these are only possible through three options: control of anxious apprehensions, implementation of preventive strategies, or use of specific interventions to manage MPA. These options do not necessarily take into account the temporal occurrence of anxiety: for instance, a musician may have practiced preventive strategies that turn out to be ineffective during concerts. In turn, this could trigger stress response and negative cognition that may have detrimental consequences for performance quality, and thus for performance success. On the opposite side of the spectrum, an individual who is particularly well-prepared for a performance may not feel the need to use any preventative strategies or specific interventions to deal with minor symptoms, but unforeseen events such as cold room temperature or bad lighting may still affect this person's ability to perform optimally, which as a result may generate stress. While these external factors may not significantly influence the success or failure of a performance, they may still contribute to musicians' performance anxiety.

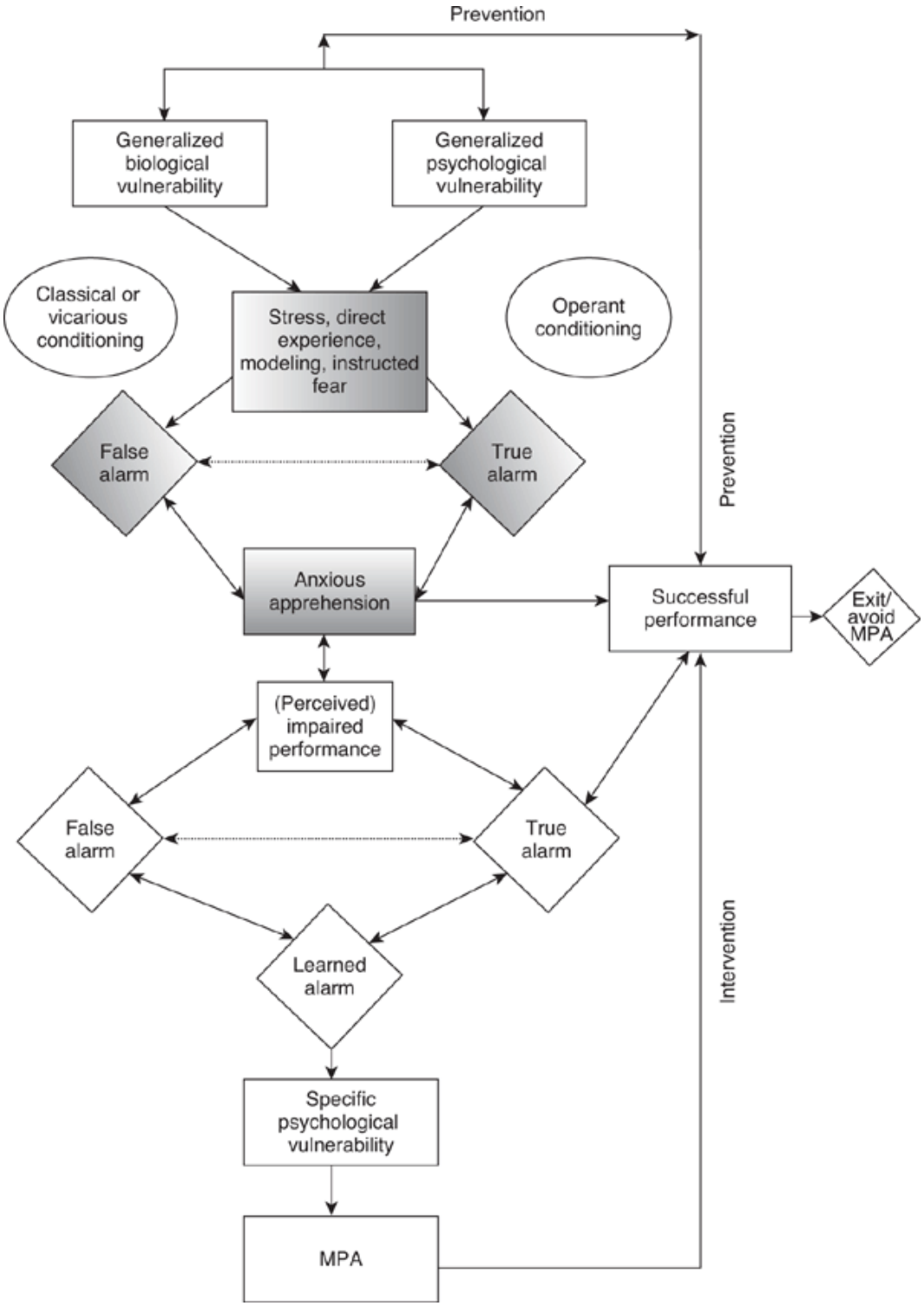

Figure 2.11. Kenny's emotion-based theoretical model of MPA. The shaded area relates to basic conditioning processes that lead to the development of anxious apprehensions. This model illustrates how MPA is triggered, maintained, and/or stopped. To end MPA, preventive strategies or interventions must be implemented in order to achieve successful performance, which is the only way to break the vicious cycle of anxiety conditioning (Kenny, 2011, p. 163).

Application to music performance anxiety. The theories presented above either are or may be linked, to some extent, to music performance anxiety (a synthesis of theories appear in Figure 2.12). However, certain models are more applicable to musicians than others. In fact, several theories that may be associated with MPA fall within two general themes: the three-system model of fear, and concepts of cognitive appraisal.

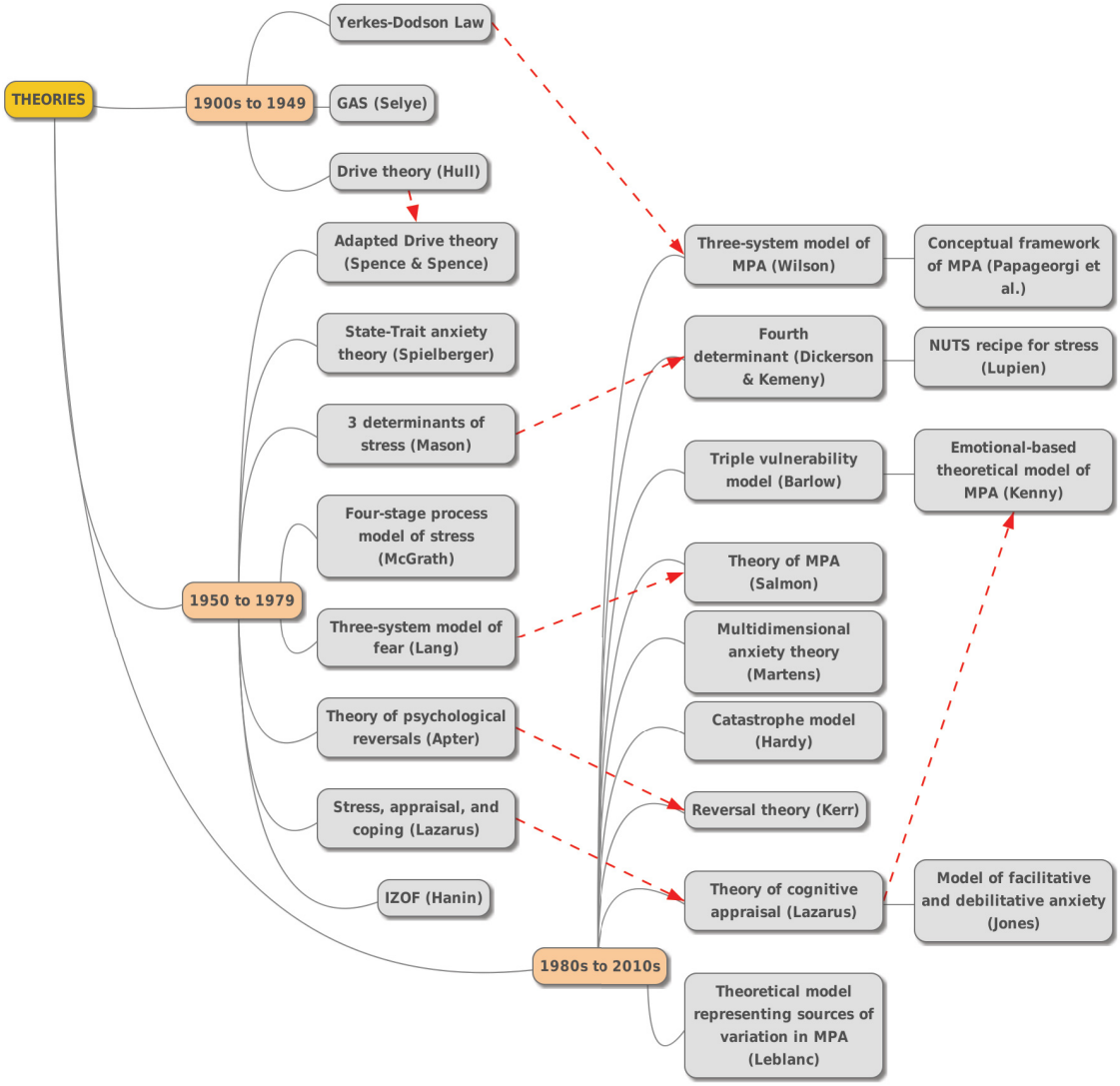

Figure 2.12. Concept map of the theories, the periods in which they were developed and their relationships to each other.

Theories based on the three-system model. Lang's three-system model of fear and Salmon's theory of MPA share common features in that the main affect (be it fear or MPA) comprises behavioral, physiological and verbal (or cognitive) variables that

interact while being partially independent. The following variables may be interpreted as symptoms of MPA: the verbal (cognitive) component, referring to negative thoughts and worries, the behavioral component of avoidance or overt manifestations of stress, such as tensed shoulders or distressed facial expressions, and the physiological component of bodily reactions resulting from heightened arousal (e.g. sweaty palms, rapid heart beat, etc.; Salmon & Meyer, 1998; Salmon, 1990). In performance contexts, musicians may experience a wide variety of symptoms (Salmon, 1990). In very stressful situations, symptoms may be synchronized, which means that cognitive, behavioral and physiological components may all become highly activated at the same time (referred to as concordance), whereas in less stressful circumstances, symptoms may become desynchronized (referred to as discordance) (Salmon, 1990; Craske & Craig, 1984). In addition, Craske and Craig (1984) distinguish between concordance and discordance:

> the degree of concordance depends upon the intensity of the emotional response and demand features of the situation. Under conditions which evoke strong emotional responses, […] fearful individuals will respond with comparably high levels of anxiety in each response system (i.e. concordance). In conditions that do not evoke strong emotional responses, the three-system model predicts discordance. (pp. 268-269)

Some researchers have mentioned that one variable is often overlooked in the literature: the affective component (Osborne & Kenny, 2008; Emmons & Thomas, 2008; Barlow, 2002). It is not part of the three-system model, but it is mentioned in a recent (and quite robust) definition of MPA proposed by Kenny (2011, p. 61). Despite the fact that the three-system model does not include the affective system, Lang's theory may be quite relevant to musicians. In fact, being able to classify symptoms may be especially useful for musicians wanting to implement effective stress-management techniques. For instance, if a performer is constantly disturbed by unrelated thoughts during concerts, using cognitive restructuring could be more effective to decrease his symptoms than, say, deep breathing. However, to be able to select an appropriate technique, one needs to know which 'system' is the most impaired (behavioral, psychological, or verbal). Therefore this model may help performers target specific symptoms of MPA, classify those symptoms, and determine the most suitable preventive strategies or interventions.

Concepts relative to cognitive appraisal. It has been shown that the cognitive component of anxiety is a predictor of MPA (Kenny, 2011; Osborne & Kenny, 2008;

Stephenson & Quarrier, 2005; Liston et al., 2003; Craske & Craig, 1984). It even surpasses somatic manifestations of anxiety (Yoshie, Shigemasu, Kudo, & Ohtsuki, 2009a; Stephenson & Quarrier, 2005, Reitman, 2001; Kleine, 1990) and behavioral and affective manifestations (Kenny & Osborne, 2006) as a factor of performance disruption. Cognitive appraisal, therefore, is a concept that must be taken into account when applying theories to musicians' experiences.

Lazarus and Folkman (1984) explain that cognitive appraisal is two-fold: primary appraisal relates to the person's evaluation of what is at stake, and secondary appraisal refers to the person's capability to cope with the situation. Because it is based on an individual's evaluation of any given event and on his/her ability to cope with potential 'threats', this theory may greatly help musicians in determining how they personally appraise musical performances. For instance, if they think an upcoming performance may have an impact on their future career, and they feel that they cannot cope with the pressure of performing, chances are they will experience MPA. On the other hand, if they think performing in public is a great opportunity to share music with others (positive appraisal), they may experience heightened arousal, but not debilitating MPA.

Individual perception. Cognitive appraisal is strongly related to individual perception, a concept that applies to other theories of MPA. For instance, McGrath's four-stage model of stress includes a central component focused on the individual perception of environmental demands (Stage 2), which precedes any stress response (Stage 3). Apter's theory is also based on an individual's cognitive appraisal as arousal levels may be interpreted as pleasant or unpleasant and may lead either to excitement or anxiety (at high arousal) or to relaxation or boredom (at low arousal). Hardy's catastrophe model also emphasizes the importance of cognitive anxiety, specifying that "the relationship between physiological arousal and performance will differ depending on one's level of cognitive anxiety, with catastrophic performance effects occurring only when cognitive anxiety is high" (Gould et al., 2002, p. 219). It thus shows that if a musician is very worried, he has more chance of experiencing "large and drastic catastrophic change in performance" (Gould et al., 2002, p. 220).

Direction of appraisal and perceived control. Jones's model of facilitative and debilitative anxiety not only focuses on cognitive appraisal, but also on the direction of

this appraisal. His theory illustrates how the perception of anxiety may be related to personal control over situations. This means that musicians who feel in control may tend to perceive MPA as positive and beneficial to performance, while musicians lacking control in performance contexts may interpret MPA as negative and debilitating.

It is interesting to note that control is also a determinant of Lupien's NUTS recipe for stress. In fact, the latter theory is entirely based on individual perception. Marin et al. (2009) confirms that "in order for a situation to be perceived as stressful, it must be interpreted as either novel and/or unpredictable and/or threatening to the ego of the person experiencing it and/or decreasing the perceived control that the person has over a situation" (p. 168). As explained earlier, these findings are based on Mason's (1968) and Dickerson and Kemeny's (2002) studies that showed a release in stress hormones when the determinants were met.

Lazarus's theory of cognitive appraisal has supplied the foundations on which many other theories were later built. Even the most recent theory presented here, Kenny's emotion-based theoretical model of MPA, includes components related to perception that may be associated with Lazarus's work. Indeed, when Kenny (2011) explains her model, she mentions that if a

> performance is impaired or is perceived to be impaired, the negative emotions and (cognitive) self-evaluation that follow may compound the anxious apprehension and trigger further alarms, which in turn increase the risk of impaired performance, in a vicious circle until the performance setting itself triggers conditioned alarms, even before the performance has taken place (p. 164).

These theories clearly indicate the major role perception and cognition play in MPA. It would be essential for musicians to learn the impact their thoughts may have on their bodily reactions in order to find solutions that would avoid erroneous cognition processes and negative appraisal.

Further considerations. This section's aim was to build a general historical portrayal of research on stress and anxiety from the 1900s to the present day and to apply some basic theoretical concepts to musicians in particular. It drew from the fields of psychology, psychophysiology, sports psychology, and music to offer information about past and current theories on stress, anxiety, and MPA (a timeline summarizing all the theories is available in Appendix 2).

Because stress has the potential to significantly impact human physiology, it also has a strong influence on people's wellbeing. Therefore, the following section provides a more general framework to situate music and health; the Biopsychosocial model.

The Biopsychosocial Model

In order to better understand the literature on active music-making and its impact on musicians' lives, it is important to have a conceptual model within which all parameters of stress and anxiety may fall. The Biopsychosocial model, developed by George L. Engel, postulates that health is affected by the interactions of biological factors, psychological factors, and social factors (Engel, 1977). Engel created this framework to address the shortcomings of the biomedical model and to challenge perceptions in the medical field. Engel explains that the biomedical model is a dominant framework in Western societies, but that it has major limitations that need to be overcome:

> It [the biomedical model] assumes disease to be fully accounted for by deviations from the norm of measurable biological (somatic) variables. It leaves no room within its framework for the social, psychological, and behavioral dimensions of illness. The biomedical model not only requires that disease be dealt with as an entity independent of social behavior, it also demands that behavioral aberrations be explained on the basis of disordered somatic (biochemical or neurophysiological) processes. Thus the biomedical model embraces both reductionism, the philosophic view that complex phenomena are ultimately derived from a single primary principle, and mind-body dua1ism, the doctrine that separates the mental from the somatic. Here the reductionist primary principle is physicalistic; that is, it assumes that the language of chemistry and physics will ultimately suffice to explain biological phenomena. (1977, p. 130)

As Engel (1977) reveals, Western culture has tried to dichotomize science and separate the body from the mind for centuries. This mind-body dualism influences classical science to foster the notion that the body is "a machine", that disease is a "consequence of breakdown of the machine" and that the doctor's task is the "repair of the machine" (Engel, 1977, p. 131). This reductionist view of health overlooks significant psychosocial factors, such as individuals' personalities, coping skills, socio-economic status, family support, and so on. While Engel claims that the biomedical model's narrow spectrum and rigorous approach has led to significant advances in the field of medicine, these breakthroughs were achieved at a certain cost. In order to provide a more holistic framework that considers human beings as a whole and examines all parameters

that might influence health outcomes, Engel developed the Biopsychosocial model (Figure 2.13). As he explained, "the boundaries between health and disease, between well and sick, are far from clear and never will be clear, for they are diffused by cultural, social, and psychological considerations" (Engel, 1977, p.132).

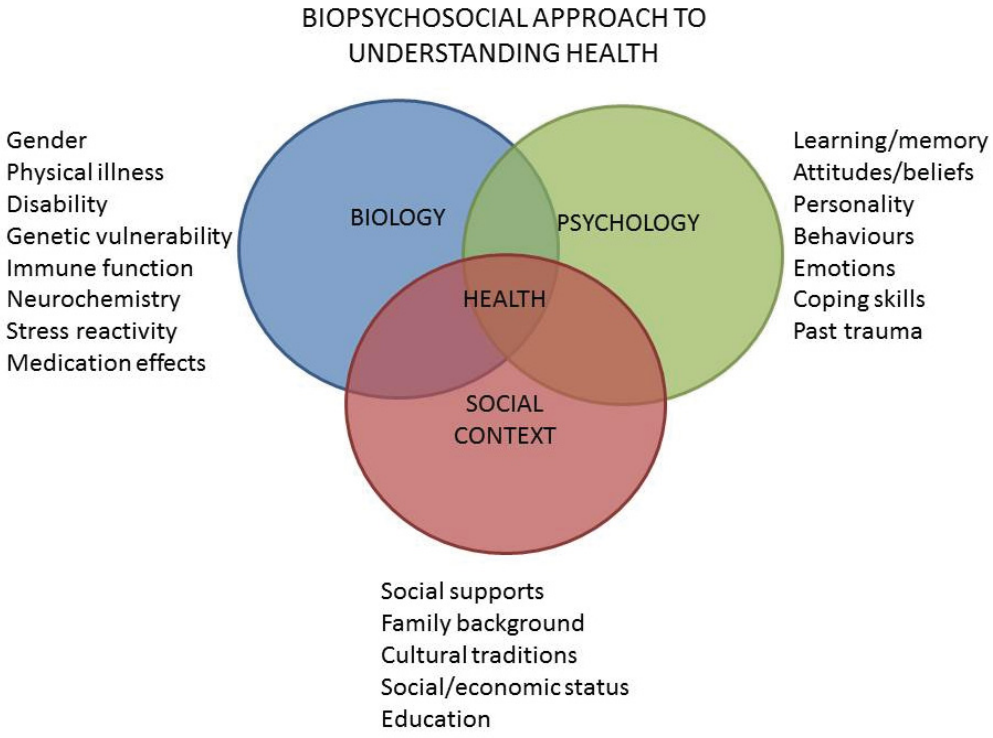

Figure 2.13. Engel's Biopsychosocial model (Illustration © Perspectives Clinic, with permission). This model is based on the premise that "humans are inherently biopsychosocial organisms in which the biological, psychological, and social dimensions are inextricably intertwined" (Melchert, 2007, p. 37).

It is essential to consider all factors that may affect humans' lives – be they biological, psychological, or social – when investigating health and wellbeing. For instance, playing music is a social and cultural activity that requires psychological and physical engagement from the musicians. It may therefore have an impact on humans' health and wellbeing, as it involves an interaction between factors. When MPA is high, it may also negatively influence musicians, as it may generate biological symptoms (increased heart rate, hot flashes) and psychological symptoms (low concentration, memory lapses, worries) that may have detrimental consequences on performance quality, which in turn may affect social interactions.

Some parameters, such as gender or genetic vulnerability (biological), past trauma (psychological), or family background (social), may not be changeable. However, other parameters (for instance, education or coping skills) may still play a role in influencing health outcomes. In fact, by having a certain degree of control over some parameters, it becomes possible to implement preventive strategies and promote long-term health.

The Biopsychosocial model takes into account the organisation of people's lives from a multi-level standpoint. In fact, Engel (1980) cites Weiss and von Bertalanffy's work to support the argument that nature is organized in systems that are hierarchical and continuous, with larger and more complex units encompassing smaller and less complex units (Figure 2.14). He explains that "each system as a whole has its own unique characteristics and dynamics; as a part, it is a component of a higher-level system" (Engel, 1980, p.537). Engel (1980) specifies that there are two hierarchies, which meet at the *person*'s level: "the single individual (*person*) is the highest level of the organismic hierarchy and at the same time the lowest unit of the social hierarchy" (p. 536). Frankel, Quill, and McDaniel (2003) also explain that "depending upon the view one adopts, disease and illness may simultaneously affect many different levels of functioning, from cellular to organ system to organism to person to family to society" (p. 23).

According to Borrell-Carrió, Suchman, and Epstein (2004), the model also has a dual nature that provides both philosophical and practical standpoints: "Philosophically, it is a way of understanding how suffering, disease, and illness are affected by multiple levels of organization, from the societal to the molecular. At the practical level, it is a way of understanding the patient's subjective experience as an essential contributor to accurate diagnosis, health outcomes, and human care" (p.576). This multi-level system demonstrates that the social hierarchy (including society, culture, community and family) may influence the person. This in turn suggests that a significant relationship exists between the person's biological and psychological states and his or her social environment.

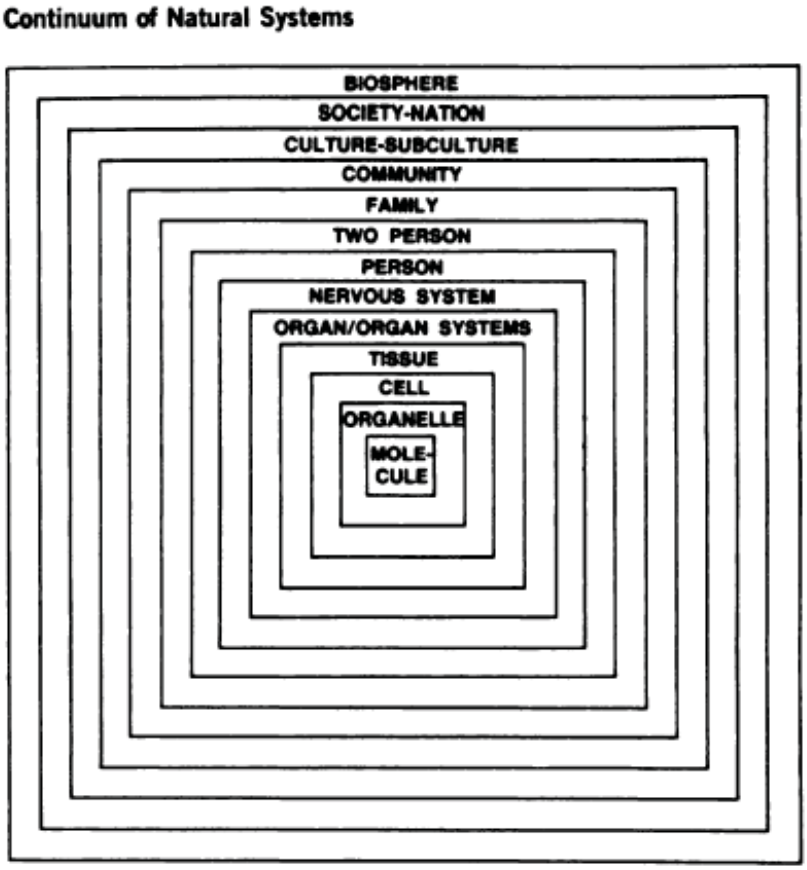

Figure 2.14. The continuum of natural systems shows each smaller system is integrated into larger ones and that each unit is at the same time both a whole and a part (Engel, 1980, p. 537).

Application to music. The Biopsychosocial model has been applied to a wide variety of fields, including medicine (Engel, 1977, 1980; Borrell-Carrió et al., 2004), psychology (Suls & Rothman, 2004), social work (McInnis-Dittrich, 2002; Zittel, Lawrence & Wodarski, 2002), and even performing arts (Mancester, 2011). Indeed, Mancester (2011) draws a parallel between Engel's arguments for the Biopsychosocial model and elements to consider when facing performance anxiety. Table 2.2 provides a portrait of these elements to facilitate comparison and shows that addressing biochemical problems without considering psychosocial factors gives an incomplete understanding of anxiety. In addition, it demonstrates similarities between health issues and MPA from the biological, psychological and social perspectives.

Table 2.2

Arguments for the Biopsychosocial Model and its Application to Performance Anxiety

Biopsychosocial model	**Application to MPA**
Biochemical defects may be a necessary condition for an illness to develop, but are not a sufficient condition	While performers who suffer from performance anxiety may have higher levels of adrenaline than those who don't, the release of adrenaline under stress is surely not all that's needed to bring on the symptoms
Understanding how biochemical defects produce symptoms requires knowledge of behavioral and psychosocial science	We have ample evidence that psychological and social factors account for the translation of extra adrenaline to the inability to perform
Psychosocial factors have been shown to influence the development of disease in a variety of populations	Different expectations about performances in various settings bring on lower or higher levels of performance anxiety, e.g. auditions
An individual's living conditions may have a major impact on one's perception of health, e.g. whether or not one feels sick	The relationship between an individual's living conditions and MPA is explored in Schneider and Chesky's (2011) study, which reveals a negative correlation between perceived social support of performance anxiety.
Treating only the biochemical defects almost never restores the patient to full health	Optimal treatment of performance anxiety in many cases involves a combination of medical and psychological approaches
The doctor-patient relationship plays a significant role in the patient's recovery, independent of the rate at which the biochemical problem resolves	While the role of the doctor-patient relationship in the management of performance anxiety has not been studied, its importance is so well established in many other situations that it's likely to have at least some influence

(Mancester, 2011, p.121)

The Biopsychosocial model may also be used to explain health-related benefits derived from active music-making. Biologically, playing music has been shown, for example, to modulate human stress response (Bittman, Berk, Shannon, Sharaf, Westengard, Guegler, & Ruff, 2005) and to improve reaction time in older adults (Khemthong, Pejarasangharn, Uptampohtiwat, & Khamya, 2012). Psychologically, it has been found to improve wellbeing (Creech, Hallam, Varvarigou, McQueen, & Gaunt, 2013), to preserve cognitive function (Bugos, Perlstein, McCrae, Brophy, & Bedenbaugh, 2007; Hanna-Pladdy & MacKay, 2011) and to reduce risks of dementia (Akbaraly et al., 2009; Verghese et al., 2003). Socially, authors have indicated that active music-making has led to increased social interactions (Skingley & Bungay, 2010) as well as strong senses of community belonging (Gembris, 2008) and social affirmation (Creech et al., 2013). Most of these findings have been reported in populations of older citizens. As

they may be more frequently confronted by illness, disease, and death (biological factor), may suffer from loneliness (social factor), or may become cognitively impaired over time (psychological factor), the Biopsychosocial model is especially relevant for this population.

As shown in Figure 2.13, stress reactivity is part of the Biopsychosocial model's biological factor. Chapter 1 identified that stress was not inherently negative, but when experienced with intensity over a prolonged period of time, it could have deleterious effects on health. Fortunately, the Biopsychosocial model illustrates that health is not only influenced by biological factors, but also by psychological factors or by social factors. This means that stress reactivity (biological factor) may be modulated by personality and coping skills (psychological factors), and/or by social support and education (social factors), for instance.

Conclusion

When investigating stress in musicians, it has been demonstrated that active music-making could have significant effects on stress levels, either by generating anxiety (MPA) or by soothing the body and mind.

It is interesting to note that in the field of performance anxiety, research in sports is quite advanced in comparison to music, especially regarding diagnosis (using self-reporting, observations, and physiological measures) and treatment. Books like *Competitive Anxiety in Sports* (Martens, Vealey, & Burton, 1990), *Foundations of Sport and Exercise Psychology* (Weinberg & Gould, 2007) and *Advances in Sport Psychology* (Horn, 2002) are good examples, demonstrating that the field of sports psychology is considerably developed and well-structured.

However, the fields of sports and music use models that are quite similar and very often based on elementary theories (e.g. the Yerkes-Dodson hypothesis). This is the case for Landers and Arent's (2001) inverted-U model in sports and for the conceptual framework of MPA in music (Papageorgi, Hallam, & Welch, 2007). It is worth noting that despite the fact that the Yerkes-Dodson Law has been disproved (Brown, 1965; Corbett, 2015), it is still used in the 21st century. This highlights the importance of

verifying the validity of basic theories by determining whether they have been empirically tested before developing new derivative frameworks.

Recently, new models and conceptual frameworks have been proposed that take into account the complexity of MPA combined with the latest advances in health research. Factors like arousal levels, environmental demands, and cognitive appraisal are still at the forefront, but concepts of adaptation and learned responses have also now been integrated. In her book *Psychology of Music Performance Anxiety*, Kenny (2011) identifies psychophysiological and neurochemical theories of anxiety and illustrates how these fields of research may deepen our current understanding of MPA. These theories, inspired by interdisciplinary research, illustrate the multidimensionality of stress and anxiety. In the coming years, we should expect to see more theories that draw from scientific fields (biology, physiology, neuroscience) to explain MPA, continuing the work Kenny and others began and applying the latest scientific findings to the field of music.

This chapter has provided an historical overview of the research on stress and MPA, starting at the beginning of 1900s and finishing in the 2010s, and has described a more general framework to explain musicians' health and wellbeing, the Biopsychosocial model. These theories illustrate the evolution of knowledge over time and attest to the current state of research. The next chapter presents a literature review, examining studies on MPA and active music-making.

Chapter 3

Review of the Literature

In the last decades, music performance has been investigated from multiple standpoints to determine its impact on musicians. The following chapter examines major research findings in the literature regarding music performance anxiety and the effect participating in musical activities has on novice musicians. The first section seeks to identify the exact nature of the relationship between MPA and gender, age, general anxiety, musical genre, years of training, level of expertise, performance settings, and instrument played. The second section reviews the literature on active music-making in community settings, with a special emphasis on older adults.

Music and Performance Anxiety

Gender. Research has examined the relationship between gender and MPA, and most authors seem to agree that women report significantly higher levels of performance anxiety than men (Brugués, 2011; Iusca & Dafinoiu, 2012; Khalsa, Shorter, Cope, Wyshak, & Sklar, 2009; Papageorgi, Hallam, & Welch, 2007; Wesner, Noyes, & Davis, 1990). This gender difference also applies in a variety of contexts, such as marching arts (e.g. marching bands, drum and bugle corps, percussion ensembles; Levy, Castille & Farley, 2011), professional orchestra players (Kenny, Driscoll, Ackermann, 2014), post-secondary music students (Çırakoğlu & Şentürk, 2013 ; Miller & Chesky, 2004 ; Widmer, Conway, Cohen, & Davies, 1997), and child/adolescent musicians (Kenny &

Osborne, 2006; Nusseck, Zander, & Spahn, 2015; Osborne & Kenny, 2005, 2008; Rae & McCambridge, 2004; Thomas & Nettelbeck, 2014).

On the other hand, in their study on anxiety, gender, and performance, Kubzansky and Stewart (1999) found that men and women reported similar levels of self-perceived MPA, even though external judges had identified female music students as appearing more anxious than male students. Barbar, Crippa, and Osório (2014) evaluated MPA in Brazilian musicians and did not find a significant difference in MPA based on gender, which is similar to Wolfe's (1989) survey on amateur and professional musicians.

Only three studies were found to support the idea that men may be more anxious than women. In her study on child musicians, Ryan (2004) revealed that boys displayed significantly more anxious behaviours than girls both before and during performances. Abel and Larkin (1991) found that men experienced higher systolic blood pressure increases than women before a performance in front of jury, although the latter had higher self-reported anxiety. Finally, Hamilton, Kella and Hamilton (1995) studied occupational stress in elite dancers and musicians and showed that men from this group seemed less able to cope effectively than men from the general population. Although this study compared male performers with male non-performers (rather than comparing men and women elite performers), it is worth pointing out that "in comparison with the norm, the male performers were less adjusted and experienced greater mood fluctuations and physical illness" (p.86).

In summary, while the literature is ambivalent regarding the effect of gender on MPA, the majority of studies identified here suggest that women seem to be more affected by MPA than men. Kenny (2006) states that female musicians are two to three times more likely to report MPA compared to their male counterparts. Fishbein and Middlestadt (1988) also mention that in professional orchestras, more women tend to describe MPA as a severe problem (19% women vs. 14% men). Interestingly, Liston, Frog, and Mohr (2003) investigated predictors of MPA and indicated that catastrophization seemed to better predict performance anxiety than characteristics like gender, perfectionism, or trait anxiety. This would need to be investigated further before any conclusions could be drawn. While researchers are starting to address the relationship between gender and performance anxiety (e.g. Yondem, 2007), note that

none of the studies reported above included a category for "other" gender. Including this gender option would allow to further understand how MPA varies with gender and identity.

Age. As with gender, mixed results are reported in the literature regarding the relationship between MPA and age, although there seems to be a trend in which younger musicians have higher MPA than older musicians. In their study on the psychological wellbeing of musicians performing in professional orchestras, Kenny and colleagues (2014) found that musicians under the age of 30 were significantly more affected by MPA than musicians over the age of 50. These results are in keeping with those of Ackerman, Kenny, O'Brien, and Driscoll (2014) as well as Wolfe (1989). Fishbein and Middlestadt (1988) conducted a survey on the prevalence of MPA based on the age of professional orchestra musicians and reported that 19% of instrumentalists aged between 35 and 45 years old had severe stage fright, as opposed to 11% of instrumentalists over 45 years old and 17% under 35 years of age.

Boucher and Ryan (2011) investigated MPA in three- and four-year old children and determined that very young musicians also reported performance anxiety, which led them to conclude that MPA is a phenomenon that may have both innate and developed aspects. Boucher (2008) also specifies that MPA may already be deep-rooted by the age of eight. Nusseck and colleagues (2015) studied teenage musicians and found a distinction between classical musicians and popular musicians. As illustrated in Figure 3.1, young popular musicians showed an increase in MPA with age, whereas classical musicians were more prone to high levels of anxiety between the ages of 7 and 16 years old and displayed less MPA later on. No significant difference was found between classical and popular musicians aged between 12 and 16 years old. Sâberscu and Dorgo (2014) reported similar findings for classical musicians, indicating that younger adolescent musicians tended to suffer from high MPA.

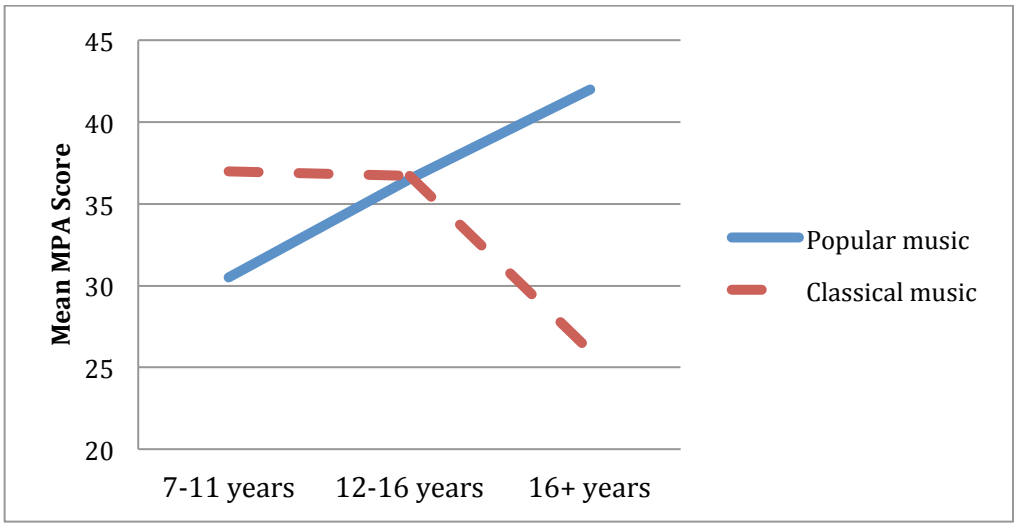

Figure 3.1. Trends in MPA among teenagers playing classical music and popular music, as revealed in a study conducted by Nusseck et al. (2015). Among classical performers, MPA decreases with age whereas among popular performers, it increases. Levels of MPA are similar between classical and popular musicians between 12 and 16 years old.

When examining articles in which no relationship is reported between MPA and age, methodological issues must be acknowledged. For instance, Wesner and colleagues (1990) argue that age does not affect levels of MPA, but provide no statistical analysis to support this claim or establish a clear distinction between MPA levels based on age groups. In addition, their sample includes people between the ages of 17 and 67, but with a mean age of 28 (±10) and a median age of 26, suggesting a group on the younger side of the spectrum. Thus there may not have been enough people studied in each age group to ensure an adequate representation to obtain statistically significant results. Zakaria, Musib, and Shariff (2013) also argued that MPA was independent of the age of the musicians. However, they only studied a cohort of university music students, which limits their findings' significance.

In summary, the literature seems to indicate that a relationship between age and MPA exists, at least to some extent, although other factors may also influence MPA levels in individual musicians. As Nagel (1993) explained: "These issues [of performance anxiety], to some degree, indiscriminately accompany both young and mature musicians, talented and less gifted performers when they cross the physical or symbolic threshold that separates backstage from center stage" (p. 494). This means that even if older adults are recognized as having less MPA than younger musicians, that does

not prevent certain musicians, regardless of their age, from suffering greatly from debilitating anxiety in performance contexts.

General anxiety. Spielberger (1966, 1972) theorizes that general anxiety is composed of trait anxiety (i.e. the propensity to be anxious in daily life) and state anxiety (i.e. the situational anxiety triggered by specific events or circumstances). More specifically, he explains that:

> Trait anxiety (T-Anxiety) refers to relatively stable individual differences in anxiety-proneness, that is, to differences between people in the tendency to perceive stressful situation as dangerous or threatening and to respond to such situations with elevations in the intensity of their state anxiety (S-Anxiety) reactions. […] The stronger the anxiety trait, the more probable that the individual will experience more intense elevations in S-Anxiety in a threatening situation. (Spielberger, 1983, p.9)

Regarding the phenomenon of performance anxiety, multiple authors have confirmed that trait anxiety was a predictor of MPA, including Kenny and Osborne (2006; Osborne & Kenny, 2008), Papageorgi and colleagues (2007), Esplen and Hodnet (1999), Wolfe (1990), and Lehrer, Goldman, and Strommen (1990).

Papageorgi, Creech, and Welch (2013) published a study in which they surveyed 244 classical and non-classical musicians. They concluded that performance experience and trait anxiety mediated MPA. Among adolescent musicians, Thomas and Nettelbeck (2014) also reported a significantly positive correlation between MPA and trait anxiety.

Some authors have also established a relationship between MPA and social anxiety[1] (Kenny, 2011; Nicholson, Cody, & Beck, 2015). Indeed, Nicholson and colleagues (2015) examined 130 professional musicians and found that social anxiety predicted MPA and was also significantly associated with performance settings. This means that social situations where musicians are highly exposed (e.g. solo context) generate more MPA than situations involving less exposure (e.g. practice context).

Only two studies were identified in which the relationship between trait anxiety and MPA was questioned. Stephenson and Quarrier (2005) focused on the link between MPA and anxiety sensitivity, a concept that refers to "the tendency of the individual to be aware of or frightened by particular bodily sensations or experiences", and that "describes individual differences in the likelihood of experiencing fear in reaction to

[1] A complete definition of social anxiety is provided in Chapter 1 (pp.3-4) and includes a specific criteria related to performance anxiety (Table 1.2).

symptoms of arousal" (p.120). The authors established that anxiety sensitivity was a better predictor of MPA than trait anxiety among college music students. According to Kenny (2011), anxiety sensitivity and trait anxiety are two different constructs. While trait anxiety is known to predict "a general proneness to respond anxiously to threatening stimuli", anxiety sensitivity refers to a "proneness that is specific to the experience of the symptoms of anxiety (not the anxiety-producing stimuli per se)" (Kenny, 2011, p.24). These definitions illustrate that these constructs are not mutually exclusive; a musician can have high trait anxiety while also experiencing heightened anxiety sensitivity. Therefore, these findings must be interpreted with caution.

The second study, published by Wan and Huon (2005), looked at the attentional processes responsible for performance degradation among 72 novice musicians having to perform a piano task under pressure and reported no evidence that a relationship existed between trait anxiety and the effect of pressure on performance. This lack of significance may be due to the fact that they studied non-musicians who were trained for the sole purpose of the study. This study would need to be replicated with a sample of more experienced musicians.

In summary, studies published so far regarding the relationship between anxiety and MPA tend to provide conclusive evidence that trait anxiety and social anxiety are predictors of MPA.

Musical genres. Before 2010, very few studies examined the difference in MPA between people specialized in classical vs. popular music. A few studies explored the personalities of classical and non-classical musicians in the 1980s, but always in the context of comparing them to normative samples. For instance, Kemp (1981) established that classical musicians reported anxiety levels that were above average when compared to the general population and that levels of neuroticism were directly correlated with MPA. Wills and Cooper (1987) showed similar findings when comparing non-classical musicians (which included jazz, rock, pop and commercial music performers) to norms. Dyce and O'Connor (1994) studied popular musicians and concluded that they were "more arrogant, dominant, extraverted, open to experience and neurotic than university males" (p. 168). However, none of these studies examined whether classical and non-classical musicians differ from one another in terms of personality traits and MPA levels.

According to Raeburn (1987a, 1987b), a career in music may create conflicts between career roles and social roles, which may generate lots of stress for performers. In their studies on job-related stressors, Raeburn (1987b), who examined rock performers, and Vervainioti and Alexopoulos (2015), who studied classical performers, both concluded that musicians were confronted to a variety of stress. Table 3.1 summarizes the job-related stressors identified in Raeburn's (1987b) and Vervainioti and Alexopoulos' (2015) studies, which highlights differences and similarities between performing styles. It is worth noting that while some of these stressors are similar, for instance MPA and job insecurity, this does not mean that classical and rock musicians experience them to the same extent.

Table 3.1

Job-related Stressors Based on Style of Music Performed

Classical musicians	**Rock Musicians**
• Public exposure (stage fright, MPA) • Personal hazards (artistic integrity, perfectionism, colleagues interaction, career satisfaction) • Job context (job insecurity, financial insecurity, touring, environmental factors, equipment) • Repertoire (task difficulty, errors, technique problems) • Competition • Injury/illness (musculoskeletal, neurological, dermatoses) • Criticism (self-criticism, supervising)	• Performance anxiety and pressure • Career development stress associated with lack of recognition from the music industry • Chronic job insecurity • Conflicts between career role and other social roles (e.g., spouse or parent) • Lack of financial support and resources

Adapted from Vervainioti & Alexopoulos (2015, p.199) and Raeburn (1987b, p.77)

There is now increasing evidence to support the idea that musicians do not experience MPA in the same way depending on the musical genre they belong to. Papageorgi and colleagues (2013) found that musicians specializing in Western classical music reported higher levels of MPA than musicians specializing in jazz, popular or Scottish traditional music. Surprisingly, Nusseck and colleagues (2015) observed different trends with regards to the development of MPA in teenagers (Figure 3.1), with young classical musicians between 16 and 20 years old having significantly less anxiety

than popular musicians of the same age group. We are left to wonder when these trends reverse. One hypothesis may be that classical musicians begin to suffer from MPA more than popular musicians when they begin their university music training, as Papageorgi and colleagues' (2013) findings seem to suggest. Leblanc (1994) posits that

> People do not seem to be equally vulnerable to performance anxiety at all points along the age continuum. [He] believe[s] that the problem becomes greater as the performer enters adolescence, and for many people performance anxiety continues to be a problem for the rest of their lives. (p.62)

Perdomo-Guevara (2014) explored performance-related emotions in 625 musicians from classical and non-classical backgrounds and showed that "classical performers reported significantly fewer positive, and more negative, performance-related emotions than their counterparts" (p.66). In addition, non-classical musicians were found to be more people-oriented and less self-oriented than classical musicians, which led the author to argue that different kinds of concerns were emphasized by performers depending on their cultural milieus. She concluded that these concerns might influence levels of MPA in musicians.

In summary, research interest in musical genres and MPA has only arisen recently, and results are inconsistent. Many questions remain unanswered and further research is warranted before an understanding of the relationship between musicians' areas of expertise and performance anxiety can be reached.

Years of training. Most authors agree that years of training are not directly associated with MPA (Esplen & Hodnet, 1999; Kubzansky & Stewart, 1999; Reitman, 2001; Zakaria et al., 2013). Some authors, such as Reitman (2001), studied the effect of years spent playing, whereas others investigated years of formal music studies (Zakaria et al., 2013). None of them found evidence that these affected MPA levels. Years of training and years of practice are not synonymous, but in these cases, the findings have led to similar conclusions.

Some issues must be acknowledged in order to better understand the effect (or lack thereof) of years of training on MPA. First of all, one may wonder whether hours of practice influence MPA, and in this case, results are mixed. Kubzansky and Stewart (1999) examined the relationship between MPA and performance quality in the context of auditions and determined that hours of practice, as well as years of training, were not

associated with anxiety and performance quality as assessed through expert ratings and musicians' self-evaluations. On the other hand, Biasutti and Concina (2014) recently showed that, among other factors, how many hours a musician practiced per week was a predictor of MPA. They explain that "the less musicians practice, the higher [MPA levels] they report" (p.199). However, it is worth pointing out that these groups of authors only studied populations of university music students, who tend to perform more often in evaluative contexts than other musicians (both young and old). These mixed results do not provide any indication of the impact that years of training may have on MPA in other populations of musicians.

Second, one may ask whether other parameters, such as personality traits, might not be stronger predictors of MPA than how many years of training a musician has undergone. Interestingly, Sadler and Miller (2010) showed that the interaction between MPA and personality disposition was mediated by years of formal training in undergraduate music students. This interaction revealed that "individuals' trait predisposition to performance anxiety was associated with less performance anxiety with increased years of study, presumably as instrumental or vocal technical proficiency increased" (p.285). According to Ryan and Andrews (2009), musicians with university music training reported episodes of MPA less frequently than those without. Despite being less frequent though, MPA was not reported to be less severe.

Schneider and Chesky (2011) investigated the relationship between MPA and self-perceived levels of social support among college music students. They found a significant correlation between MPA and low social support from significant others. They also specified that MPA was less frequent and had less impact on ability to perform in students with high social support than in students reporting low levels of social support.

In summary, few studies have been published on the effect of years of training on MPA. Most research tends to focus on students who are currently undergoing some form of music training. However, it is as yet unclear whether years of training may have an impact on musicians after their academic training has ended. For instance, there is no evidence that adult musicians who have been formally trained (in music institutions such as music schools, conservatories, colleges, or universities) experience MPA differently

than informally trained musicians (who learned by themselves, without private teachers). Because of this lack of research, findings reported in this section must be interpreted with caution.

Level of expertise. People may study music for many years without necessarily ever becoming (or wanting to become) professional musicians. Because of that, it is worth looking at the relationship between MPA and level of expertise. While the literature has yet to provide concrete evidence and remains ambiguous in this regard, some authors have found that music students have significantly higher levels of MPA than professional musicians (Biasutti & Concina, 2014; Steptoe & Fidler, 1987) and that the latter report more MPA than amateur musicians (Barbar et al., 2014).

While a number of authors have found no evidence of a relationship between expertise and MPA (Brugués, 2011; Esplen & Hodnet, 1999; Zakaria et al., 2013), a few have discovered mediating effects. For instance, Papageorgi and colleagues (2013) found that musicians' performance experience was a factor mediating the impact of anxiety on performance. On the other hand, Iusca and Dafinoiu (2012) showed that among undergraduate students, the relationship between MPA and musical level was offset by the performer's gender and chosen musical instrument.

As suggested by Rae and McCambridge (2004) and by Esplen and Hodnet (1999), MPA may not wear off with the passage of time for certain musicians, and they will continue to have high levels of MPA throughout their lives, regardless of their previous training and current experience. In addition, while no relationship exists between professional experience and MPA according to Brugués (2011, p.102), "students affected by MPA may decide not to become professional musicians because of their inability to cope with the devastating effects of performance anxiety". All these factors may contribute to explaining the ambiguity of the findings reported in the literature.

Performance settings. There is clear evidence that the type of performance influences levels of MPA and authors agree that MPA is higher in contexts of evaluation and solo performances. Studer and colleagues investigated MPA in relation to hyperventilation (2012) and psychophysiological response (2014) in over 65 performing music students under two conditions; private and public (the latter including an audience with a jury). In both studies, they confirmed that MPA was heightened in the public

context compared to the private condition. These findings are in keeping with those of Brotons (1994) and Yoshie, Kudo, and Ohtsuki (2009b) who also compared evaluative performance and rehearsal settings. Su, Luh, Chen, Lin, Liao, and Chen (2010) investigated the impact of relaxation breathing training on children's MPA before a music examination (solo jury) and found that despite the intervention, anxiety increased, reaching a peak about 30 minutes prior the performance. However, these authors did not compare MPA levels against other performance settings, such as group rehearsal or practice conditions.

A number of researchers specifically studied differences in levels of MPA between solo and group performances. Not surprisingly, Papageorgi and colleagues (2013) showed that solo performances generated significantly more MPA than group performances, a finding supported by Ryan and Andrews (2009), who added that within the context of group performances, instrumental ensembles induced more anxiety than choral ensembles. Fishbein and Middlestadt (1988) completed a national survey investigating 2212 classical musicians from 48 orchestras nationally and found that musicians in small orchestras were more likely to report severe MPA than musicians in large orchestras (17% versus 14%). Several authors have included a rehearsal/practice condition in their analysis and confirmed that MPA was highest for solo performances, followed by group performances, and was lowest in rehearsal/practice conditions (Nicholson et al., 2015; Cox & Kenardy, 1993; Miller & Chesky, 2004).

In summary, there seems to be an agreement among authors that solo performances are more stressful than group performances, which are in turn more stressful than practice or rehearsal conditions. Evaluative settings are also acknowledged to induce MPA, as indicated in Figure 3.2.

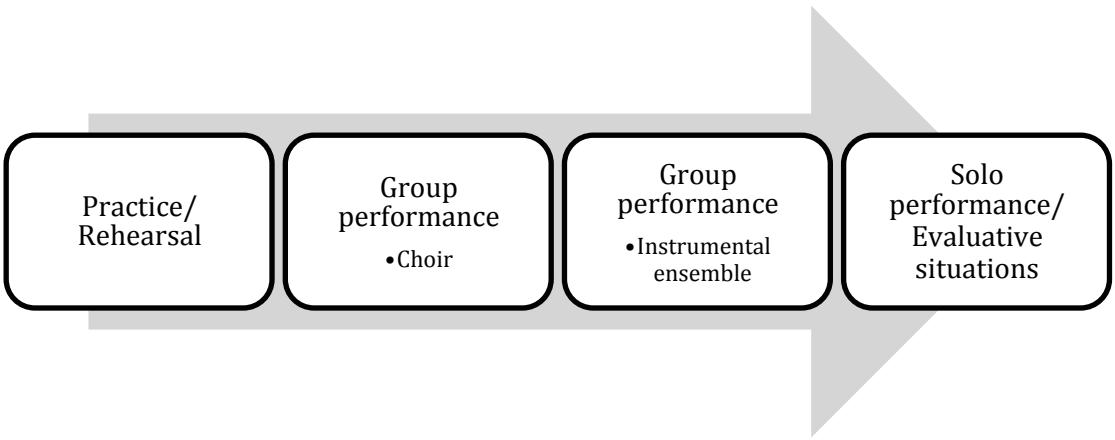

Figure 3.2. Performance settings, from the least to the most stressful conditions.

Instrument. In their extensive study on orchestral musicians, Fishbein and Middlestadt (1988) compared MPA levels in different instrument groups and found that 22% of brass players, 14% of string players, 14% of woodwind players, and 17% of other instrument players (e.g. percussion, keyboard, harp) mentioned having severe anxiety. As indicated earlier, Iusca and Dafinoiu (2012) also showed that MPA levels differed depending on instrument played. However, contrary to Fishbein and Middlestadt's results, they found that string performers and vocalists reported significantly higher MPA levels than pianists, woodwind and brass players.

Studies published over a decade ago about pop and rock musicians also argue that these musicians' instrument choices had no significant impact on their MPA levels (Dyce & O'Connor, 1994; Gillespie & Myors, 2000). Regarding marching artists (including musicians from marching bands, drum and bugle corps, indoor color guard, and percussion ensembles), Levy and colleagues (2011) established that color guard performers experienced significantly more somatic symptoms of MPA than brass performers.

In summary, MPA seems to affect musicians differently based on their choice of instrument, but this relationship is still poorly understood and results are inconsistent. More studies are needed to determine which groups of instrumentalists suffer from higher MPA and why they seem significantly more affected than others.

Music in Community Settings

Research on the effect of music on health has been done in both clinical and community settings. The following section focuses primarily on studies conducted among community-dwelling older adults and findings associated with illness and survival, mental health (depression and anxiety), physical health (respiratory function and blood pressure), and quality of life.

Music, illness, and survival. There is now compelling evidence that demonstrates how musical activities may reduce the risk of dementia in older adults (Davis, Gfeller, & Thaut, 2008; Verghese et al., 2003). Akbaraly and colleagues (2009) showed that practicing cognitively stimulating leisure activities delayed the onset of dementia in people living at home. More specifically, they reported that:

> Persons engaging in stimulating activities at least twice a week (doing a crossword puzzle or playing cards, attending organizations, going to the cinema/theater, and practicing an artistic activity) had a 50% reduced risk of developing dementia over the 4-year follow-up compared to persons who engaged in such activities less than once per week 1) independently of education level, occupational attainment, and cognitive functioning of participants at inclusion; 2) after adjusting for vascular risk factors, depressive symptoms, and physical functioning; and 3) independently of other leisure activities. (Akbaraly et al., 2009, p.858)

Research on music training's effects on the brain also showed several benefits in older adults, including improvements in visual and auditory reaction times (Khempthong, Pejarasangharn, Uptampohtiwat, & Khamya, 2012) as well as in memory, planning, concentration, and strategy maintenance (Bugos, Perlstein, McCrae, Brophy, & Bedenbaugh, 2007). Among stroke survivors in community settings, Jeong and Kim (2007) found that using music and movement in the context of a rehabilitation program resulted in increased range of motion, flexibility and social interactions, in addition to improved moods. Furthermore, authors have reported that music-making had a positive impact on patients' immune systems and helped to reduce pain (Creech, Hallam, Varvarigou, & McQueen, 2014). Singing in a choir has also been shown to improve self-perceived physical health, morale, and loneliness, and to decrease number of visits to the doctor, amount of medication used, and instances of falls (Cohen, Perlstein, Chapline, Kelly, Firth & Simmens, 2006).

Bygren, Konlaan, and Johansson (1996) studied how attending cultural events,

reading, and making music or singing in a choir could be determinants of survival in a population of over 12,000 individuals between 16 and 74 years old. The authors found that "people attending cultural events often had a better chance of survival than those attending rarely" (p.1580). However, this study has been criticised for methodological issues due to a lack of information regarding the music intervention (especially the nature and extent of participants' involvement in the activities) and the measurements used to evaluate health outcomes (survival rate) at the end of the study (Clift, Hancox, Staricoff & Whitmore, 2008).

This brief overview of research on illness and survival shows that music-making has a significant impact on seniors' lives and may be effective in promoting healthy aging among community-dwelling individuals.

Music, depression, and anxiety. According to Nemeroff and Owens (2002), depression is one of the leading causes of disability and mortality after heart disease. Women are more subject to depression than men, with rates 1.5 to 3 times higher in the female population compared to the male population (DSM-V, APA, 2013). In fact, the lifetime risk of depression is 20% to 25% in women compared to 7% to 12% in men in the United States (Garcia & Petrovich, 2011). Kessler and colleagues (2003) specify that in the United States, the 12-month prevalence of major depressive disorder is 6.6% and the lifetime prevalence is 16.2%. Regarding anxiety, the lifetime risk of generalized anxiety disorder is 9% and women are twice as likely as men to suffer from this disorder (DSM-V, APA, 2013).

Very few studies have been conducted to examine the links between music, depression and anxiety among older adults living in the community, but those that have provided evidence that a significant relationship might exist. For instance, music has been shown to counter depressive moods in older adults (Chan, Wong, Onishi, & Thayala, 2011) and in women recovering from depression (Fullagar, 2008). Clift and Morrison (2011) found that participating in choirs improved mental wellbeing for people suffering from mental illness as demonstrated by participants' reports of emotional and social benefits. Moreover, Eyre (2011) showed that among people suffering from a chronic psychiatric illness, choral singing had several positive effects, including mood alteration, emotional expression and coping with stress. Another study on group singing

(Unwin, Kenny, & Davis, 2002) showed that people between 55 and 65 years of age experienced a significant positive change in mood after a short session of either singing or listening to singing. Chan, Chan, Mok and Tse (2009) completed a randomized controlled study with 47 older adults living at home and found significant reductions in depression scores after a one-month intervention consisting of one 30-minute session of music listening per week. Bittman and colleagues (2005) investigated recreational music-making's effectiveness in significantly reducing stress response following a 1-hour protocol of stress induction in 32 adults aged from 18 to 76 years old, and discovered a marked difference in the intervention group compared to a resting control group.

While research is scarce regarding mental health issues and music in community settings, it is much more substantial when the focus is on quality of life. Studies that show evidence of benefits beyond those reported for anxiety and depression will be further explored in the section on music and quality of life.

Music, respiratory function, and blood pressure. Music has been known historically for its calming and anxiolytic properties (Peters, 2000; Finlay & Anil, 2016). This section presents findings about the effects of music interventions on respiratory function and blood pressure (BP), both of which may be directly influenced by stress levels (Chapter 1). As shown by the mixed results in the literature, it is difficult to find conclusive evidence on music's effect on these two parameters.

Respiratory function. A number of studies have been published regarding music's effect on respiratory function. Research has examined (a) the use of singing interventions to help individuals suffering from Chronic Obstructive Pulmonary Disease (COPD), (b) the effect of playing wind instruments on the pulmonary function of advanced musicians, and finally (c) the impact of music-making on breath management. These three topics will be discussed in this section.

Music and COPD. Five studies have investigated the outcomes of group singing among older adults with COPD. Three of them were randomized controlled trials (Bonilha, Onofre, Vieira, Prado, & Martinez, 2009; Lord et al. 2010; Lord et al., 2012)—this is considered a robust design for experiments—and two were exploratory studies (Engen, 2005; Pacheco, Costa, Amado, & Almeida, 2014).

Of the three randomized controlled studies, only Bonilha and colleagues (2009) found a significant change as indicated by a small improvement in maximal expiratory pressure in the experimental group and a deterioration in the control group. Lord and colleagues (2010, 2012) published two studies that examined respiratory control: In the first study, they assessed the effect of singing by measuring single breath counting[2] and breath hold time. While participants reported a self-perceived physical difference following the intervention, no significant change was found on these breath control measures between the singing group and the control group who received standard care (Lord et al. 2010). In the second study, they used the same protocol, but compared the singing group to a film group to control for social isolation, a potential bias in their prior study. In keeping with the first study, no significant difference was found with regards to breath control, although improvements in self-perceived physical wellbeing were reported (Lord et al, 2012). It is important to note that measures of respiratory function (FEV_1) were only used to describe participants' baseline characteristics and were not included in the variables being studied.

Regarding the two exploratory studies, Engen (2005) conducted a research project on group singing for elderly adults with emphysema and found significant differences in breath control (single breath counting) and breath support (intensity of speech) over time, but none in respiratory function (FEV and inspiratory threshold). She specified that "the breathing mode of subjects showed a clear shift from predominantly clavicular to 100% diaphragmatic that was maintained in all but one subject two weeks after the treatment sessions ended" (Engen, 2005, p.37).

Pacheco and colleagues (2014) studied four subjects with COPD who took weekly group singing lessons for 10 weeks and indicated that three of them improved their maximal expiratory pressure while one deteriorated, experiencing an exacerbation of COPD symptoms. FEV_1 had improved for one participant at the end of the program, remained the same for two participants, and worsened for one. No other differences were observed in terms of residual volume and total lung capacity.

[2] Single breath counting consisted of breathing in and then counting out loud in time with a metronome running at 60 beats/min.

Wind instrument and pulmonary function. Research on the effect of playing a wind instrument on lung function is not conclusive. Dhule, Sunita, and Gawali (2013) found that wind instrumentalists had higher lung function than a control group, but they studied only young men in their twenties and provided very little information regarding the methodology and type of statistical analysis undertaken, so results should be interpreted with caution. Deniz, Savci, Tozkoparan, Ince, Ucar, and Ciftci (2006) also used a sample of young men but reported the opposite effect: pulmonary function was significantly diminished in wind players compared to control subjects. They hypothesized that this reduced lung function was due to constant barotraumas or the development of asthma because of the strenuous respiratory maneuvers required to play a wind instrument over the years. Fuhrmann, Franklin, and Hall (2011) completed a robust study on the respiratory function of musicians between 18 and 60 years old. They compared 55 wind musicians with at least two years of experience (including singers) to a control group made up of 47 string players, percussionists and non-musicians. No consistent evidence was found that respiratory function was altered in wind instrumentalists. Given the lack of consensus among researchers, it is impossible to determine at this point whether playing a wind instrument may be beneficial, deleterious or neither for musicians, especially novices.

Music-making and breath control. Only one study has investigated the impact of playing wind instruments on older amateur musicians, and while self-perceived increases in breath capacity were reported by 35% of band members after joining the ensemble, "no statistically significant difference between the mean pulmonary function scores were found before and after rehearsal" (Rohwer, 2009, p.10). Schorr-Lesnick, Teirstein, Brown, and Miller (1985) have analyzed this disparity between individuals' perceptions and physiological measurements of respiratory function in the past and concluded that improved pulmonary function in singers and wind instrumentalists was a "myth". On the other hand, they acknowledged that musicians and vocalists might have an increased awareness of breath control, which is consistent with Clift and Hancox's (2001) findings about the perceived benefits of singing as well as with those of Smith, Kreisman, Colacone, Fox, and Wolkove (1990) about respiratory pressure quantitation and lung volume control in wind instrumentalists. These results seem to indicate that, although

there is no conclusive evidence to support the claim that playing music improves pulmonary function, musicians may have better "respiratory perception" and more precise "ventilatory neuromuscular control" than the general population (Smith et al., 1990, p. 2380).

Blood pressure. It is theoretically acknowledged that music has the power to influence blood pressure (Hays, Bright, & Minichiello, 2002; Lai & Good, 2006). Qualitative inquiries have also provided a few anecdotal testimonies about the effect of music on musicians' individual BP (Lally, 2009). In addition, multiple studies have been done in clinical settings (for instance on cardiovascular units, in pre- and post-natal care, and during medical procedures and surgery) and have shown music listening to have a significant effect on BP (Staricoff, 2004). However, almost no studies have empirically tested whether active music-making affects older adults' blood pressure levels.

One of the most robust findings regarding music and BP comes from Konlaan, Björby, Bygren, Weissglas, Karlsson and Widmark (2000), who completed a randomized controlled study on the biomedico-social effects of attending cultural events (such as movies, concerts, theatre performances and art exhibitions). They found significant reductions in diastolic BP in eight out of the nine participants engaged in cultural activities after the 2-month experiment. However, no difference was shown in systolic BP. Systolic and diastolic BP remained stable in the groups not engaged in cultural activities. Chan and colleagues (2009) reported a significant drop in BP after a music listening intervention among community-based elderly adults. In clinical settings, Singh, Rao, Prem, Sahoo, and Keshav Pai (2009) did a randomized control pilot study in which they investigated the effect of self-selected music among 72 hospitalized subjects with chronic obstructive pulmonary disease. They found that the music group displayed statistically significant changes in systolic BP across two 30-min sessions that occurred on the same day. However, no change was reported in diastolic BP.

It is worth noting that all these studies focused on music listening rather than music-making interventions. The only study examining the effect of participatory music on BP was conducted by Valentine and Evans (2001). They compared the effects of solo singing, choir singing, and swimming on the mood and physiological indices of

university students. While they found significant differences in almost all variables in the three groups, no changes were observed in BP.

It is important to acknowledge the interrelations between music-making, respiration, and blood pressure. Music has been found to generate physiological reactions such as "regularizing or irregularizing [the] heartbeat, relaxing or jarring the nerves, affecting the blood pressure, the digestion and the rate of respiration" (Tame, 1984, p.14). A relationship has also been established between breathing and blood pressure. In fact, Grossman, Grossman, Schein, Zimlichman, and Gavish (2001) have shown that respiratory exercises help reduce BP. Singing and playing an instrument, which use similar breathing patterns (Engen 2005), may be considered pleasant forms of respiratory exercise (Bonhilla et al., 2009). These arguments suggest that music may be a powerful tool to influence breath control and blood pressure, though this claim needs further assessment.

Music and quality of life. The World Health Organization defines Quality of Life (QoL) as the "individuals' perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns" (WHOQOL Group, 1998, p.551). Four domains are taken into account when evaluating QoL: physical health, psychological health, social relationships and environment. Considering that these domains relate to biological, psychological, and social/environmental factors, they may be associated with Engel's Biopsychosocial model (1980), described in Chapter 2.

In keeping with the Biopsychosocial model and the World Health Organization's definition of QoL, some extensive research projects have been conducted in the UK to investigate the physical, psychological, and social effects of playing music and/or singing (Clift et al., 2008; Clift, Hancox, Morrison, Hess, Kreutz & Stewart, 2010; Creech et al., 2014). According to the participants' testimonies and questionnaire analyses shared in these reports, music-making substantially enhances older adults' QoL.

Creech, Hallam, McQueen, and Varvarigou (2013a) found that older adults participating in musical activities had significantly higher QoL than those not involved in music. Varvarigou, Hallam, Creech & McQueen (2012) used qualitative analysis and demonstrated that being actively engaged in musical endeavours improved QoL with

cognitive, social, emotional and physical benefits. Interestingly, Rohwer and Coffman (2006) also indicated that engagement in activities (musical or not) was an important factor contributing to QoL. In fact, the authors specified that, while "band and non-band participants indicated similarly high perceptions of quality of life" (p. 25), the only statistically significant difference was associated with leisure activity level (high activity subjects reporting better quality of life than low activity subjects).

Over the years, many studies have examined the impact of music on older adults' QoL. Multiple benefits have been identified in the literature, aligned with the domains proposed by the World Health Organization and the Biopsychosocial model. The following subsections synthesize the positive outcomes related to physiological, psychological, and social/environmental factors. An exhaustive list of publications demonstrating these positive outcomes is provided in Appendix 3.

Physiological health. Health-related benefits identified by older adults following their participation in musical activities include pain management (Creech et al., 2014; Finlay & Anil, 2016), breath control and support (Clift & Hancox, 2001; Davis et al., 2008), physical wellbeing (Clift et al., 2008; Coffman, 2008; Lord et al., 2010; Li & Southcott, 2012), reduction of arthritic discomfort (Zelazny, 2001), increased immune system efficacy (Creech et al., 2014; North, Hargreaves, & Tarrant; 2002), and improved physical health (Bungay & Skingley, 2008; Skingley & Bungay, 2010), reaction times (Khemptong et al., 2012), flexibility, and range of motion (Jeong & Kim, 2007; Zelazny, 2001). Physiological benefits are summarized in Figure 3.3.

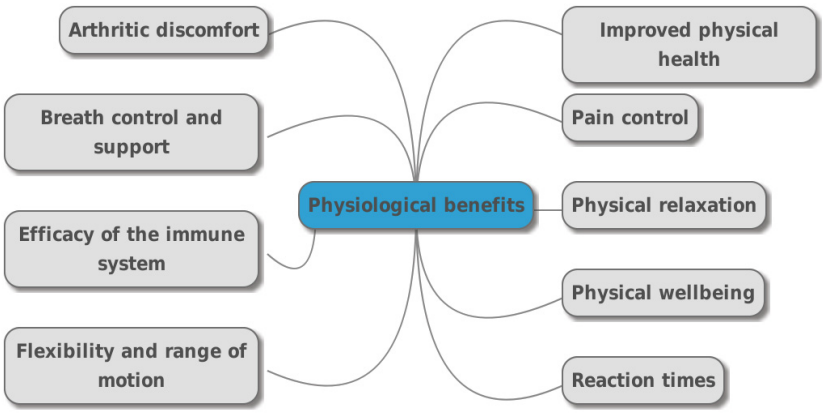

Figure 3.3. Synthesis of findings regarding the physiological benefits of music-making for older adults.

Psychological health. Benefits associated with psychological health are abundant. Cognitively, improvements have been reported in concentration (Bugos et al., 2007; Bungay & Skingley, 2008; Clift et al., 2008) and memory (Bungay & Skingley, 2008; Bugos et al., 2007; Clift et al., 2008; Dabback & Smith, 2012; Hanna-Plady & MacKay, 2011; Moser, 2003; Skingley & Bungay; 2010). In addition, effects have been observed in cognitive stimulation (Clift et al. 2008; Clift & Hancox, 2001; Coffman, 2008; Creech et al., 2013a; Skingley & Bungay, 2010), learning (Bruhn, 2002; Clift et al., 2008; Davis et al., 2008; Skingley & Bungay, 2010; Solé, Mercadal-Brotons, Gallego, & Riera, 2010;Veblen & Olsson, 2002), skills development (Creech et al., 2013a; Gembris, 2008; Varvarigou et al., 2011), sense of competency, and self-confidence (Dabback, 2006; Hays & Minichiello, 2005; Lord et al., 2010).

Emotionally, older adults have indicated positive effects on their mental health in the form of better morale or mood (Clift et al., 2008; Clift & Hancox, 2001; Cohen et al., 2006; Eyre, 2011; Jeong & Kim, 2007; Skingley & Bungay, 2010), self-esteem (Clift et al., 2008; Creech et al., 2013b; Hays & Minichiello, 2005) and subjective wellbeing (Bungay & Skingley, 2008; Clift & Morrison, 2011; Clift et al., 2008; Clift & Hancox, 2001; Coffman, 2008; Coffman & Adamek, 1999; Creech et al., 2013a & 2013b; Lord et al., 2010; Perkins & Williamon, 2014; Skingley & Bungay, 2010; Li & Southcott, 2012;Varvarigou et al., 2011). Researchers have also found that music-making helps elderly adults cope with stress (Clift et al., 2008; Clift & Hancox, 2001; Dabback & Smith, 2012; Eyre, 2011), construct a new identity in later life (Bruhn, 2002; Creech et al., 2013b; Dabback, 2008; Hays & Minichiello, 2005), and develop a sense of purpose (Clift et al., 2008; Creech et al., 2013a & 2013b; Southcott, 2009) and accomplishment (Coffman & Adamek, 1999; Lord et al., 2010; Perkins & Williamon, 2014). Singing or playing an instrument has also been found to encourage self-expression (Aigen, 2012; Eyre, 2011; Gembris, 2008; Varvarigou et al., 2013; Veblen & Olsson, 2002), personal growth/spirituality (Clift & Hancox, 2001; Hays & Minichiello, 2005; Southcott, 2009), and autonomy (Creech et al., 2013a & 2013b; Dabback, 2006; Hays & Minichiello, 2005), in addition to being a source of overall enjoyment for seniors (Bungay & Skingley, 2008; Clift et al., 2008; Gembris, 2008; Perkins & Williamon, 2014; Skingley &

Bungay, 2010; Varvarigou, Creech, Hallam, & McQueen, 2011). All these psychological benefits are synthesized in Figure 3.4.

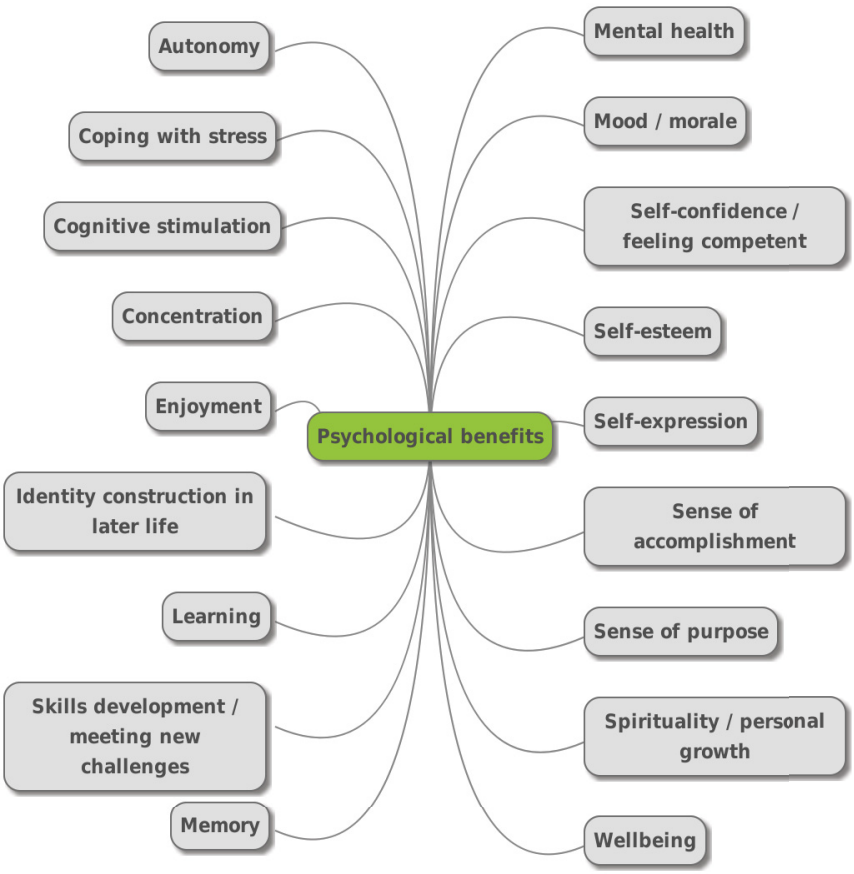

Figure 3.4. Synthesis of findings regarding the psychological benefits of music-making for older adults.

Social relationships and environment. Music-making is a social activity that has been shown to encourage collaborations (Varvarigou et al., 2011), interactions (Bungay & Skingley, 2008; Coffman & Adamek, 1999; Gembris, 2008; Jeong & Kim, 2007; Perkins & Williamon, 2014; Skingley & Bungay, 2010; Varvarigou et al., 2013), connections with others, and social network building (Bungay & Skingley, 2008; Clift & Hancox, 2001; Coffman, 2008; Hays & Minichiello, 2005; Solé et al., 2010; Southcott, 2009; Varvarigou et al., 2011). These positive outcomes help reduce loneliness (Cohen et al., 2006; Dabback & Smith, 2012; Davis et al., 2008; Hays & Minichiello, 2005) and establish a sense of belonging and inclusion in the community (Bruhn, 2002; Clift et al., 2008; Gembris, 2008; Jones & Langston, 2012; Veblen & Olsson, 2002; Veblen & Waldron, 2012). Being involved in musical activities also promotes social affirmation

(Creech et al., 2013a & 2013b) and relatedness through shared interests (Dabback, 2006; Clift et al., 2008; Li & Southcott, 2012; Varvarigou et al., 2011). In addition, it provides social support: i.e. giving and receiving peer support (Creech et al., 2013a; Clift et al., 2008; Lord et al., 2010). Social benefits are summarized in Figure 3.5.

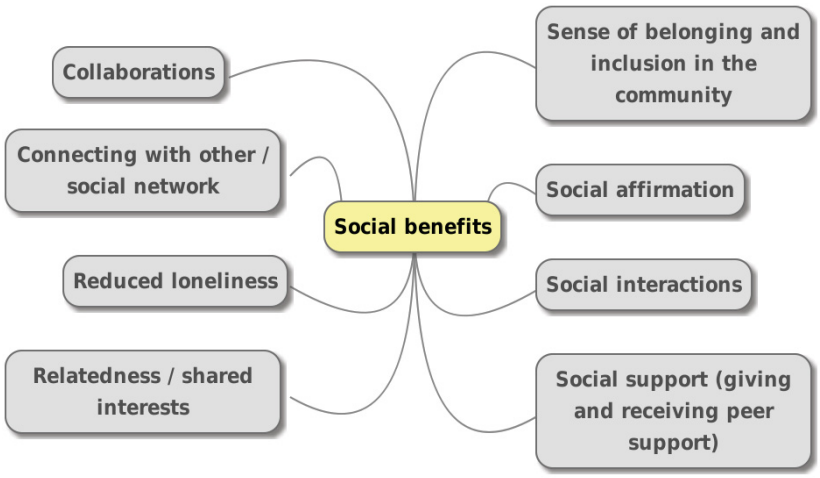

Figure 3.5. Synthesis of findings regarding the social benefits of music-making for older adults.

Although not included in the last figure, musical activities are also associated with the environmental domain, as they provide opportunities for recreational activities that encourage creative self-expression, promote freedom, control and autonomy, and allow participants to learn and acquire new skills, all of which are facets of QoL recognized by the World Health Organization. Table 3.2 identifies the relationship between these facets of QoL and the benefits of active music-making for elderly adults.

Table 3.2

Domains and Facets of Quality of Life as defined by the World Health Organization and their Association with the Benefits Reported from Music-Related Activities

Domain	Facets included within domains	Music-related benefits (x)
Physical health	Pain and discomfort	x
	Sleep and rest	x (physical relaxation)
	Energy and fatigue	x (physical wellbeing)
	Mobility	-
	Activities of daily living	-
	Dependence on medicinal substances and medical aids	-
	Work capacity	-
Psychological	Positive feelings	x
	Thinking, learning, memory and concentration	x
	Self-esteem	x
	Bodily image and appearance	-
	Negative feelings	x (better morale)
	Spirituality/religion/personal beliefs	x
Social relationships	Personal relationships	x
	Social support	x
	Sexual activity	-
Environment	Freedom, physical safety and security	-
	Home environment	-
	Financial resources	-
	Health and social care: accessibility and quality	-
	Opportunities for acquiring new information and skills	x
	Participation in and opportunities for recreation/leisure activity	x
	Physical environment (pollution/noise/traffic/climate)	-
	Transport	-

WHOQOL Group (1998, p. 552)

Conclusion

This literature review was intended to provide a broad overview of the areas that have been studied so far regarding music-making and performance, and to identify gaps in the current body of research on MPA and the impact of music on biopsychosocial factors.

Researchers seem to agree that certain factors have an impact on MPA, including gender, trait anxiety, performance settings, and to some extent, musicians' age. However, more evidence is needed to determine whether years of training and level of expertise are associated with performance anxiety.

Although trends have been observed regarding the instrument played and levels of MPA, caution is needed when interpreting findings, as some instrumentalists tend to perform in more exposed conditions than others. As for the style of music performed, there seems to be a difference in MPA between classical and non-classical musicians, but more research is needed to determine the significance of these results, especially because other factors tend to mediate the relationship between MPA and performance style.

Regarding the literature on active music-making in older populations, authors agree almost unanimously that singing and playing music leads to significant health-related benefits and improvements in quality of life. While more evidence is needed to better understand the exact effects of active music-making on community-dwelling older adults (especially regarding depression, anxiety, respiratory function, and blood pressure), the vast body of literature on quality of life provides promising insights regarding music's potential to promote seniors' mental and physical wellbeing, as well as facilitating social interactions.

Chapter 4

Original article

Psychometric properties of the Performance Anxiety Inventory for Musicians (PerfAIM)

Abstract

Music Performance Anxiety (MPA) has received increased interest from researchers in recent decades. However, very few studies have focused on MPA's effect on popular musicians, and no questionnaires have ever been validated exclusively with this population. The aim of this paper was to develop the Performance Anxiety Inventory for Musicians (PerfAIM) and undertake a validation process of the inventory. In Study 1, 69 popular musicians completed an online questionnaire booklet including the PerfAIM, the Performance Anxiety Inventory (or PAI; Nagel et al., 1989) and the revised Kenny Music Performance Anxiety Inventory (or K-MPAI; Kenny, 2009a). The PerfAIM demonstrated excellent internal consistency (Cronbach's *alpha* coefficient = .93), very good reliability (ICC = .89 with 95% CI), satisfactory convergent validity (*r* value of .48, $p < .05$) and high concurrent criterion-related validity with correlations of $r = .59$, $p < .01$ with the PAI and of $r = .68$, $p < .01$ with the K-MPAI. Study 2 consisted of creating a French translation of the PerfAIM and performing a factor analysis using a sample of 241 musicians from various musical backgrounds. The PerfAIM's internal consistency increased to .95, and test-retest reliability, established with a sample of 59 respondents, reached .86. An exploratory factor analysis using a maximum likelihood extraction method with oblique rotation (direct oblimin) was performed, and the Kaiser-Meyer-Olkin measure verified sampling adequacy for the analysis, KMO = .94. Bartlett's test of sphericity, χ^2 (946) = 6613.84, $p < .001$, indicated that correlations between items were large enough for factor analysis. Four components were found with eigenvalues over 1.5 and in combination explained 52.14% of the variance. Items clustering around the same factors suggest that Factor 1 was associated with unpredictability, Factor 2 with anticipation, Factor 3 with threat to the ego, and Factor 4 with decreased sense of control. Factors 1, 3, and 4 are determinants of Lupien's theory, the NUTS Recipe for Stress (Lupien, 2010, 2012), and Factor 2 can be associated with the temporal occurrence of MPA, one of the PerfAIM's domains. In conclusion, the PerfAIM appears to be a valid and reliable questionnaire for assessing MPA in both popular and classical musicians and it can provide solid foundations for future comparisons between performing styles.

Introduction

Music performance goes beyond merely performing music in front of an audience. Musicians must show musicality, expressivity, and technical proficiency, as well as a capacity to withstand the psychological and physical demands of performing. Music Performance Anxiety (MPA) is defined by Kenny (2009b, 2011) as

> the experience of marked and persistent anxious apprehension related to musical performance that has arisen through specific anxiety-conditioning experiences. It is manifested through combinations of affective, cognitive, somatic and behavioral symptoms and may occur in a range of performance settings, but is usually more severe in settings involving high ego investment and evaluative threat. It may be focal (i.e. focused only on music performance), or occur co-morbidly with other anxiety disorders, in particular social phobia. It affects musicians across the lifespan and is at least partially independent of years of training, practice, and level of musical accomplishment. It may or may not impair the quality of the musical performance. (2009, p. 433; & 2011, p. 61)

In the last three decades, the few studies looking at the occurrence of MPA among popular musicians focused primarily on personality types and occupational stress (Cooper & Wills, 1989; Dyce & O'Connor, 1994; Wills & Cooper, 1987). However, popular musicians (including musicians performing any other non-classical styles such as rock, jazz, country, commercial music, and so forth) are approximately 15% more likely to experience above-average anxiety levels compared to norms found in the general population (Wills & Cooper, 1987). Perdomo-Guevara (2014) studied the differences between classical and non-classical musicians regarding performance anxiety and found that the performers' cultural group had a significant impact on musicians' emotional profiles and on how they approached performance, a finding that is supported by Papageorgi, Creech, and Welch (2013). In fact, because popular musicians' working environment is more social in nature and more closely related to the world of entertainment and "show business" (Cooper & Wills, 1989, p.22), popular musicians tend to have different personality types than classical musicians. They are described as being extroverted (Dyce & O'Connor, 1994; Marchant-Haycox & Wilson, 1992), as having high levels of neuroticism (Cooper & Wills, 1989; Dyce & O'Connor, 1994; Gillespie & Myors, 2000), and as being especially prone to stress (Wills & Cooper, 1987). Wills and Cooper (1987) also report that the main predictors of mental distress among popular musicians are performance anxiety and performance-related anxiety, although further

research is needed to determine which components of MPA are specifically detrimental to popular performers.

To our current knowledge, no self-report questionnaire has been validated with a specific sample of popular musicians. Validation is an essential process to ensure that measures provide accurate representations of constructs of interest (Hulley et al., 2001). While a variety of questionnaires already exist in the literature, not all of them are psychometrically sound. In fact, a decade ago Osborne and Kenny (2005) did an extensive literature review and identified 20 self-report questionnaires assessing MPA. Unfortunately, none of these measures, except the Music Performance Anxiety Inventory for Adolescents (MPAI-A; Osborne & Kenny, 2005), included adequate norms and standardization procedures according to the minimum criteria for basic psychometric properties (see Table 2 for the list of criteria) from the Standards for Educational and Psychological Testing (1985). Although the MPAI-A met almost all criteria, it was designed for young musicians only. The authors pointed out that the reviewed articles did not provide information regarding procedures of development, except when questionnaires were adapted from pre-existing measures (Kenny, 2006; Osborne & Kenny, 2005).

More recently, Kenny (2009a, 2011) has revised the Kenny Music Performance Anxiety Inventory (K-MPAI) into a 40-item questionnaire showing excellent psychometric properties among professional orchestra musicians (Ackermann, Kenny, O'Brien, & Driscoll, 2014; Kenny, in press) and student classical musicians (Kenny, 2009a; 2011). Çırakoğlu and Şentürk (2013) also published a psychometrically sound study on the development and validation of the Performance Anxiety Scale for Music Students in Turkey. While its design and methods were robust, the latter sample consisted of students in music education exclusively and the authors did not specify the style of music performed.

Currently, findings from the 20 questionnaires reviewed by Osborne and Kenny (2005), the Turkish Performance Anxiety Scale (Çırakoğlu & Şentürk, 2013), and the revised K-MPAI (Kenny, 2009a, 2011) can only be generalized for populations of students or professional orchestra musicians. Since popular musicians were not studied, we do not know whether they share similar trends with classical performers or not, or

whether a significant difference exists between popular music students and professional popular musicians with respect to MPA.

While all the self-report questionnaires mentioned above aim at assessing MPA as accurately as possible, it is worth mentioning that underlying theories differ. For instance, the Performance Anxiety Inventory (Nagel, Himle, & Papsdorf, 1989) is based on the three-systems model of fear (Lang, 1971) and the Kenny Music Performance Anxiety Inventory (Kenny, 2011) on Barlow's theory of triple vulnerability (Barlow, 2000). The Performance Anxiety Scale for Music Students (Çırakoğlu & Şentürk, 2013) has no theoretical foundation: items are solely based on the authors' experiences and adaptation from existing questionnaires (which were not identified by the authors of that study).

The goals of our studies were to develop a new measure, the *Performance Anxiety Inventory for Musicians* (PerfAIM), and to establish its psychometric properties with samples that include popular musicians. For the purpose of the studies, the term 'popular musicians' is used broadly to indicate all non-classical music performers.

Domains

In order to develop the PerfAIM, a review of the literature was conducted to determine the domains and items associated with MPA that were mentioned frequently in the research. Most authors (e.g. Kenny, 2011; Papageorgi, Hallam, & Welch, 2007, Salmon, 1990; Yoshie, Shigemasu, Kudo, & Ohtsuki, 2009a) agree that specific domains, such as causes, temporal occurrences, direction, and symptoms (somatic, cognitive, behavioral, and affective), are important to consider in relation to MPA.

Causes (situational and personal sources of stress). Research shows that external and internal stimuli may cause anxiety (Robson, Davidson, & Snell, 1995), and that a relationship exists between MPA and environmental and personal factors (Esplen & Hodnett, 1999). Situational sources of stress, often considered external triggers of anxiety, may refer to any type of situation surrounding a performance that affects MPA levels in musicians (e.g. playing in front of a jury panel, being led by a very demanding conductor, performing the same repertoire as another musician, or arriving at a venue late; Emmons & Thomas, 2008; Ryan & Andrews, 2009).

Personal sources of stress, often considered internal triggers of anxiety, may be associated with one's general propensity to be anxious (Cox & Kenardy, 1993; Hamann, 1982), past negative experiences (Abril, 2007; Papageorgi et al., 2007), feelings of self-exposure (Roland, 1994), and personality traits such as neuroticism, introversion, low self-esteem, and perfectionism (Papageorgi et al., 2007).

Kenny (2011) surveyed 357 professional orchestra musicians and identified 22 causes for MPA, including internal and external sources of stress, such as self-induced pressure, not knowing how to deal with stress, inadequate preparation, anxious personality trait, health issues, worries or negative thoughts, lack of support, pressure from the conductor, section leader, or peers, and so forth. Since causes of MPA seem to be important triggers of stress responses, their inclusion in a questionnaire is essential to create an accurate portrait of the phenomenon.

Temporal occurrences. Evidence suggests that musicians generally experience a peak of anxiety right before the performance (Ryan, 1998; Su et al., 2010), and that MPA tends to decrease once the performance has started (Güsewell, 2010). Furthermore, Salmon and colleagues (Salmon, Schrodt, & Wright, 1989; Salmon, 1990) demonstrate that anticipating a performance may be more stressful than the actual performance, and that stress levels usually increase as the performance approaches. On the other hand, a recent study on the time dynamics of music students' psychophysiological activation during private and public performances indicated that musicians experience higher activation during the performance than before or after it (Studer, Danuser, Wild, Hildebrandt, & Gomez, 2014). Psychophysiological activation is not bad in itself: it all depends on how one appraises it.

Direction. MPA may be interpreted as facilitating or debilitating (Yoshie et al., 2009a) according to individuals' perceptions. This may affect performance quality (Salmon, 1990). Although researchers agree that MPA is related to cognitive appraisal (Esplen & Hodnet, 1999; Gould, Greenleaf, & Krane, 2002), and that the direction of anxiety is a significant predictor of MPA (Yoshie et al., 2009a), opinions vary as to the exact relationship between direction and intensity.

Facilitating MPA is known to help musicians perform at their best, while debilitating anxiety tends to hinder musicians and decrease performance quality (Lehrer,

Goldman, & Strommen, 1990). Some researchers mention that facilitating and debilitating anxiety are on the same continuum and an optimal level of MPA lies somewhere in-between (Güsewell, 2010; Weinberg & Gould, 2007). Others argue that a small amount of MPA may facilitate performance (Ely, 1991; Kirchner, Bloom, & Skutnick-Henley, 2008; Meharg, 1988; Wolfe, 1989), while high anxiety levels may lead to negative performance outcomes (Stephenson & Quarrier, 2005). Gill, Murphy, and Rickard (2006) have suggested that the direction of anxiety may have a greater influence on a musician's performance than its intensity level. Somewhat contradictorily, Yoshie, Kudo, Murakoshi, and Ohtsuki (2009c) in their study on skilled pianists in stressful (competition) and non-stressful (rehearsal) conditions explained that while subjective, autonomic, and electromyographic reactions can be "interpreted as integral components of an adaptive biological system that creates a state of motor readiness in an unstable or unpredictable environment, they can adversely influence pianists by disrupting their fine motor control on stage" (p. 117).

There is thus a lack of agreement among researchers regarding the impact of the direction of MPA on musicians. In addition, the main focus of the PerfAIM being to assess MPA specifically under stressful performance situations, the facilitating component of MPA was not particularly relevant to our research context. As a result, direction of anxiety was not a domain that was included in the current study for further analysis.

Symptoms. On the basis of Kenny's definition (2009b, 2011) provided above, symptoms of MPA are classified into four interacting – and sometimes overlapping – components: somatic, cognitive, behavioral, and affective.

Evidence indicates that the cognitive components of MPA have a stronger impact on performance and anxiety levels than do the somatic (Kleine, 1990; Reitman, 2001; Stephenson & Quarrier, 2005; Studer et al., 2014; Yoshie et al., 2009a), affective, and behavioral ones (Kenny & Osborne, 2006). Despite this, it is important to thoroughly assess all four factors because they all interact with each other (Abril, 2007; Brotons, 1994; Ely, 1991; Emmons & Thomas, 2008; Kenny, 2009b; Leary & Kowalski, 1995; Osborne & Kenny, 2008). It is also worth noting that the number of symptoms experienced may be less important for performers than their intensity (Gould et al.,

2002). In addition, as musicians pay more attention to symptoms that are instrument-specific (e.g. dry mouth for flutists; Gill et al., 2006), it is essential to develop a sample of items that would allow all musicians to report the variety and intensity of their symptoms accurately.

Determinants of MPA in relation to the NUTS Recipe for Stress

The NUTS recipe for stress (Lupien 2010, 2012; Marin, Schramek, Maheu & Lupien, 2009) is a psychological theory developed by the Centre for Studies on Human Stress (Montreal, Canada). 'Novelty', 'Unpredictability', 'Threat to the ego', and 'Sense of control decreased' are the four determinants of the NUTS theory, which states that a situation will be interpreted as stressful if one or more of the criteria are met. It also mentions that the presence of a greater number of determinants is more likely to heighten stress levels (Marin et al., 2009).

Because the recipe is based on personal appraisal, it is universal. In fact, typical 'anxiety-provoking' situations do not matter as much as how an individual perceives them (Marin et al., 2009): When an event is perceived as novel, unpredictable, threatening or uncontrollable, it triggers a stress response. Therefore, if a questionnaire asks a participant to think about stressful performance situations, responses should shed light on the perception and experience associated with the NUTS determinants.

In relation to the MPA domains, the NUTS recipe lends itself easily to contexts of music performance and is particularly well suited to encompass the causes, temporal occurrences, and symptoms of anxiety. The relationship between these domains and the NUTS recipe influenced the final selection of items for the PerfAIM's development.

The causes of MPA, be they external or internal, relate to the NUTS determinants because the underlying reasons for experiencing MPA are based on self-appraisal: being judged or playing under a difficult conductor is threatening to the ego, arriving late at a venue is unpredictable, having to perform when the temperature in the concert hall is not comfortable is uncontrollable, and so forth.

The temporal occurrence of MPA also relates strongly to the NUTS recipe. The moment at which the anxiety peaks may be unpredictable and uncontrollable. For instance, if it happens on stage, it may be detrimental to performance, whereas if it

happens beforehand, it may not be as likely to affect performance quality. In addition, earlier onset of MPA may provide additional time for performers to control their stress level by implementing strategies to lower anxiety.

The NUTS determinants are associated with symptoms of MPA. Indeed, manifestations of anxiety tend to be generally unpredictable and may also decrease one's sense of control. In addition, symptoms that are instrument-specific may pose a threat to the ego by altering musicians' ability to play optimally. Finally, new symptoms may arise during a performance and the novelty may generate a stress response. In all these cases, symptoms of MPA strongly relate to Lupien's theory.

To our knowledge, no prior study has associated the NUTS recipe for stress with the MPA construct. We showed that the four determinants of Lupien's theory are closely aligned with our MPA domains. While our primary goal was to create a data-driven questionnaire with strong psychometric properties that would allow findings to be generalized to broad populations of musicians, establishing a link between domains (empirically proven to predict MPA) and a stress theory was a logical step to ensure a strong conceptual framework.

PerfAIM: Development and Validation

This project included two studies that were conducted between 2010 and 2014. Both studies received ethics approval from the Research Ethics Board Office of McGill University. Study 1 consisted of developing a questionnaire to evaluate levels of MPA in what are perceived as stressful performance situations, investigating the psychometric properties of the PerfAIM using a sample of popular musicians exclusively, and revising the questionnaire based on the data collected. Study 2 aimed at creating a French translation and undertaking a new validation process that included an Exploratory Factor Analysis (EFA) and reliability tests, using a larger sample of musicians from all backgrounds.

Factor analysis is a method used to explore an underlying construct that cannot be directly measured, using items that are thought to be an adequate reflection of the construct of interest (Beaver et al., 2013). While Principal Component Analysis (PCA) has often been used in the development of MPA scales (Kenny, 2009a, 2011; Çırakoğlu

& Şentürk, 2013), there is a debate surrounding its validity as a factor analytic method (Costello & Osborne, 2005; Field, 2009; Suhr, 2005). Beaver and colleagues (2013) explain that component analysis is used to reduce a large number of items into fewer components, is considered a data reduction method, and is different from factor analysis. They caution researchers that "both theoretical and mathematical differences exist between component analysis and common factor analysis. The failure to make these distinctions clear leads to difficulty interpreting the context and diminishes the researcher's ability to make theoretically sound decisions" (Beaver et al., 2013, p.5).

We chose to undertake an Exploratory Factor Analysis because it is a data-driven method (Beaver et al., 2013) that adequately reflected our approach to questionnaire design. Because we used findings from the literature to create the questionnaire and empirical data from interviews, focus groups and respondents to validate it, we found that EFA was the most appropriate option to explore "underlying constructs, which cannot be measured directly, through items thought to be reflective measures of the construct" (Beaver and colleagues, 2013, p. 5) as opposed to other methods such as Confirmatory Factor Analysis, which are more theory-driven. This allowed us to explore the extent to which the items of the PerfAIM reflected our domains of MPA (causes, temporal occurrences, manifestations) and/or were associated with the NUTS recipe for stress.

Study 1

Methods

Questionnaire design. On the basis of the literature review, we generated a pool of items about MPA that was examined by two focus groups of undergraduate and graduate music students and performers. Focus groups were used to generate as many items as possible for the PerfAIM, as well as to collect information regarding individuals' perceptions and understanding of MPA. Interviews with twelve experts from various fields (jazz performance, music education, psychology and sports psychology) were conducted to evaluate all items and determine face validity.

Face validity was established by asking the experts to rate the PerfAIM's validity using the absolute method (Nevo, 1985). We assessed the entire questionnaire (as well as

its construct, its domains, and its items) with a 5-point scale for clarity, relevance, importance, and appropriateness each. Means, standard deviations, and distributions of responses were calculated for each component. Content validity was achieved by (a) proposing a definition of the main construct and its domains; (b) submitting all elements of the questionnaire for evaluation (instruction, format, scaling system, and so forth); (c) using samples from the population of interest and experts to generate items and assess their relevance; (d) quantifying experts' judgments using evaluation scales; and (e) revising the questionnaire until a high level of agreement among experts was reached (Haynes, Richard, & Kubany, 1995). An iterative process was used to adapt the instruction, scale, items, and format after each round of interviews in a cyclical pattern (for all the details about the questionnaire design including items' development, interviews with experts, and estimation of face validity, please consult Barbeau, 2011).

Questionnaire validation. ***Participants*****.** All respondents recruited were 18 years old or over. Participants were excluded from the project if they were taking psychotropic medication (e.g. antidepressants, psychostimulants, lithium) on an ongoing basis because potential changes in perception, mood, consciousness, cognition, and behavior might affect the results (Hulley et al., 2001). Professional musicians were invited to participate in the studies by email, and music students from Canadian universities were contacted through list-serves.

Among the 370 musicians contacted, 69 participated in the study (Table 4.1) and completed the online questionnaire booklet (a response rate of 19%). These 69 respondents were invited again a week later to complete the PerfAIM for the purpose of establishing test-retest reliability. Of them, 21 musicians agreed to participate a second time.

Table 4.1

Questionnaire Validation: Demographic Information

Sample of popular musicians (professional and students) *n*=69		**Percentage (*n*)**
Gender	Male	55% (38)
	Female	45% (31)
Age	18-24	28% (19)
	25-35	55% (38)
	35+	17% (12)
	*Range:18-53 years old (*M*=29, *SD*=8)	
Education	High school	7 % (5)
	CEGEP/college (Grade 12 and above)	19% (13)
	University	74% (51)
Full-time occupation	Student	39% (27)
	Musician	35% (24)
	Music teacher	9% (6)
	Musician and music teacher	6% (4)
	Other	10% (7)
	Unemployed	1% (1)
Level of musical proficiency	Non-professional (i.e. Beginner, Intermediate, Advanced)	46% (32)
	Professional/Expert	54% (37)
Most frequently performed style	Pop and/or other non-classical styles	91% (63)
	Classical	0%
	Both	7% (5) *(1 missing answer)*
Has MPA been ever experienced?	Yes	85% (59)
	No	15% (10)

Measures. Two questionnaires were selected for the validation process: the Performance Anxiety Inventory (Nagel et al., 1989) and the revised Kenny Music Performance Anxiety Inventory (Kenny, 2009a).

The Performance Anxiety Inventory (PAI), a 20-item questionnaire using the three-systems model of anxiety (Lang, 1971) to evaluate somatic, cognitive and behavioral symptoms of MPA, has been widely used in research (Kenny, 2005; Kirchner et al., 2008; Liston, Frost, & Mohr, 2003; Stephenson & Quarrier, 2005; Thurber, Bodenhamer-Davis, Johnson, Chesky, & Chandler, 2010). Its four-point scale of frequency ranges from 1 (almost never) to 4 (almost always), and scores range from 20 to 80. Cronbach's *alpha* score for the PAI is 0.89 (Nagel et al., 1989), which is considered high (Streiner & Norman, 2009).

The revised Kenny Music Performance Anxiety Inventory (K-MPAI, 2009a) is a 40-item questionnaire assessing MPA from the standpoint of Barlow's emotion-based theory of triple vulnerability (Barlow, 2000). It uses a 7-point scale of endorsement

(strongly disagree to strongly agree), and scores range from 0 to 240. The K-MPAI demonstrates high internal consistency (Cronbach's *alpha* score = .94; Kenny, in press), and previous studies have shown clear relationships between MPA (especially in its severe form) and Barlow's theory (Kenny, 2009a*)*.

According to the Standards for Educational and Psychological Testing (1985) and the criteria adapted for self-report measures from McCauley and Swisher (1984), the K-MPAI in its revised form meets almost all psychometric criteria, whereas the PAI meets only a few (Table 4.2). The K-MPAI is now a gold standard in the literature as a result of Kenny and colleagues' studies establishing psychometric properties on multiple samples. As for the PAI, it can be considered a silver standard: this measure has been widely used in research, which may offer some ground for comparisons between studies, but the original paper from Nagel and colleagues failed to report most of the psychometric properties that would have made the PAI a gold standard.

Table 4.2

Psychometric Criteria Reported for the PAI and K-MPAI

Criteria	Measures
1. Description of normative sample	K-MPAI
2. Sample size (over 100)	K-MPAI
3. Item analysis	K-MPAI, PAI
4. Means and standard deviations	K-MPAI, PAI
5. Concurrent validity	K-MPAI
6. Predictive validity	-
7. Test-retest reliability	K-MPAI
8. Description of test procedures	PAI
9. Description of tester qualification	-

(Adapted from Osborne and Kenny, 2005, p. 728).

Results

Validity and reliability. Using a Cronbach's *alpha* coefficient, the PerfAIM's internal consistency reached .93, which is excellent, with Cronbach's *alpha* scores ranging from .927 to .932 if the item is omitted. Test-retest reliability was established using an intraclass correlation coefficient with a 95% confidence interval, and comparison of scores between the first and second completion demonstrated good reliability for the PerfAIM, ICC (2,1) = .89 [.75-.95].

Concurrent criterion-related validity was established through Pearson product-moment correlations. Statistically significant positive correlations were found between the PerfAIM and the PAI ($r = .593$, $p < .01$) and between the PerfAIM and the K-MPAI ($r = .681$, $p < .01$), and were very high.

Construct validity was established by correlating the PerfAIM and the PAI. Because these questionnaires assess symptoms of MPA, their theoretical framework was considered similar enough to estimate construct validity (the K-MPAI was not included in this analysis because its theoretical foundation was too different to evaluate convergent and divergent validity effectively).

We compared similar (i.e. symptoms) and dissimilar domains (i.e. PerfAIM's causes and temporal occurrences against PAI's symptoms), with expected r values of $\geq .4$ for convergent validity and of $< .4$ for divergent validity. We found a significant positive correlation of .48 ($p < .05$) between symptoms of MPA. Regarding divergent validity, Pearson product-moment correlations were below the .4 threshold: comparison of the PAI's symptoms with the PerfAIM's causes showed a correlation of .22 ($p > .05$) and with the PerfAIM's temporal occurrences, a correlation of .34 ($p < .05$). This suggests that both questionnaires generally converge towards the same main construct and that the dissimilar domains are sufficiently different to justify the use of the PerfAIM for its uniqueness in assessing specific parameters of MPA, such as causes and temporal occurrences.

Revisions. Because we noticed that the PerfAIM, which comprises many items, could be shortened without affecting its reliability, and that the 5-point scale was not as effective as hoped, we proceeded with a revision of the PerfAIM. We took advantage of this revision to translate the questionnaire and undertake a new validation process.

Item-total correlations. Using data collected, correlations between items were verified for the entire questionnaire and for each domain. Items with correlations below .10 were removed. Items with correlations between .10 and .30 were tentatively kept to investigate whether correlations would increase when including musicians from classical backgrounds in the pool of respondents (Study 2). Later on, items with correlations

remaining below .3 were finally removed. The final set of items and the associated means, standard deviations, and item-total correlations appear in Appendix 4.

Scale, response options, and instructions. During the interviews, a few experts mentioned the limitations of the scaling system as did some respondents in the comment box provided at the end of the questionnaire. Overall, participants were unsatisfied with the response options mainly because they felt they were not able to be specific enough in their answers. Therefore, the original 5-point scale of endorsement was changed to a 5-point scale of intensity ranging from "not at all" to "greatly". We realized that an intensity scale was more appropriate than an endorsement scale to provide answers to our original research question (i.e. what is the extent to which highly stressful situations affect levels of self-perceived music performance anxiety in musicians?). We reworded most of the items to reflect the use of this new scale and adapted the set of instructions. In addition, numbers were added under each level of the scale (from 0: not at all, to 4: greatly) to facilitate completion.

Discussion

Concurrent criterion-related validity. The PerfAIM demonstrated statistically positive relationships with both the K-MPAI and the PAI, which means that people who obtained high scores on one measure also tended to get high scores on the other (or vice versa). Osborne and Kenny (2005) report that validity coefficients around .3 and .4 are high, and that those exceeding .6 are considered rare. The correlations of PerfAIM/PAI (r=.59) and PerfAIM/K-MPAI (r=.68) may thus be considered very strong.

Construct validity (convergent and divergent). The PAI was used to test construct validity and the results yielded a significant positive relationship of r = .48 for convergent validity, which falls directly within the acceptable range of .4 – .8 recommended by Streiner and Norman (2009).

Divergent validity was established by comparing dissimilar domains of the PerfAIM and the PAI (i.e. PerfAIM's causes and temporal occurrences compared to PAI's symptoms). None of the correlations reached the .4 level, which is satisfying and contributes to demonstrating that the PerfAIM differs enough from the PAI to be considered a unique and relevant tool.

Revisions. Revisions of the PerfAIM consisted in re-examining data, removing items, and modifying the scale. The original Likert-type scale, which had a "neutral" (middle) value was problematic because participants tended to answer "neutral" for three reasons that were undistinguishable: 1) the item did not apply to the respondents' experience, 2) the respondents did not have an opinion about the item, or 3) the respondents endorsed the item moderately. According to Streiner and Norman (2009), this is the main reason for which the use of Likert-type scales in questionnaire design is problematic: it becomes very difficult to interpret scores composed of many "neutral" values. In addition, we found that participants had trouble answering questions because scales of endorsement are bipolar and usually best used for evaluating beliefs and attitudes, while unipolar scales are more effective to assess the extent of a problem or "the ability to perform some action" (Streiner & Norman, 2009, p. 46). Since the PerfAIM's items are mostly related to the ability to perform music under stress, the use of a unipolar scale made more sense than the use of a bipolar scale.

We thus addressed the problem by changing the scale of endorsement to a scale of intensity. As a result, we solved the high level of dissatisfaction with the former and made the PerfAIM's scores easier to interpret.

Study 2

The aim of Study 2 was to create a French translation of the PerfAIM and to undertake new validation processes for both the French and English versions, which included an Exploratory Factor Analysis (EFA) and reliability tests with a larger sample of musicians from all backgrounds (classical and non-classical).

Methods

Translation. The translation process was undertaken independently by ourselves and by one external translator (native French-speakers familiar with research on MPA). We worked in close collaboration with an English Second Language professor (native English-speaker teaching university students) to find consensus between translations and ensure that the English version remained aligned at all times. Through an iterative process, we completed the following steps: translation, revision, agreement between

authors, and alignment with English version, which were repeated until no further changes were required. Final versions of the PerfAIM in English and French appear in Appendices 5 and 6 respectively.

Participants. For the testing, an online version of the PerfAIM was completed by a sample of 241 musicians. The same recruitment process and inclusion criteria were applied as in Study 1. The final sample included 104 men and 137 women; 193 respondents were English-speakers and 48 French speakers; 123 were classical musicians, 72 popular musicians, and 45 performed both styles; 89 were experts/professional musicians, 101 were advanced musicians, and 51 beginner/intermediate musicians. Ages ranged from 19 to 81 (M = 39.41, SD = 17.40). Among these participants, 59 respondents completed the inventory twice for test-retest reliability.

Results

Exploratory Factor Analysis. In order to ensure that all items were adequately correlated, we analyzed the correlation matrix of the new data set collected with our sample of 241 respondents. Three items and five sub-items were removed in the process (Table 3) – those having values below .3 (Field, 2009). Once these items were deleted, an exploratory factor analysis using a maximum likelihood extraction method with oblique rotation (direct oblimin) was conducted on the 44 remaining items of the PerfAIM. The Kaiser-Meyer-Olkin measure verified sampling adequacy for the analysis, KMO = .94, which was above the recommended value of .6. Bartlett's test of sphericity, χ^2 (946) = 6613.84, $p < .001$, indicated that correlations between items were large enough for factor analysis.

Table 4.3

Items Deleted After Analysis of the Correlation Matrix (r < .3)

Item number	Statement
11.	I sing/play better in front of an audience than when I sing/play just for myself.
13.	I avoid choosing difficult pieces for fear of failing in front of others.
22.	Alcohol or recreational drugs help me deal with music performance anxiety.
25.	In front of an audience, my level of music performance anxiety increases due to: e. the musicians with whom I perform. h. other reasons (acoustic, room temperature, etc.).
26,	When I have music performance anxiety, I experience the following symptoms: g. urge to urinate. j. dizziness. l. other symptom(s).

An initial analysis was run to obtain eigenvalues for each component in the data. Four factors had eigenvalues over Kaiser's criterion of 1 and in combination explained 52.14% of the variance. A Scree test was performed, which confirmed the use of four factors with eigenvalues above 1.5 for the final analysis (Figure 4.1). Table 4.4 demonstrates the factor loadings after rotation. The items that cluster around the same components suggest that Factor 1 relates to unpredictability, Factor 2 to anticipation, Factor 3 to a threat to the ego, and Factor 4 to a decreased sense of control. Factors 1, 3, and 4 are determinants of Lupien's theory, the NUTS Recipe for Stress.

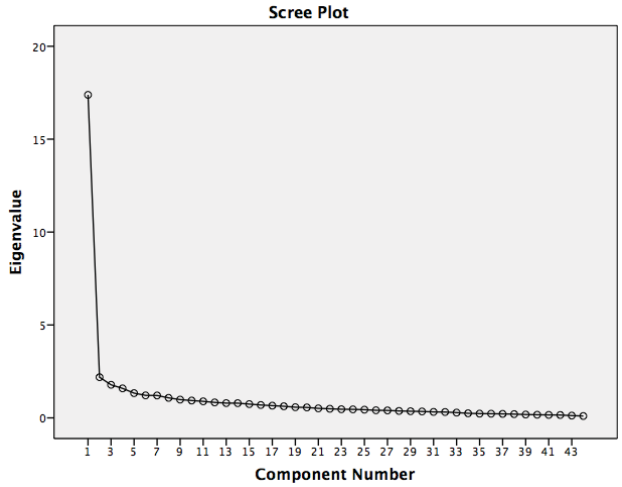

Figure 4.1. Scree test. Factor 1 had an eigenvalue of 17.39, Factor 2 of 2.19, Factor 3 of 1.78, and Factor 4 of 1.59, for a combination of explained variance of 52.14%.

Table 4.4

Factor Loadings for Exploratory Factor Analysis with Varimax Rotation

Items	Rotated factor loadings (Pattern Matrix)			
	Factor 1 Unpredictability	Factor 2 Anticipation	Factor 3 Threat to the ego	Factor 4 Decreased sense of control
24d. I am anxious, worried or stressed when I go on stage.	**.835**			
24c. I am anxious, worried or stressed before going on stage.	**.788**			
24e. I am anxious, worried or stressed during the initial pieces I play/sing.	**.725**			
26d. When I have music performance anxiety, I experience the following symptoms: trembling lips, voice, fingers or legs.	**.702**			
1. I have music performance anxiety when I play/sing in front of an audience.	**.659**			
2. I am nervous when I perform a new or not yet mastered repertoire.	**.628**			
26e. When I have music performance anxiety, I experience the following symptoms: racing and/or pounding heart.	**.587**			
24f. I am anxious, worried or stressed between pieces.	**.558**			
3. I have trouble sleeping the night before a performance.	**.446**	**.443**		
26c. When I have music performance anxiety, I experience the following symptoms: cold hands or sweaty palms.	**.424**			
25c. In front of an audience, my level of music performance anxiety increases due to: the presence of people that are close to me.	**.417**			
26f. When I have music performance anxiety, I experience the following symptoms: shortness of breath.	**.406**			
24b. I am anxious, worried or stressed the night before a performance.		**.587**		
24a. I am anxious, worried or stressed: the week before a performance.		**.483**		
16. I fear people will judge me.			**.652**	
7. I worry about not performing as well as I am able to.			**.631**	
14. I fear the worst will happen.			**.610**	

(Table continued)

Items	Rotated factor loadings (Pattern Matrix)			
	Factor 1 Unpredictability	Factor 2 Anticipation	Factor 3 Threat to the ego	Factor 4 Decreased sense of control
4. I worry about the audience's reaction to my performance.			**.601**	
9. I am afraid of making mistakes.			**.584**	
6. Negative thoughts adversely affect my performance.			**.578**	
21. I am over-sensitive to or I over-react for the slightest reason (wrong notes, ambient noise, inattentive audience, poor lighting, etc.).			**.536**	
25a. In front of an audience, my level of music performance anxiety increases due to: a lack of self-confidence.			**.515**	
19. I let my mistakes get the better of me.			**.501**	
25f. In front of an audience, my level of music performance anxiety increases due to: a difficult/challenging repertoire.			**.497**	
5. I make music mistakes due to performance anxiety.			**.466**	
23. I worry about the same things over and over.			**.464**	
24g. I am anxious, worried or stressed during the most difficult pieces.	**.454**		**.461**	
25g. In front of an audience, my level of music performance anxiety increases due to: a specific type of performance (e.g. an audition; solo performance).			**.404**	
26k. When I have music performance anxiety, I experience the following symptoms: impaired coordination.				**.589**
26i. When I have music performance anxiety, I experience the following symptoms: numbness / tingling.				**.520**
18. I am short of energy when I am nervous.				**.467**
24h. I am anxious, worried or stressed at other times (for example, after a performance).				**.434**
15. I have difficulty concentrating when I am performing.				**.406**
Eigenvalues	17.39	2.19	1.78	1.59
% of variance	39.51	4.97	4.05	3.61

Notes: Factor loadings < .40 do not appear
Items with no factor loading above .40 have been removed from this table

Reliability: Internal Consistency and Test-Retest. The internal consistency of the PerfAIM was excellent, Cronbach's α = .95. For the three domains, we found that symptoms had the highest Cronbach's α (.92), followed by temporal occurrences (.89) and causes (.75). For the four components of the EFA, the following Cronbach's α's were established: Factor 1-Unpredictability (.94), Factor 2-Anticipation (.90), Factor 3-Threat to the ego (.93), and Factor 4-Decreased sense of control (.79). These results demonstrate that items were answered consistently across participants. While the last factor indicated a slightly lower internal consistency than the other three, it still remains above the acceptable value of .7 suggested by Field (2009).

When the data were stratified according to language, the internal consistency proved to be excellent, with a Cronbach's α = .96 for the English version and a Cronbach's α = .94 for the French. When stratified according to gender, it remained high and consistent as well, with men and women each showing a Cronbach's α = .95. Finally, when stratified according to performing styles, the results were equally excellent: Cronbach's α scores reached .95 for classical musicians, .96 for popular musicians, and .96 for performers playing both styles of music.

Test-retest reliability was established using an ICC (model 3,1) with a 95% confidence interval. The PerfAIM proved to be a reliable measure to assess MPA when completed twice, at a one-week interval, ICC = .86, CI [.78 - .91]. The most reliable domains were found to be symptoms and temporal occurrences with ICC values of .86 and .85, respectively. Less consistent were the causes, with an ICC = .69, CI [.52 - .80].

Discussion

Exploratory Factor Analysis. The EFA revealed that four factors explained more than half of the variance. Factor 1 was associated with "Unpredictability": 13 items clustered around this component, with values ranging from .41 to .84, and underlined the fact that musicians could not predict how the performance would turn out. For instance, MPA could be triggered by causes with unknown outcomes (like performing a new or not yet mastered repertoire) or by symptoms that might hinder the ability to perform optimally (e.g. shortness of breath, cold hands, trembling); and all these elements could elicit a stress response because of their unpredictability. As mentioned by Yoshie et al.

(2009a), despite the fact that stress reactions may be an integral part of music performances because they create states of physical readiness in unpredictable conditions, they may also have a negative impact on musicians' fine motor control.

Factor 2 was associated with anticipation of performance. Three items (3, 24a, 24b) clustered around this factor with values ranging between .44 to .59, which is considered acceptable by Costello and Osborne (2005). It was found that anticipation generated problems of sleep as well as anxiety that could occur up to a week prior to performing. Anticipation relates to MPA's temporal occurrence, which is assessed systematically in the PerfAIM and is a symptom that could significantly affect musicians (Salmon et al., 1989; Salmon, 1990). With regard to the NUTS theory, one may wonder: Do musicians anticipate performances because they perceive them as novel, unpredictable, threatening to one's sense of self, and/or uncontrollable? Identifying the determinants may be a way to find the underlying source of stress associated with anticipation, which could help explain the origins of MPA.

Factor 3 included 14 items (ranging from .40 to .65) that were associated with a threat to the ego characterized by excessive worries, by fears about being judged and making mistakes, by overreaction and catastrophization, and by a lack of self-confidence. These components relate to the causes (internal and external) and symptoms (mainly cognitive and affective) of MPA and are aligned with Kenny's definition, which specifies that MPA tends to be more severe in settings that involve "high ego investment and evaluative threat" (Kenny, 2009b, p. 433).

Factor 4 was associated with a decreased sense of control. The five items (ranging between .41 and .59) clustering around this factor were mainly symptoms such as somatic manifestations (e.g. impaired coordination, numbness, lack of energy) that could impact musicians' control over their body and cognitive manifestations (e.g. difficulty concentrating, worries that persist even after a performance) that could affect musicians' control over their mind. Yoshie and colleagues (2009a) demonstrated that psychological stress and increased muscle tension, which are related to lack of control, affect coordination and fine motor control. This is in accordance with Papageorgi and colleagues (2007) who point out that high anxiety levels that are perceived as uncontrollable by musicians may affect a performance's quality, whereas anxiety levels

that remain manageable can help musicians to focus and to be mentally and physically prepared for action.

Reliability. The results yielded that the 44-item PerfAIM is an internally consistent measure as expressed by a Cronbach's score of .95 (Gliem & Gliem, 2003; Streiner & Norman, 2009). This is similar to the internal consistency reported for the K-MPAI, with values above .9 when using samples of classical musicians (Kenny, 2011; Kenny, Ackermann, & Driscoll, 2009). These results are unique in that they provide the first reliability tests for samples of popular musicians, who can now be compared to their classical counterparts.

Further implications

The literature related to psychological assessment stresses the importance of establishing the validity and reliability of questionnaires (Foster & Cone, 1995; Haynes et al., 1995; Nevo, 1985; Streiner & Norman, 2009; Vogt, King, & King, 2004). However, in our review of studies using MPA questionnaires, we found very few articles reporting psychometric properties, and none of them had been validated with a specific emphasis on popular musicians.

A questionnaire's internal consistency is directly associated with the number of items and is dependent on the magnitude of the correlation (Gliem & Gliem, 2003; Streiner & Norman, 2009). While results above .9 may be considered excellent, they may also express redundancy (Streiner & Norman, 2009), which is why the PerfAIM's number of items was reduced from 58 items in Study 1 to 44 items in Study 2. It is worth mentioning that shortening the questionnaire improved the PerfAIM's reliability (from .93 to .95), which is explained by the fact that we removed items that did not correlate well with others (i.e. item-total statistics < .10) as part of our revision process. When accounting for language, gender, and performing styles, the internal consistency proved to be highly consistent; all values exceeded the .9 critical threshold point commonly used in clinical fields (Streiner & Norman, 2009). When examined by domains (i.e. causes, temporal occurrences, and symptoms) and by factors (unpredictability, anticipation, threat to the ego, and sense of control decreased), all Cronbach's α scores also remained above the minimal acceptable values of .7 (Field, 2009).

The PerfAIM's test-retest reliability showed excellent scores in both Study 1 (ICC = .89) and Study 2 (ICC = .86), exceeding the values recommended by Lexell and Downham (2005), who suggest that ICC scores between .4 and .75 are fair to good, and above .75, excellent. To our knowledge, test-retest reliability has only been reported once in the literature about MPA assessment, by Çırakoğlu and Şentürk (2013) whose results demonstrated a remarkably high reliability of .95 at a 14-day interval. However, they used Pearson's correlation coefficients to determined test-retest reliability, the results of which are known to be usually higher than true reliability (Streiner & Norman, 2008).

We conducted an exploratory factor analysis (maximum likelihood) using data collected with 241 respondents. Four factors were identified that accounted for 52% of the variance. Interestingly, three of these components relate to the NUTS Recipe for Stress, while anticipation (Factor 2), which was identified in the literature review as an important predictor of MPA, encompasses one or more determinants and also relates to temporal occurrences. The EFA confirms that the selected domains (causes, temporal occurrences, manifestations) in conjunction with the use of the NUTS recipe for stress were appropriate for the development of the PerfAIM. The next step in the validation process would be to corroborate the relationship between theory and data by undertaking a confirmatory factor analysis (CFA).

Conclusions

The aims of the current studies were to describe the process of creating and validating the Performance Anxiety Inventory for Musicians, the PerfAIM. The main contribution of this paper is to provide the first questionnaire focusing on popular musicians for which the psychometric properties have been established. In addition, this is the first questionnaire to demonstrate a relationship between the NUTS Recipe for Stress and MPA. Finally, as its validity and reliability were demonstrated in both the English and French versions, the PerfAIM offers a robust measure to compare levels of MPA without the barrier of language.

Further research is warranted to develop norms and standards for popular musicians and to confirm the theoretical foundations of the PerfAIM through CFA. However, this study provides the basic foundations for future inquiries by offering a valid

ground on which to develop new research projects. From now on, the PerfAIM may be utilized as a tool to determine the extent to which levels of MPA might differ between popular and classical musicians and to investigate what factors contribute to heightening anxiety in contexts of musical performance.

Ethical approval

This study has been approved by the Research Ethics Board Office of McGill University [Reference numbers 225-1110 and 365-0412]

Chapter 5

Original article

Impact of Gender, Age, General Anxiety, Musical Background, and Expertise on levels of MPA among Classical and Popular Performers.

Abstract

The aim of the study was to investigate the extent to which MPA affects musicians according to specific parameters –trait anxiety, gender, age, years of training, instrument, level of expertise, and performance setting– and to examine these parameters in the light of the style of music performed. A sample of 241 musicians completed self-administered questionnaires online. Results of the statistical analyses showed that musicians suffering from trait-anxiety had more MPA than non-anxious musicians. Regarding gender, men reported significantly less MPA than women. While MPA was not associated with years of training, it was found to be dependant of age in adulthood, with younger musicians being significantly more anxious than older ones. Singers and arched string players reported significantly more MPA than plucked string, woodwind, and brass players. Keyboard players, the third most anxious performers, also reported higher MPA than brass players. Performing in small ensemble settings of 2 to 8 musicians proved to be less stressful than playing in other performance settings, especially in solo. Regarding levels of expertise, advanced musicians experienced significantly higher MPA than expert musicians. Significant differences were found between classical musicians and popular musicians, as well as between classical musicians and musicians playing both styles. Exploratory analyses suggest that MPA differed among men and women based on the performing style, whereas it remained similar between classical and popular musicians when comparing groups of young adults, soloists, and small ensemble performers. Further research is warranted to confirm these findings.

Introduction

Music performance anxiety (MPA) is a phenomenon that has received increased attention by researchers since the 1980s. Several experts have attempted to provide definitions of MPA to clarify the construct (such as Kesselring, 2006; Salmon, 1990). Unfortunately, none of these definitions achieved consensus among researchers (Kenny, 2011). This led Kenny to propose a definition that has set a new standard in the field:

> Music performance anxiety is the experience of marked and persistent anxious apprehension related to musical performance that has arisen through specific anxiety-conditioning experiences. It is manifested through combinations of affective, cognitive, somatic and behavioral symptoms and may occur in a range of performance settings, but is usually more severe in settings involving high ego investment and evaluative threat. It may be focal (i.e. focused only on music performance), or occur co-morbidly with other anxiety disorders, in particular social phobia. It affects musicians across the lifespan and is at least partially independent of years of training, practice, and level of musical accomplishment. It may or may not impair the quality of the musical performance. (Kenny, 2009b, p. 433; 2011 p. 61)

Some variables have been shown to affect levels of MPA in musicians, such as trait anxiety and performance settings (Kenny, 2011). However, authors do not always agree on the extent to which other parameters influence performers' anxiety. For example, aspects such as gender, age, musical background, and level of expertise have yet to show definite evidence of their impact on MPA. Indeed, Kenny's (2009b) definition provides no information regarding the impact of gender on MPA. This is due to the fact that findings reported in the literature are somewhat inconsistent. For instance, while Wolfe (1989) and Barbar, Crippa, and Osório (2014) did not find any significant relationships between gender and MPA in their studies, many researchers showed that women tend to report higher MPA levels than men (Brugués, 2011; Iusca & Dafinoiu, 2012; Kenny, Driscoll, & Ackermann, 2014; Khalsa, Shorter, Cope, Wyshak, & Sklar, 2009; Papageorgi, Hallam, & Welch, 2007; Wesner, Noyes, & Davis, 1990). When we examine the effect of age on MPA, findings are also contradictory. Wesner and colleagues (1990) did not find any evidence to support that age had an impact on MPA in music students and faculty, which is similar to Zakaria, Musib and Shariff's (2013) findings. However, the latter study was methodologically flawed because the authors only used music undergraduates, which limits the age range under study and also

compromises generalizability. In addition, they did not provide any information regarding their sample's age range, means, and standard deviation. Similarly with Wolfe (1989), Kenny and colleagues (2014) recently found that professional orchestral musicians over 50 years old had significantly less MPA than musicians under 30 years old and concluded that age was an independent predictor of MPA intensity. This was also reported in other studies such as those of Steptoe and Fidler (1987), and Liston, Frost, and Mohr (2003). These mixed results suggest that further investigations are warranted to confirm that gender and age may influence MPA.

Musicians' backgrounds include choice of instrument, years of musical training, level of expertise achieved, and performance setting. Few authors have studied how MPA affects performers based on their instruments, but those that had seemed to agree that significant differences exist in MPA levels depending on the type of musical instrument played (Iusca & Dafinoiu, 2012; Levy, Castille, Farley, 2011; Wolfe, 1989). Still, no distinction has been made between performing styles. Researchers acknowledge that years of training are not associated with MPA (Liston et al., 2003; Rae & McCambridge, 2004; Reitman, 2001), neither are musicians' levels of expertise (Brugués, 2011; Esplen & Hodnett, 1999; Zakaria et al., 2013). However, these findings have been mitigated by Biasutti and Concina (2014), who showed that advanced music students had higher MPA than professional musicians and that this could be partly attributed to experience. Brugués (2011) explained that although many musicians suffer from MPA regardless of their age, experience, and hours of practice, studies tend to overlook the fact that the students with severe MPA may decide not to pursue a musical career due to their inability to cope with stress. This attrition may influence study outcomes and provide findings that may or may not be adequate representations of the population of interest. Further studies are needed to provide evidence that years of training and level of expertise are associated with MPA.

The impact of specific performance settings on MPA has been studied at length in the 1990s and 2000s. It is not surprising to find that evaluative settings such as competition, solo performances, practical exams, and auditions generate higher MPA than non-evaluative or practice settings (Cox & Kenardy, 1993; Rae & McCambridge, 2004; Yoshie, Kudo, & Ohtsuki, 2009b). Ryan and Andrews (2009) found that solo

performances induced more anxiety than ensemble experiences and that playing in instrumental ensembles tended to produce more MPA than singing in choral ensembles. Kenny and colleagues (2014) studied professional orchestral musicians and ranked performance settings from the most stressful to the least stressful, starting with auditions, solo performances, chamber music performances, orchestral concert performances, and finishing with lessons or master classes, orchestral rehearsals, and individual practices. Although not entirely similar, this order is aligned to the one provided by Miller and Chesky (2004), who ranked solo jury, scale jury, studio class, small ensemble, lessons, and large ensemble in decreasing order of stressfulness. Performance settings often vary with the style of music performed. For instance, while jazz musicians may regularly perform in small (e.g. trios, quartets) and large ensembles (e.g. Big Bands), rock musicians tend to usually perform primarily in small bands. Others, like popular singers, are expected to be able to perform in a variety of settings, for instance as lead singer in a band, free-lance back vocalist, chorister, or musical theater performer. As for classical musicians, they may perform in solo, small ensembles (chamber music), or large ensembles (orchestras). We may thus wonder whether MPA is more or less detrimental in musicians that perform in a variety of settings as compared to those who do not.

MPA has been found to be associated with general anxiety, and especially with trait anxiety (Esplen & Hodnett, 1999; Hamann, 1982; Kokotsaki & Davidson, 2003; Papageorgi et al., 2007), a concept that originates from the State-Trait Anxiety Theory (Spielberger, 1972). Trait anxiety refers to the propensity of individuals to be generally anxious in daily lives or "to respond anxiously across a broad range of situations and experiences" (Kenny, 2011, p. 68), as opposed to state anxiety, which is associated with a temporary emotional state that is triggered by specific events and is "characterized by subjective, consciously perceived feelings of apprehension and tension, accompanied by or associated with activation or arousal of the autonomic nervous system" (Weinberg & Gould, 2007, p. 79). Kenny and Osborne (2006; Osborne & Kenny, 2008) identified trait anxiety as a predictor of MPA. This contradicts Wan and Huon's (2005) and Stephenson and Quarrier's (2005) prior findings: the former studied performance degradation under pressure using a sample of 72 novice musicians and found no relationship between trait anxiety and the effect of pressure, while the latter investigated anxiety sensitivity in

college students and reported that it better predicted MPA than trait anxiety. It is worth pointing out that Wan and Huon (2005) used non-musicians that they had specifically trained for the purpose of the experiment, which prevents generalization of their findings to true musicians, and Stephenson and Quarrier (2005) compared two constructs that are different (Kenny, 2011), but should not be considered mutually exclusive.

Research on the relationship between MPA and the style of music performed is somewhat limited (Papageorgi, Creech, & Welch, 2013), but recent studies have shown that classical and non-classical musicians tend to experience performance anxiety differently (Nusseck, Zander, & Spahn, 2015). Papageorgi et al. (2013) established that, at university level and beyond, classical musicians suffered from higher levels of MPA than musicians from other traditions, including jazz, popular, and Scottish traditional music. On the other hand, Nusseck and colleagues (2015) found opposite trends in MPA for young popular and classical musicians from 7 to 20 years old, with anxiety increasing with age for the former and decreasing for the latter. Perdomo-Guevara (2014) specified that non-classical musicians had less negative performance-related emotions than classical musicians. She also determined that the groups did not approach performances the same way: classical musicians were more self-oriented and less people-oriented than their non-classical counterparts. Perdomo-Guevara's (2014) research is among the firsts attempting to identify how these two groups of musicians differ in terms of performance anxiety. However, much remains to be done to study more systematically these populations and furthermore, to determine the extent to which performers who play both classical and non-classical music are affected by MPA.

Purpose. The goals of this study were to (a) investigate the relationship between MPA and musicians' gender, age, years of training, instrument, style performed (classical, popular, both), performance setting (solo, small ensemble, large ensemble, both solo and group settings), level of expertise, and general anxiety; and (b) further explore the distinctive characteristics of MPA as reported by classical and popular musicians. Here, the term 'popular' is used broadly to encompass all non-classical traditions (including jazz, rock, blues, folk, country, commercial music, and world music) and used interchangeably with the term 'non-classical' music.

Methods

Population and settings. Upon approval by the Research Ethics Board Office of McGill University, this study took place between 2012 and 2014. Participants were recruited through academic list servers, emails, and social media. A total of 241 respondents, aged between 19 and 81 years old, completed online versions of the PerfAIM and the STAI-Form Y (Spielberger, 1983). Complete demographic information appears in Table 5.1 and a cross-tabulation of instrumentalists by gender, age, musical style, and performance setting is provided in Table 5.2.

Inclusion criteria were to be 18 years old or over, to be fluent English or French speaker, and not to be following treatment that includes a daily use of psychotropic medication. An information sheet about the study was provided upon invitation to participate and musicians were considered to have provided their consent once they submitted the online questionnaire.

Table 5.1

Demographic Information

Males: *n* (%)	104 (43%)
Females: *n* (%)	137 (57%)
English-speaking musicians: *n* (%)	193 (80%)
French-speaking musicians: *n* (%)	48 (20%)
Age: *Mean (SD*)	39 (±17)
Years of musical training: *Mean (SD)*	14.9 (±10.9)
Musical expertise: *n* (%)	
- Beginner/Intermediate	51 (21%)
- Advanced	101 (42%)
- Expert/Professional	89 (37%)
Hours of practice per week: *Mean* (*SD*)	11 (±9.3)
Style performed*: n* (%)	
- Classical	123 (51%)
- Popular	72 (30%)
- Both	45 (19%)

Table 5.2

Cross-Tabulation of Instrumentalists by Gender, Age, Musical Style, and Performance Setting

	PerfAIM	***Gender(n)***		***Age group (n)***		***Musical style (n)***			***Performance setting (n)***			
Instruments	*Mean (SD)*	*M*	*F*	*18-34 yrs*	*35+ yrs*	*Clas*	*Pop*	*Both*	*Solo*	*Small ens.*	*Large ens.*	*Both solo & group*
Voice (*n*=35)	76 (26)	11	24	23	12	17	12	6	11	4	6	11
Arched strings (*n*=29)	73 (28)	7	22	23	6	22	5	2	1	12	9	6
Keyboards (*n*=52)	67 (32)	17	35	23	29	33	8	10	20	9	6	13
Plucked strings (*n*=31)	56 (29)	26	5	10	20	3	24	4	6	20	0	4
Woodwind (*n*=50)	56 (31)	17	33	22	27	24	15	11	0	12	29	8
Percussions (*n*=10)	54 (20)	8	2	5	4	5	4	1	2	4	2	2
Brass (*n*=32)	51 (25)	16	16	15	15	17	4	11	2	4	23	3
Total (*n*)*		**102**	**137**	**121**	**113**	**121**	**72**	**45**	**42**	**65**	**75**	**47**

* Some answers are missing.

Instrumentation. The Performance Anxiety Inventory for Musicians (PerfAIM) is a 44-item questionnaire divided into 24 statements. Of these statements, 21 are stand-alone items and three include sub-items. At the end of the PerfAIM, two open-ended questions about mental and physical conditions appear, as well as a comment box. Items are answered with a 5-point scale of intensity that goes from 0 (Not at all) to 4 (Greatly). Scores range from 0 to 176 for the entire questionnaire. For specific domains, ranges of scores vary: Causes, from 0 to 40; Temporal occurrence, from 0 to 36; and Symptoms, from 0 to 100. The PerfAIM is an inventory available in English and French that focuses exclusively on highly stressful performances. It has been demonstrated to be a valid measure among both classical and non-classical musicians. In a previous study (Chapter 4), we indicated that the internal consistency of the PerfAIM was excellent (Cronbach's α = .95) and remained consistent in the French version. We also reported robust test-retest reliability (ICC = .85). An exploratory factor analysis determined that PerfAIM's items clustered around four factors which predicted 52% of the variance: unpredictability, anticipation, threat to the ego, and decreased sense of control. These factors are aligned with the determinants of Lupien's theory, the NUTS Recipe for Stress

(Lupien, 2010; 2012), on which the PerfAIM is conceptually based and which states that stress responses are triggered by Novelty, Unpredictability, Threat to the ego, and a decreased Sense of control (NUTS).

The State Trait Anxiety Inventory, Form Y (STAI; Spielberger, 1983), is a 40-item questionnaire divided in two subscales of 20 items assessing respectively State anxiety and Trait anxiety. The State anxiety subscale evaluates situational anxiety using a 4-point scale of intensity ranging from 1 (Not at all) to 4 (Very much so), while the Trait anxiety subscale evaluates general anxiety using a 4-point scale of frequency ranging from 1 (never) to 4 (almost always). This measure is recognized in psychology as a screening tool for anxiety disorders and has also been widely used in music research to assess music performance anxiety (Brodsky, 1996; Osborne & Kenny, 2005; Widmer, Conway, Cohen, & Davis, 1997). The STAI has been extensively validated in the literature and shows good construct validity and high internal consistency (Ramanaiah, Franzen, & Schill, 1983). It is available in many languages, including English and French.

The STAI was used to distinguish anxious from non-anxious musicians in our sample. Cut-off values on the State and Trait anxiety subscales were determined by the norms reported in the STAI manual (Table 5.3, Spielberger, 1983).

Table 5.3

Cut-off Values between Anxious and Non-Anxious Performers based on Age and Gender

Trait Anxiety subscale			
	18-39 years old	40-49 years old	50+ years old
Male	35-36	35-36	33-34
Female	36-37	35-36	31-32

Results and Analysis

PerfAIM's scores were normally distributed as shown in Figure 5.1. The mean of scores was 62 (*SD* = 30) and values ranged from 9 to 158[1]. All the statistical analyses undertaken met the assumptions of normality, independence, and homogeneity of variance. However, findings from the exploratory analyses must be interpreted with caution due to the use of unequal sample sizes.

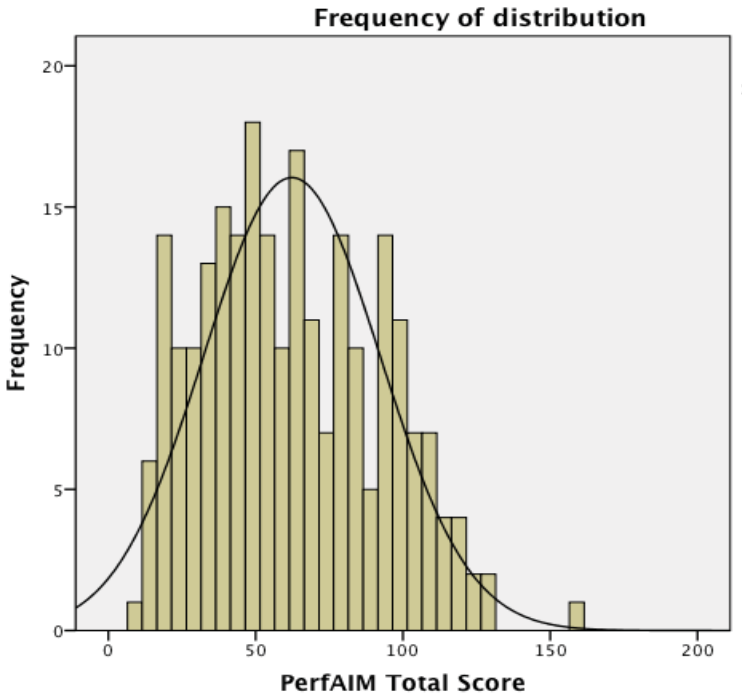

Figure 5.1. Frequency of distribution of PerfAIM's scores. Results are collected from 241 respondents (*M*=62, *SD*=30) and follow a normal curve.

MPA and general anxiety. All respondents completed both the PerfAIM and the STAI. Using the latter inventory to classify musicians as being either anxious or not anxious on the trait anxiety subscale, we performed *t*-tests to determine whether anxious and non-anxious persons differ in regards with MPA. Results from the *t*-tests confirmed that musicians who are generally anxious in their daily lives – i.e. those scoring higher than the cut-off values – had significantly more MPA than musicians who are not anxious in their daily lives, $t(228) = -5.97$, $p < .001$, $r = .37$. In summary, musicians with trait

[1] Means and standard deviations for each individual item are reported in Appendix 7 and classified by factors (biological, psychological, social), determinants of the NUTS recipe for stress (novelty, unpredictability, threat to the ego, sense of low control), and main themes.

anxiety tend to suffer from higher levels of MPA than musicians without trait anxiety (Table 5.4).

Table 5.4

PerfAIM Scores from Anxious and Non-Anxious Respondents based on STAI cut-offs

Trait anxiety	PerfAIM scores: *Mean (SD)*
Anxious	69 (28)
Not Anxious	46 (27)

MPA and gender, age, years of training, and instrument. A significant difference was found between men and women's scores on the PerfAIM, with male musicians reporting less MPA (M=55, SD=28) than female musicians (M=68, SD=31), $t(239)= -3.16$, $p < .01$, $r = .20$.

A one-way independent groups design ANOVA was performed to compare whether MPA levels were dependent of musicians' age. Participants were divided into four categories that correspond to main career stages: 18-24 years old (academic studies), 25-34 (beginning of the musical career), 35-59 (professional musical career), 60 and over (end of career and retirement). The ANOVA showed a significant effect of age on MPA levels in our sample, $F(3, 232)= 8.07$, $p < .001$, $\omega^2= .08$ representing a medium effect. Post hoc comparisons were carried out using Tukey HSD tests and showed that musicians between 18 and 24 years old (M=70, SD=30) and between 25 and 34 years old (M=72, SD=28) were significantly more anxious than musicians from 35 to 59 years old (M=56, SD=29) and from 60 years old and over (M=49, SD=28). No significant difference was found between the 18-24 and 25-34 age groups, nor between the 35-59 and 60+ age groups. Figure 5.2 shows the mean scores and standard deviations for each age group.

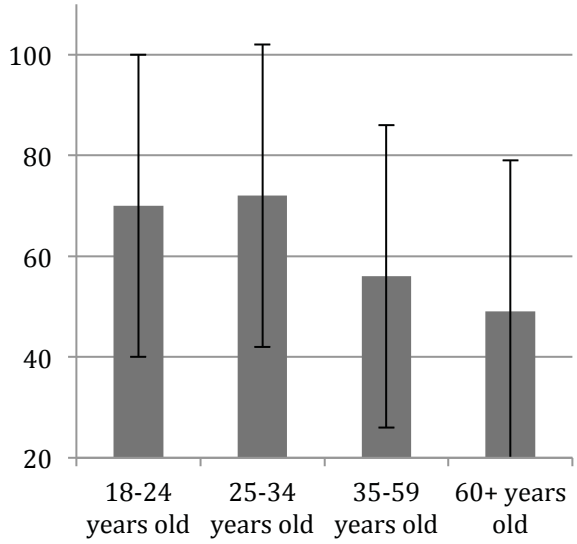

Figure 5.2. Mean PerfAIM's scores by age groups. Analyses show a statistically significant difference between younger musicians (aged 18 to 34 years old) and those older (aged 35 to 60 years old and above).

Another one-way ANOVA was completed to examine the relationship between years of training and MPA. No significant correlation was found between PerfAIM's scores of musicians with 0 to 9 years of training (M=67, SD=31), musicians with 10 to 15 years of training (M=61, SD=30), and musicians with 16 or more years of training (M=60, SD=29), $F(2, 238)= 1.47$, $p > .05$.

On the other hand, when looking at the relationship between types of instrument played and MPA, the one-way ANOVA proved to be significant, $F(6, 232)= 3.83$, $p < .01$, with a medium effect of $\omega^2= .07$. After carrying out a LSD post hoc analysis, we found that singers (M=76, SD=27) and arched string players (M=73, SD=28), who had the highest scores on the PerfAIM (Figure 5.3), both reported significantly more MPA than plucked string (M=56, SD=29), woodwind (M=56, SD=31), and brass players (M=51, SD=25). Singers' scores also significantly differed from percussionists' scores (M=54, SD=20). However, no statistically significant difference was found between the latter and arched string players. Most likely this is due to the small group size of the percussionists who participated (Table 5.2), which increased the error rate in this sample. The findings involving percussion players should thus be interpreted with caution. Keyboard players, who had the third highest scores, experienced statistically more MPA

than brass instrumentalists (*M*=67, *SD*=32). No other significant effect was observed between groups.

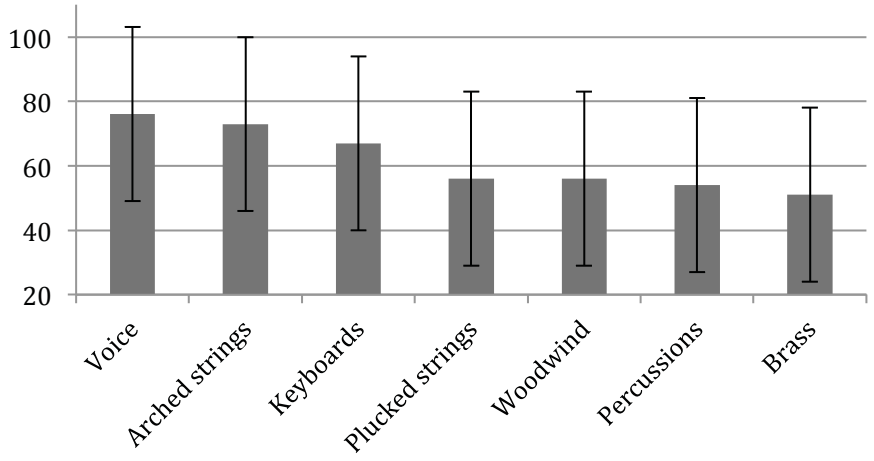

Figure 5.3. Mean PerfAIM's scores by type of instrument. This figure shows that singers have the highest scores, which significantly differ from plucked strings, woodwind, percussion, and brass players. Arched string players have more MPA than plucked string, woodwind, and brass players, but this difference is not statistically significant for percussionists. Keyboard players report significantly higher MPA than brass players.

MPA, performance setting and level of expertise. According to the literature, performance setting – i.e. performing in solo, small ensemble, or large ensemble – has an impact on MPA levels. We conducted a one-way ANOVA to compare levels of MPA in musicians performing primarily in solo contexts, in ensemble contexts (either small or large groups) or in a combination of solo and ensemble contexts. Statistical analyses confirmed that the setting in which musicians usually perform was correlated with PerfAIM's scores, $F(3, 227)= 3.20$, $p < .05$, $\omega^2= .03$. Using a Tukey HSD post hoc test, we found that musicians performing in solo (*M*=71, *SD*=31) had significantly more MPA than musicians playing in small ensemble of 2 to 8 players (*M*=55, *SD*=27). No other significant difference was observed when groups were compared with large ensemble (*M*=59, *SD*=30), or musicians performing in both solo and group settings (*M*=65, *SD*=29). Figure 5.4 summarizes the mean scores and standard deviations for types of setting.

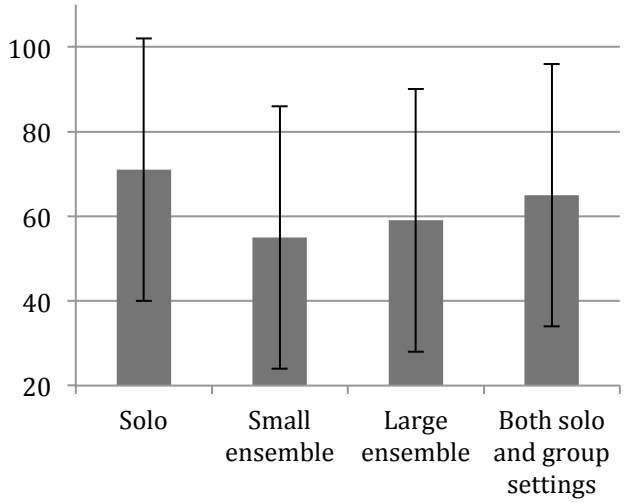

Figure 5.4. Mean PerfAIM's scores by performance settings. Results show that soloists have significantly more MPA than musicians performing in small ensemble settings. No other difference was observed.

A one-way independent groups ANOVA showed a significant effect of expertise on MPA, F (2, 238)= 5.30, $p < .01$, $\omega^2 = .03$. A Tukey HSD post hoc analysis demonstrated that experts (M=55, SD=26) had significantly less MPA than advanced musicians (M=68, SD=31). No other significant difference was found between the group of experts and the group of beginner/intermediate musicians (M=64, SD=33), neither than between the latter group and advanced musicians (Figure 5.5).

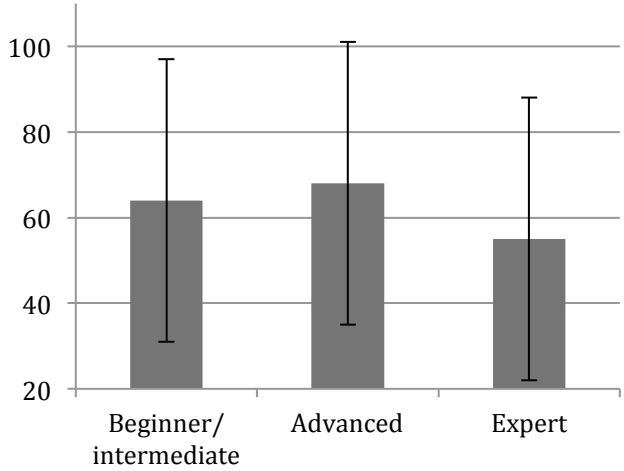

Figure 5.5. Mean PerfAIM's scores by expertise levels. A significant difference in MPA exists between advanced musicians and experts.

MPA and musical style. In order to investigate whether the main style performed (classical or popular[2]) had an impact on MPA, we performed a *t*-test. Results showed that classical musicians (*M*=68, *SD*=29) were significantly more anxious than popular musicians (*M*=58, *SD*=29) when performing, $t(193)= 2.23$, $p < .05$, with a small effect of $r = .16$.

Because many musicians playing both styles were excluded from this analysis, we decided to investigate further and to test whether there was a difference between musicians playing only classical music, those playing only popular music, and those playing both classical and popular music (*M*=53, *SD*=29). A one-way ANOVA confirmed that the samples significantly differed, $F(2, 237)= 5.29$, $p < .01$, $\omega^2= .03$. A LSD post hoc analysis identified that a significant difference existed between classical musicians and popular musicians, as well as between classical musicians and musicians playing both styles (Figure 5.6). No significant difference was found between popular musicians and those playing both styles. Results of this ANOVA must be interpreted with caution, though, because sample sizes were not equal.

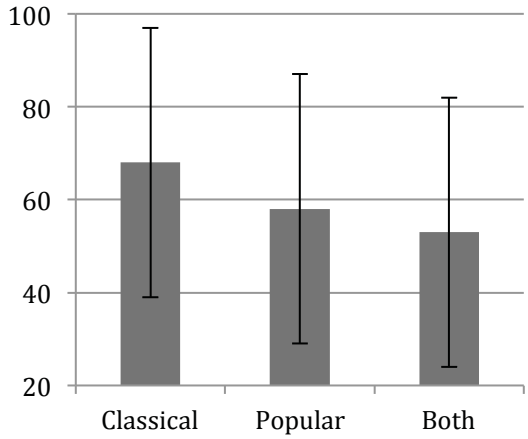

Figure 5.6. Mean PerfAIM's scores by musical style(s) performed. Classical musicians have significantly higher levels of MPA than popular musicians and musicians performing both styles.

[2] In this study, popular music includes all non-classical forms of music: folk, jazz, rock, commercial music, musical theatre, world music, and so forth.

Exploratory analyses of MPA parameters associated with musical style. Exploratory analyses were undertaken to investigate the correlations between MPA and the style of music performed within specific parameters.

Based on the fact that women reported higher levels of MPA than men, we chose to compare gender-related MPA across performing styles (Table 5.5). We found that men and women from the classical tradition had similarly high levels of anxiety, $t(121)= -1.25$, $p > .05$. Self-reported MPA among men and women performing both styles did not significantly differ either, $t(43)= -0.41$, $p > .05$. Only female popular performers were found to be significantly more anxious than male popular performer, $t(70)= -3.19$, $p < .01$, $r = .36$. When examining MPA levels among women exclusively, results confirmed a significant correlation between female classical musicians, female popular musicians and female musicians playing both styles, $F(2, 133)= 3.31$ $p < .05$, $\omega^2= .03$. The LSD post hoc test revealed that women playing classical music and women playing popular music were significantly more anxious than women playing both styles. No significant difference was observed between women performing exclusively classical music and those performing exclusively popular music as their mean PerfAIM scores were nearly identical.

Interestingly, the trend was different for men. First, no significant difference was found between groups of male performers specialized in classical, popular, or both styles, $F(2, 101)= 2.86$ $p > .05$. This result was attributed to the smaller sample size of the latter group and its greater standard deviation. However, when the 17 musicians performing both styles were excluded from the analysis, a difference appeared between the remaining 42 classical musicians and 45 popular musicians, $t(85)= 2.32$, $p < .05$, $r = .24$. This result indicates that male classical performers report experiencing significantly more anxiety than male popular performers.

Table 5.5

Mean PerfAIM Scores of Male and Female Musicians Based on their Performing Style

	Classical *Mean (SD)*	**Popular** *Mean (SD)*	**Both styles** *Mean (SD)*
Female	70 (31)	71 (30)	54 (28)
Male	63 (27)	50 (26)	50 (31)

To follow up on the result that younger musicians (aged between 18 and 35 years old) were more anxious than older musicians, we investigated whether MPA was significantly higher in the youths playing classical music (*M*=72, *SD*=29) than in the youths playing popular music (*M*=75, *SD*=28) and both styles (*M*=56, *SD*=23). No significant difference was identified, $F(2, 117)= 2.42$, $p > .05$. It is worth pointing out that because group sizes were unequal, results may be subject to some caveats. The literature indicates that music students tend to report higher levels of MPA than amateur or professional musicians (Biasutti & Concina, 2014; Barbar et al., 2014), so we examined whether classical and non-classical music students experienced the same amount of MPA or not. Our analysis demonstrated that music students playing classical music (*M*=74, *SD*=29), popular music (*M*=67, *SD*=23), or both styles (*M*=62, *SD*=27) had levels of MPA that were statistically similar, $F(2, 95)= 1.26$, $p > .05$.

Regarding performance settings, we compared whether performing styles influenced levels of MPA in soloists (who reported the highest scores on the PerfAIM) and in musicians performing in small ensemble (who reported the lowest scores). While no significant difference was found between soloists performing exclusively classical music (*M*=72, *SD*=31), popular music (*M*=72, *SD*=34), or both (*M*=66, *SD*=31), $F(2, 39)= .07$, $p > .05$, results almost reached significance when comparing classical musicians (*M*=63, *SD*=27), popular musicians (*M*=55, *SD*=26), and musicians performing both styles (*M*=39, *SD*=25) in small ensemble settings, $F(2, 62)= 2.98$, $p = .058$. This lack of significance may be due to the use of unequal groups. For instance, among the 42 soloists evaluated, 35 were classical musicians, eight were popular musicians, and four played both styles (which means that the low number of participants in the other non-classical categories most probably violated the assumption of normality). In the small performance group, sample sizes were more balanced but contrary to the solo group, there were more popular musicians (*n*=37) than classical musicians (*n*=17) and musicians playing both styles (*n*=13).

Findings from the exploratory analysis have to be interpreted with caution because the number of musicians in each group was unequal, which is known to increase the error rate considerably and may have affected the accuracy of the *F*-ratio (Field, 2009). Further analysis is warranted to confirm the exact nature of the relationship

between the style of music performed and MPA among female and male musicians, young performers, music students, as well as in specific performance settings (solo, small ensemble).

Discussion

The purpose of this study was to investigate MPA in association with specific parameters such as general anxiety, gender, age, musical background, and expertise among classical musicians, popular musicians, and musicians performing both styles of music.

Analysis of PerfAIM's scores showed that musicians classified as trait-anxious on the STAI (Spielberger, 1983) reported significantly more MPA than non-anxious musicians. This contributes to confirm that general anxiety is a predictor of MPA as previously shown in the literature (Esplen & Hodnett, 1999; Hamann, 1982; Kenny & Osborne, 2006; Osborne & Kenny, 2008; Papageorgi et al., 2007).

Performing style was an important element explored in this study. When the entire sample was compared, classical musicians reported higher levels of MPA than popular musicians, which concurs with Papageorgi and colleagues' (2013) findings. We also discovered a significant difference between classical musicians and those performing both classical and popular styles. It is interesting to point out that the latter showed lower mean scores on the PerfAIM than musicians performing exclusively popular music as well. Although correlations did not reach significance in this case, results proved to be statistically significant when comparing MPA among men and women separately. Indeed, we found that women reported experiencing significantly more MPA than men. This finding is similar to that mentioned by Iusca and Dafinoiu (2012) and Kenny et al. (2014), who assessed MPA levels in undergraduate music students and professional orchestral musicians respectively, as well as by Wesner and colleagues (1990), who examined both music students and faculty. To our knowledge, no study has investigated the nature of the gender difference observed between men and women with regards to MPA and performing style. Although only exploratory, our analysis showed that there was a difference in MPA between men and women performing classical, popular or both styles. In fact, female musicians performing exclusively one style (be it classical or popular)

suffered from higher levels of MPA than female musicians performing both styles. This suggests that women who specialize in only one musical tradition may feel more ego-invested, and thus more threatened in contexts of performance, than women who play in a variety of styles. A different trend was observed among men. In fact, classical male musicians were found to have significantly more MPA than their popular counterparts. It is worth noting that while popular musicians had a similar mean PerfAIM score than performers playing both styles in our analysis, the latter's smaller sample size and greater standard deviation affected the validity of the statistical analysis by decreasing the power, which resulted in a lack of significance when comparing male musicians performing in both styles with classical performers. Gender comparisons between classical, popular and both-style performers showed that men and women differed only in their experience of MPA if they played popular music. In this instance, female popular performers had significantly more MPA than male popular performers. Among classical musicians, both sexes suffered from levels of MPA that were high, whereas among musicians playing both styles, both sexes reported low levels of MPA. These findings suggest that the relationship between gender and MPA may be mitigated by musicians' performing style, which may also contribute to explain why mixed results have been previously outlined in the literature.

When looking at the association between MPA and age, our findings align with research stating that older musicians have less MPA than younger musicians (Kenny et al., 2014; Liston et al., 2003; Steptoe & Fidler, 1987; Wolfe, 1989). Multiple reasons may explain why MPA levels differ depending on the age of performers: older musicians may feel they have less to prove because their situation is more stable both professionally and financially (ego investment), they may be confronted with new and unfamiliar situations less often than younger musicians, they may rely on their vast experience to deal with challenges or issues, and so forth. In addition, musicians who greatly suffered from performance anxiety may have abandoned music careers during adulthood and therefore samples of older musicians are impacted due to attrition (Brugués, 2011). Another important element to point out is that three types of older musicians were studied in this project: active professional musicians, retired musicians, and elderly amateur musicians performing in community bands or choirs. It may thus be expected that these old adults

are not affected by MPA the same way as younger musicians are: their career is not at stake when they perform, they are not evaluated in exams or contests anymore, they do not have to compete with peers, etc.

No significant correlation was found between PerfAIM's scores and years of training, which had been previously suggested in the literature (Liston et al., 2003; Rae & McCambridge, 2004). According to Kenny's (2009b) definition, MPA is at least partially independent of years of training. Our findings reinforce the evidence that training is not an essential factor influencing MPA among musicians.

MPA was found to be directly associated with the type of instrument played. Our results indicated that singers and arched string players had the highest MPA scores and reported significantly more performance anxiety than plucked string, woodwind, and brass players. As shown in Table 5.2, the most anxious musicians were primarily female, relatively young (over 65% of them were aged between 18 and 34 years old), and mainly classical performers (about 50% of the singers and 75% of the arched string players were specialized in this musical style), which might also contribute to explain their heightened MPA. In their study on undergraduate music students, Iusca and Dafiniou (2012) found that singers and string players had higher MPA than pianists, wind instrumentalists, and brass players. While these findings mostly align with ours, we observed that keyboard players were the third most anxious performers in our sample and experienced significantly more MPA than brass players. Both our results and those of Iusca and Dafiniou reinforce Levy, Castille, and Farley's (2011) conclusion that brass players seem to display generally less MPA than other performers.

In accordance with findings in the literature (Cox & Kenardy, 1993; Kenny et al., 2014; Miller & Chesky, 2004; Ryan & Andrews, 2009), our study showed that solo performances generated higher levels of MPA than performing in small or large ensemble. Our exploratory analysis comparing classical and non-classical solo players did not provide any evidence that musical style influenced MPA levels. Indeed, all soloists reported elevated anxiety, no matter their chosen musical genre. Contrarily to previous studies showing that large ensemble performers experienced the lowest levels of MPA (Miller & Chesky, 2004; Ryan & Andrews, 2009), our analysis demonstrated that playing in small ensemble settings of two to eight musicians was considered the least stressful

condition. The fact that our sample was primarily comprised of popular musicians, who tend to perform much more often in small groups than their classical counterparts, may partially explain these findings. While smaller bands are the norm for popular performers – the comfort zone in which they thrive –, classical musicians might feel more comfortable in larger settings. This seems to be supported by Kenny and colleagues (2014) who investigated MPA in classical professional musicians and indicated that chamber music performances were considered more stressful than orchestral concert performances, ranking third after auditions and solo performances.

While being versatile in terms of musical style was shown to positively influence MPA in our study, being versatile in terms of performance settings did not. Indeed, musicians who indicated performing in both solo and group settings had a mean PerfAIM score that ranked the second highest, right after solo settings. Because the PerfAIM requires from the respondents to consider only the most stressful performance situations, it is probable that musicians have filled out the questionnaire thinking more about what they experience as soloists than as members of an ensemble. The relationship between performance settings and MPA has not been previously studied from the perspective of musicians who engage in both solo and group settings throughout their careers. There is a need for qualitative research to identify these musicians' perceptions about MPA and how specific performance settings may affect their ability to perform optimally. There may also be a link between performance setting and instrument played. In our sample, singers and keyboard players reported high MPA levels and were the only two categories of instruments where the majority of performers were soloists or combined solo/group settings. One may wonder whether the large number of singers and keyboardists in solo and solo/group settings might have influenced mean PerfAIM scores upward in this analysis. This would deserve to be investigated further.

Regarding levels of expertise, advanced musicians reported significantly higher MPA than expert musicians, which is similar to the findings of Biasutti and Concina (2014). No other significant difference was found between beginner/intermediate musicians and advanced musicians, neither than between the former group and expert musicians. This tends to confirm that MPA is partly independent of level of expertise, as suggested in Kenny's definition (2009b).

Educational considerations. People with trait anxiety have been found to suffer from MPA. Musicians would benefit from learning about stress management techniques early in their music training, not only to manage MPA but also for daily anxiety. The implementation of successful strategies for stress control would contribute to minimize the risks for musicians to abandon potentially promising music careers due to an inability to cope with anxiety (Brugués, 2011).

Competition is fierce in both classical and popular areas, especially because jobs are scarce and working conditions may be difficult (Cooper & Will, 1989; Vervainioti & Alexopoulos, 2015). Musicians from both musical traditions are confronted with a variety of stressors throughout their career and while some are similar, others are unique to each type of musician, as Raeburn (1999) explains:

> Classical musicians share some general stressors with popular musicians, of course, such as coping with the creative process, making a living in an extremely competitive arena, or enduring the strains of touring, but the differences may also be substantial. Major differences often exist in the areas of musical training and pedagogy, working conditions, values and beliefs, reference groups, social support, and risk-taking behaviours (p.172).

Our results seem to confirm that Raeburn's distinctions between classical and popular musicians are sound and that trends among men and women depend on their area of expertise. For instance, male classical musicians were more anxious than male popular musicians whereas female classical musicians had the same high levels of MPA than female popular performers. One may also wonder the extent to which the gender difference in MPA may be mediated by factors such as values and beliefs, reference groups, social support, and risk-taking behaviours. Further research is definitely warranted to explore these issues.

Investigation would be needed to determine whether being able to perform in more than one style (or becoming more versatile and accomplished in a variety of musical traditions) might be a useful strategy to help control MPA. Our findings suggest that classical musicians, because they tend to report high levels of MPA, could benefit from being involved in other musical genres. In addition, Perdomo-Guevarra (2014) showed that non-classical performers were generally more positive about performances, more people-oriented and less self-oriented than classical musicians. Classical musicians could build on these findings and use other musical styles to address performances from

new or different standpoints and to learn how to rationalize their experiences. For instance, what difference would it make for a classical musician having a memory blank to be able to improvise on stage? Would not it help a performer become more confident? What perspective could a popular musician bring to classical music and how could classical music enrich popular musicians' practices? Becoming more versatile in a variety of styles could expand horizons and provide insightful tips on how to approach performances.

Limitations. This study has some limitations that must be acknowledged. First of all, the relationship between gender and MPA may be more complex than what was first anticipated, and our findings seem to suggest that other factors tend to mitigate the experience of anxiety, among which the performing style in which musicians are specialized. In addition, one must not forget that gender differences may have been affected by the fact that men may be less likely to report suffering from MPA than women. As such, observational and experimental research would be needed to confirm the current findings. It is also worth pointing out that in keeping with previous studies in the field of MPA, gender was collected in self-report format in which participants were asked to identify themselves as either male or female. A category "other" was not included in our analysis, which may have limited the scope of our findings. Further studies investigating the relationship between gender and MPA should take into account not only the biological sex of participants, but also their gender identity.

Secondly, comparisons have been made between classical and non-classical musicians, but one is led to wonder where musicians performing in more than one musical tradition situate themselves. In terms of general stressors, Raeburn (1999) showed that classical and popular musicians shared some characteristics, but what about the reference groups of musicians playing both styles of music? Do they have a distinctive system of values and beliefs? Do they lean more toward one performance tradition than the other? Are their personality traits similar to classical or popular performers? Reflecting on the practice of these versatile musicians may provide new perspectives that could inform best practices in both fields of studies.

Thirdly, regarding statistical analyses and sample size, it is known that dividing a sample into categories with less than 30 respondents results in a weaker statistical

power, which means that findings must be interpreted with caution (Ferguson & Takane, 1989). In addition, unequal sample sizes may affect the normality and homogeneity of variance, which in turn may increase the risk of Type I error (falsely rejecting the null hypothesis or, in other words, getting a significant result while in reality no relationship exists) and may decrease the overall power of tests (in other words, the ability to rightfully detect a change; Ferguson & Takane, 1989). In our study, the assumptions of normality and homogeneity of variance were always met and we used at least 30 respondents per group in all but two instances: First, when analyzing the relationship between MPA and type of instruments, and second, when undertaking the exploratory analyses. In the first case, sample sizes varied from 10 respondents (percussion players) to 52 respondents (keyboards) per group. While we found a significant difference between singer and percussion players, none was found between percussionists and arched string players, although the latter group reported levels of MPA almost as high as singers. In the second case, the assumption of homogeneity of variance was met, but the use of unequal sample sizes violated the assumption of normality. Field (2009) explains that when group sizes are equal, the *F*-ratio is quite robust to violations of normality, but when unequal groups are used and normality is violated, the *F*-ratio may be biased. This study would thus need to be replicated with larger samples of equal sizes to confirm the findings suggested in the exploratory analyses.

Conclusion

The goal of the study was to investigate the extent to which MPA affected musicians based on parameters such as trait anxiety, gender, age, years of training, instrument, performance setting, and level of expertise, in the light of musicians' performing style. This study was the first to examine parameters influencing MPA in a large sample including not only classical and popular musicians, but also musicians embracing more than one musical tradition.

Authors have reported mixed findings regarding gender and MPA (Biasutti & Concina, 2014). Our analysis showed that MPA may be mitigated by the performing style of musicians, and that future studies should take into account men and women's area of expertise as a potential confounding variable when examining MPA. Our results

indicated that women had higher MPA than men and their scores were consistently higher than the men's on the PerfAIM. However, exploratory analyses demonstrated that when accounting for performing styles (classical, popular, or both), the only area where this difference reached significance was between male and female popular musicians. Among men exclusively, classical performers were found to be significantly more anxious than popular performers. Among women, while classical and popular musicians reported similarly high levels of MPA, women used to perform in more than one musical tradition demonstrated considerably lower MPA. Other noticeable findings from the current study involve significant differences in MPA found between age groups (younger versus older musicians), levels of expertise (advanced versus expert musicians), performance settings (solo versus small ensemble), and types of instruments (singers, arched string players, and keyboardists being the most anxious musicians, and brass players the least anxious).

While more research is needed to confirm the trends suggested in the exploratory analyses, results presented in this article provide a foundation for further study and offer new evidence that may contribute to the fields of music performance, music psychology, and music education.

Chapter 6

Original article

The effects of participating in community concert band on senior citizens' quality of life, health and performance anxiety

Abstract

Participation in music ensembles has been shown to have many positive effects on seniors' lives, including on perceived health, quality of life, mental wellbeing, as well as concentration, memory and social interactions. The goal of this study was to determine the extent to which participating in an intergenerational and bilingual community band had an impact on quality of life, mental health (anxiety and depression), physical health (respiratory function, blood pressure) and performance anxiety of senior citizens of 60 years old and over who were beginner musicians. From the 16 participants recruited to be part of the study, eight were musicians and eight formed the control group. Using a quasi-experimental design, participants were followed over 4 months of music instruction. Interviews, questionnaires, and physiological tests were carried out pre- and post-intervention for both the experimental and control groups. In the experimental group, blood pressure values were also collected pre- and post-rehearsal once a month, and music performance anxiety was assessed following concerts. Results were interpreted in the light of the Biopsychosocial model. Physically, self-perceived improvements in breathing and physical endurance were reported. Psychologically, benefits included increased wellbeing, cognitive stimulation, sense of purpose and identity, as well as overall enjoyment. Socially, positive outcomes included being part of a group, meeting new people, and keeping in touch or reconnecting with friends. A high level of satisfaction was reported among band members altogether, which concurs with findings from the literature. While no statistically significant difference was found between the experimental and control groups at the end of the intervention, the results seem to suggest positive trends in benefits for the experimental group. This lack of significance may be due to the small sample size and length of the intervention. Further contributions and pedagogical considerations are discussed.

Introduction

The world population is increasing in size and getting older. In Canada, it is currently estimated that the population of seniors will double in the next 25 years and that the proportion of elderly people in the general population will reach 23% by 2036 (Statistics Canada, 2011a; 2011b). Maintaining senior citizens' quality of life (QoL) thus becomes extremely important in order to promote healthy aging and potentially minimize health care expenditure (Davis, Gfeller, & Thaut, 2008).

Quality of Life and the Biopsychosocial Model. The World Health Organization defines QoL as the "individuals' perception of their position in life in the context of the culture and value systems in which they live, and in relation to their goals, expectations, standards and concerns" (Skevington, Lofty, & O'Connell, 2004, p. 299). Skevington and colleagues (2004) also describe QoL as a combination of the following indicators: physical health, psychological functioning, emotional wellbeing, social functioning, competence in the activities of daily living, financial resources, and environmental issues.

QoL is closely related to the Biopsychosocial model (Engel, 1980), which suggests that general health is influenced by three interacting factors (biological, psychological, and social), and that by understanding the dynamic relationships that link them together, one may help to promote and maintain individuals' health and wellbeing (Davis et al., 2008). For more details on the Biopsychosocial model, please see Chapter 2.

It is worth noting that the Biopsychosocial model's interactive nature is exemplified by phenomena such as anxiety, depression, high blood pressure, and reduced respiratory function. Indeed, because these issues are multi-faceted, they may have an overlapping impact on people. The following paragraphs illustrate the simultaneous interactions between these phenomena and how they relate to the biological, psychological, and social factors affecting seniors' health outcomes.

It is currently acknowledged that stress and anxiety decrease immune functioning when experienced for a prolonged period (Darrow, 2008) and are conditions that may be associated with depression (Hanser, 1985). The latter, which may have a direct impact on social interactions, is also an important factor related to quality of life. Indeed, Davis and

colleagues (2008) estimate that 20 to 45% of elderly people are affected by depression[1] and Darrow (2008) reports that "although depressive disorders are not highly prevalent among older adults, they pose serious consequences to health and levels of functioning, as a higher suicide rate is reported for this group than any other" (p. 140).

It has been shown that work-related stress, race, social environment, as well as emotional distress are factors that increase blood pressure (Kulkarni, O'Farrell, Erasi, & Kochar, 1998). In fact, anxious adults tend to have higher blood pressure levels than less anxious adults (Räikkönen, 1999) and high blood pressure is associated with increased risks of cardiovascular diseases in people over 50 (Chobanian et al., 2003). Regular physical activity has been recommended as an effective strategy to reduce blood pressure (Warburton, Nicol, & Bredin, 2006), even if it is known to spontaneously increase blood pressure (Palatini, 1988). Relaxation techniques are also being used to treat individuals suffering from hypertension (Zimmerman & Frohlich, 1990).

Lung capacity has been shown to decrease with age (Berry, 1974; Knudson, Lebowitz, Holberg, & Burrows, 1983; Peters, 2000). This may have a significant impact on physical health (biological factor) and on daily activities such as speaking (social factor) and walking. In addition, reduced pulmonary function may affect the circulatory system and the heart, and may increase the risk of pneumonia in seniors (McInnis-Dittrich, 2002).

Music, Health and Quality of Life. Research has showed that music has an impact on both health and QoL. Indeed, some studies have found that music may help to reduce blood pressure in healthy and clinical populations (Chafin, Roy, Gerin, & Christenfeld, 2004; Davis et al., 2008; Knight & Rickard, 2001), as well as to improve QoL and preserve some respiratory function in chronic and obstructive pulmonary disease patients (Bonhila, Onofre, Vieira, Prado, & Martinez, 2009). Taylor (1997) points out that "historically, the most widely accepted application of music as a therapeutic agent is its use as a calming agent to combat anxiety, tension, and stress"

[1] In Canada, the province of Quebec has the highest suicide rate in the general population (13.8 per 100 000 people, compared to 10.2 per 100 000 in the whole country; ISQ, 2010). While suicide ideations are lower among older adults than among other age groups (0.6% against 2.3% for people between 15-25 years old, 1.8% for people between 25-44 years old, and 2.2% for people between 45-64 years old), experts have established a strong relationship between suicide ideations and psychological distress (ISQ, 2010), the latter affecting 19% of older adults in Quebec (ISQ, 2012a).

(p. 102). More recently, new empirical evidence has been found, which supports that claim (Chafin et al., 2004; Hallam et al., 2010; Knight & Rickard, 2001). Using music to foster relaxation may be quite significant for healthy ageing. It is important to note, however, that studies assessing the impact of music on anxiety, depression, and quality of life have mostly been done in clinical settings (Burack, Jefferson, & Libow, 2008; Choi, Soo Lee, & Lim, 2008; Cooke, Moyle, Shum, Harrison, & Murfield, 2010a, 2010b; Eyre, 2011) rather than in healthy populations, and most of them have mainly focused on music listening rather than on active music-making. Therefore, further research is warranted.

Existing studies on participation in music ensembles have identified multiple positive outcomes for seniors, including perceived health, self-esteem, self-expression, sense of belonging, social interaction, and memory (Bruhn, 2002; Coffman, 2002; Creech et al., 2013a & 2013b; Hillman, 2002; MacDonald, Kreutz, & Mitchell, 2012; Skingley & Bungay, 2010; Solé, Mercadal-Brotons, Gallego, & Rira, 2010; Varvarigou, Hallam, Creech, & McQueen, 2012). Recently, researchers have also found that participation in intergenerational musical activities resulted in wellbeing improvements among seniors (Varvarigou, Hallam, Creech, & McQueen, 2011).

In their cross-national survey assessing QoL of choir members, Clift et al. (2010) found that singing was associated with improvements in wellbeing as shown by high average scores on the WHOQOL-BREF[2], a psychometrically sound questionnaire. Bailey and Davidson (2003) also reported enhancements in quality of life among homeless men singing in an amateur choir. However, the average age of these samples was below 65, which means that results may not be generalized to a population exclusively composed of seniors. In his study on seniors' participation in a two-year community choir program, Cohen and colleagues (2006) reported improved morale and a reduction in depression and loneliness in the experimental group as compared to a control group. Results came from self-reported assessments of general physical health and health services utilization rather than scientifically valid questionnaires. Davidson, McNamara, Rosenwax, Lange, Jenkins, and Lewin (2014) used standardized measures of health and wellbeing to examine the effectiveness of an 8-week singing program for community-

[2] (WHOQOL Group, 1998). For a description of the questionnaire, refer to the section "Measurements" below.

dwelling older adults, but results showed little effects on these outcomes. This lack of significance was attributed to the length of the intervention and the small sample size. None of these studies used physiological measurements. In addition, since studies were conducted with choirs, their findings might not be applicable to senior musicians playing in concert bands.

In her study on the pulmonary function of musicians involved in senior citizens' bands, Rohwer (2009) did not find a significant difference pre- and post-rehearsal when measuring the ratio of forced expiratory volume in one second to forced vital capacity (FEV_1/FVC), but still reported that 35% of the participants perceived an improvement in breathing capacity over time. This finding about instrumentalists' perception is in accordance with Smith, Kreisman, Colacone, Fox, and Wolkone (1990) who indicated that musicians have better respiratory perception and control than non-musicians. There is a need to do comparative studies with people who do not play music and "to have measurements from adult beginning instrumentalists who are just starting music instruction, so that baseline data could be obtained to see a clearer picture of cause and effect in relation to musical participation and pulmonary function improvement over time" (Rohwer, 2009, p. 13). Further investigations of the impact of playing a wind instrument on older adults' respiratory function is warranted, especially among beginner musicians.

As anxiety and depression may greatly affect QoL through psychological and physiological changes (Darrow, 2008), and as music may influence one's perception of QoL (Clift et al., 2010), it becomes essential to study thoroughly the relationship between these factors using both psychological (i.e. questionnaires) and physiological (e.g. blood pressure, breathing capacity) measures. Furthermore, one must not forget that music performance may also generate some anxiety, and studies to determine whether healthy seniors tend to report experiencing music performance anxiety (MPA) during community music concerts have yet to be undertaken.

The purpose of this study is two-fold: first, to determine the extent to which participation in community concert bands affects older adults' QoL, mental health and physical health; second, to investigate whether these participants suffer from MPA during an end-of-term concert.

Methods

A dual role: researcher and musical director. One of the authors had the dual role of researcher-practitioner in this project. Although this position brought some challenges, overall it greatly facilitated the data collection. It is worth pointing out that the authors do not consider this study to be action research even if it was conducted by a researcher-practitioner: no field notes were taken during the process, and no formal observations were recorded. That being said, Barbeau's dual role in this research project still informed the analysis of findings and this aspect is further detailed in the discussion section.

Protocol. Participants from the experimental group were members of the Montreal New Horizons Band, an intergenerational concert band created in collaboration with the New Horizons International Music Association and the Schulich School of Music[3]. Inclusion criteria were as follows: being 60 years of age or older[4], being fluent in French or English, not suffering from hearing loss severe enough to impair the ability to hear music, and not missing more than four rehearsals in a row during the 15 week period of the study (i.e. between January and June 2014). Participants needed to be healthy enough to ensure active participation and commitment. No audition was required: all members of the ensemble were expected to be beginners (as is often the case with New Horizons Bands).

The recruitment process took the form of a 10-minute presentation during a regular band rehearsal. Seniors were recruited on a voluntary basis during the third week of rehearsal: they were asked to put their name on a sheet to indicate their interest and were contacted by phone afterwards. A control group was also recruited through community partners (i.e. The Yellow Door and Action Centre-Ville) and participants' referrals. All subjects were met once at the beginning and at the end of the study for

[3] Senior members registered with the band were recruited in both French and English communities of the Greater Montreal Area, through advertisements in local newspapers and email invitations sent to seniors' associations (e.g. Lions Clubs, Heritage Club) and community centers (Yellow Door, Action Centre-Ville). Posters were also put up in local stores (groceries, drugstores, etc.) and at McGill University.

[4] Although many adults choose to retire earlier when possible, it is common in Quebec to retire at 65 years old as the retirement governmental pension plan starts at 65 years old (Retraite Québec, n.d.). While we are aware that other studies have investigated the benefits of music-making among people as young as 50 years old, we chose to study participants aged 60 and over to ensure that they would be most likely nearly or already retired.

individual semi-structured interviews, physiological tests and completion of questionnaires. All meetings took place in the Music Performance and Body Laboratory (Schulich School of Music, McGill University). In addition, the experimental group was met once a month for pre- and post-rehearsal measurements of blood pressure. After the end-of-term concert, these participants were asked to fill out the PerfAIM (Chapter 4) as part of their last interview and to discuss their experience of performing in front of an audience.

Measurements. Demographic information was collected (i.e. age, gender, height, weight, marital status, ethnicity, mother tongue, income, primary occupation before retirement, physical activity, use of medication) at the beginning of the study.

Semi-structured interview. A series of questions were developed for semi-structured interviews (Appendix 8) in order to get a broad overview of participants' lives at the beginning and end of the project. These interviews included questions on family and social relationships, recreational activities and daily routines, quality of life, and current emotional status (anxiety, depression). All interviews were audio recorded, transcribed, and analyzed using NVivo Software for Mac (version 10.2.0-1374, developed by QSR International).

Respiratory function. Forced vital capacity (FVC), forced expiratory volume (FEV) and forced expiratory volume in one second (FEV_1) were taken with a spirometer (MicroLab, Summit Technology). Measures were collected during the initial and final interview sessions for both the experimental and control groups, and consisted in two trials of three forceful exhalations, with a short break in-between, as suggested in the ATS guidelines on Standard of Spirometry (2005). The most valid measures were selected to calculate the ratios of FEV_1 to FVC that were used for data analysis. Descriptions of these measurements are provided in Table 6.1.

Table 6.1

Description of Respiratory Tests: FVC, FEV_1, and Ratio of FEV_1 to FVC

Respiratory test	Description
Forced vital capacity (FVC)	Total volume of air that is exhaled after a maximal inhalation and during a maximally forced expiration effort
Forced expiratory volume in one second (FEV_1)	Volume of air that is exhaled in the first second after a maximal inhalation and during a maximally forced expiration effort
Ratio of FEV_1 to FVC (FEV_1/FVC)	Percentage of forced vital capacity expired in the first second of FVC.

Higher numbers on all measurements indicate better pulmonary function.

Adapted from Rohwer (2009, p.11)

Blood pressure. During the initial interview session, blood pressure was taken as a baseline measure for both the experimental and control groups using a digital blood pressure monitor (Omron- HEM- 907XL model). These measures were used to screen the participants for hypertension and to verify whether both groups differed significantly. Final measures were taken to investigate whether blood pressure levels remained stable (or even decreased) over time in the experimental group as compared to the control group. Once every month (i.e. in March, April, and May), participants' blood pressure was tested pre- and post-rehearsal as well, to study short-term effects within the experimental group. All measurements were taken by the investigator, within half-hour of the rehearsal. As proposed by Powers and colleagues (2011), measurements were taken twice each time and the final set of data was the average of both blood pressure scores.

Questionnaires. Specific questionnaires were also used to assess quality of life, mental health (i.e. depression, anxiety), and MPA.

- The World Health Organization Quality of Life Questionnaire-Bref, or WHOQOL-Bref (WHOQOL Group, 1998; Appendix 9), is an abbreviated version of the WHOQOL-100. It is a 26-item questionnaire assessing four domains related to quality of life (physical, psychological, social, and environmental). Response options consist in 5-point Likert-type scales of intensity ('how much'), capacity ('how completely'), frequency ('how often') and evaluation ('how good' or 'how satisfied'; Skevington et al., 2004). Scores are expressed in percentages to facilitate interpretation between

domains. The WHOQOL-Bref possesses excellent psychometric properties (internal consistency scores have been shown to be .82 for the physical domain, .81 for the psychological domain, .68 for the social domain, and .80 for the environment domain; Skevington et al., 2004; WHOQOL Group, 1998). The WHOQOL-Bref was preferred over the well-known SF-36 questionnaire because of its effectiveness to assess global QoL, whereas the SF-36 focuses more on health-related QoL, a slightly different construct (Huang, Wu, & Frangakis, 2006).

- The Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996) is a self-report screening test consisting in 21 groups of statements answered on a Likert-type scale ranging from 0 to 3. The BDI takes approximately 10 minutes to complete and results range between 0 and 63. Scores may be interpreted as follows: between 0-13 (minimal depression), 14-19 (mild depression), 20-28 (moderate depression), and 29-63 (severe depression; Segal, Coolidge, Cahill, & O'Riley, 2008). Several studies have tested the internal consistency of the BDI with different samples, with results reported between .73 and .92 (Beck, Steer, & Garbin, 1988). It has been specifically validated with depressed geriatric patients (coefficient alpha of .90; Steer, Rissmiller, & Beck, 2000) and with community-dwelling seniors (coefficient alpha of .86; Segal et al., 2008).
- The State-Trait Anxiety Inventory Form Y, or STAI, (Spielberger, 1983) is made of two-subscales evaluating state (i.e. situational) anxiety and trait (i.e. general) anxiety respectively. Both subscales have 20 items that are answered with 4-point scales: the trait anxiety subscale uses a scale of frequency ranging from 1 (never) to 4 (almost always), and the state anxiety subscale uses one of intensity ranging from 1 (Not at all) to 4 (Very much so). This inventory acts as a screening tool for anxiety disorders, but it is also widely used in music to assess MPA (Brodsky, 1996; Osborne & Kenny, 2005; Widmer, Conway, Cohen, & David, 1997). The STAI has been extensively validated and shows good construct validity and high internal consistency (Ramanaiah, Franzen, & Schill, 1983), including with samples of seniors

(Bouchard, Ivers, Gauthier, Pelletier, & Savard, 1998; Kabacoff, Segal, Hersen, & Van Hasselt, 1997; Kvaal, Ulstein, Nordhus, & Engedal, 2005).

- The Performance Anxiety Inventory for Musicians (PerfAIM; Barbeau, 2011) has been designed and validated by the investigator. It has recently been revised, translated into French, and validated with both French-speaker and English-speaker musicians (Chapter 4). The revised version includes 44 items divided in 24 statements that are answered on a 5-point scale of intensity ranging from 0 (Not at all) to 4 (Greatly). Of these statements, 21 are stand-alone items and three include sub-items (respectively eight, six, and nine). At the end of the questionnaire, items 25a and 25b are short-answer questions about the respondent's general state of being regarding physical and mental aspects. The entire questionnaire takes approximately 15 minutes to complete. Computation of scores is done by calculating the total score, ranging from 0 to 176, and scores for each domain (i.e. Causes, Temporal Occurrence, Symptoms).

Ethical considerations. This project was approved by the Research Ethics Board-II of McGill University. All participants signed an informed consent form. Subjects in the experimental group were offered a 50% refund of their tuition fees (i.e. $48) as compensation for participating in the study and a financial compensation of $30 was given to each of the control group subjects.

Population. 12 participants of 60 years old and over were recruited for each group and matched by gender. During the study, one experimental subject withdrew from the band and three missed more than a month of rehearsal, so they were excluded from the analysis. In the control group, four subjects were also excluded because of health issues. The final sample included eight subjects in each group (see Table 6.2). In the experimental group, four participants had retired less than a month before joining the band while the others had been retired for at least a year before the beginning of the study. In the control group, one person retired a week prior the initial interview, five had been retired for at least a year, and two were still working full time. No participant had prior musical experience, except for three: Ian[5] (who was taking saxophone lessons with

[5] All names have been modified to preserve confidentiality.

a private instructor at the time of the study), Rick (who was playing trombone with another community band at the same time as with the MNHB), and Julia (who was a skilled amateur pianist but had never played flute before joining the MNHB). In any case, these three participants were still considered beginner musicians on their respective instruments at the time of the study.

Table 6.2

Demographic Information

*Subjects**	*Gender*	*Age*	*Ethnicity*	*Mother tongue*	*Marital status*	*Employment status*	*Instrument*
Experimental group							
Joyce	F	65	Caucasian	English	Married	Newly retired	Clarinet
Hal	M	63	Caucasian	English	Divorced	Newly retired	Flute
Julia	F	61	Caucasian	English	Single***	Newly retired, Part-time worker	Flute
Guy	M	61	Caucasian	French	Single***	Retired	Trumpet
Jade	F	66	Caucasian	French	Divorced	Retired	Oboe
Ian	M	65	Black	English	Separated ***	Retired	Saxophone
Sue	F	63	Caucasian	English	Common-law spouse	Newly retired	Clarinet
Rick	M	73	Caucasian	German**	Widow	Retired	Trombone
Control group							
Mary	F	63	Caucasian	French	Common-law spouse	Retired	
Emma	F	63	Caucasian	French	Divorced	Retired	
Ryan	M	62	Caucasian	English	Common-law spouse	Retired	
Lily	F	63	Caucasian	French	Single	Full-time	
Clara	F	61	Caucasian	French	Common-law spouse	Retired	
Beth	F	60	Asian	English	Separated	Retired	
Greg	M	60	Caucasian	English	Common-law spouse	Retired	
Tim	M	63	Caucasian	English	Married	Full-time	

*All participants' names were changed
** The interview was conducted in French
*** But with a partner

Data analysis. Using a quantitative approach, randomization tests (Dugard, File, & Todman, 2012) were used to determine whether there was a significant difference between the experimental and the control groups at the beginning and end of the project regarding anxiety, depression, quality of life, respiratory function, and blood pressure. Results were also analyzed for potential changes over time for the experimental and

control groups separately. All randomization tests completed for this study were analogous to *t* tests and ANOVA. It is worth noting that when samples are small, randomization tests are more appropriate than classical parametric tests. As Todman and Dugard (1999) point out:

> For single-case and small-n experimental designs, […] the use of procedures other than an appropriate randomization test, such as t-tests, analyses of variance, nonparametric (ranking) tests, or visual inspection, are all more likely to lead to invalid conclusions about the efficacy of treatments (p.73).

Qualitative analysis was also undertaken. Thematic analyses were done using the content of the interviews, in order to complement the answers provided with questionnaires and as a way to ensure that potential confounding variables were detected and taken into consideration in the data processing. Participants' answers were regrouped based on the interview questions (Appendix 10) and themes were identified and categorized in NVivo. Changes in individual participants were analyzed over time (before versus after the intervention) and results were compared between participants of the experimental and control groups.

Results and Analysis

Statistical analyses. The experimental and control groups were compared to determine if they significantly differed from one another at the beginning of the project and at its end. As expected, both groups were found to be similar at the beginning of the study regarding quality of life, anxiety, depression, respiratory function, and blood pressure. At the end of the project, no significant difference was observed between groups on any variables under study. In addition, no significant difference was found over time for both the experimental group and control group separately, although it is worth noting that some of the results almost reached significance in the experimental group ($p < .05$). The complete report of all computed statistical tests appears in Appendix 11.

Regarding respiratory function, randomization tests (analog to repeated-measures design of the null hypothesis stating that respiratory function did not change over time) gave 5.7% ($p = .057$) of a random sample of 2000 rearrangement statistics at least as small as the experimental value for FEV1 when comparing baseline (M=2.77, SD=.64)

versus final measurements (*M*=2.78, *SD*=.67), and 5.6% (*p* = .056) for the ratio FEV1/FVC (*M*=.78, *SD*=.06 *versus M*=.78, *SD*=.07). While these results are not below the 5% significance threshold (i.e. *p* > .05), there is still less than 6% of probability that changes observed in the experimental group pre- versus post-intervention might be attributable to chance. In other words, there is more than 94% of chance that these findings did not happened randomly.

Similar results were found for systolic blood pressure, where the null hypothesis that blood pressure did not change over time gave 5.6% (*p* = .056) of a random sample of 2000 rearrangement statistics at least as small as the experimental value when comparing baseline (*M*=126, *SD*=13) and final tests (*M*=120, *SD*=17). While blood pressure levels were not significantly different when collected once a month prior to and after rehearsals (Table 6.9), systolic BP was found to almost reached significance on the first month of measurements (i.e. March), with 5.8% (*p* = .058) of random sample of 2000 rearrangement statistics at least as small as the experimental value before (*M*=138, *SD*=28) versus after the rehearsal (*M*=137, *SD*=25).

Given the size of the sample and the length of the intervention, these results show a trend that would be worth investigating further with a larger sample and over a longer period of time.

Qualitative analysis. To avoid potential bias due to external parameters and to ensure that the experimental and control groups were comparable cohorts for the study, we examined whether participants were isolated or at risk of suffering from solitude, and whether they were physically active. In the experimental group, the amount of instrumental practice was analyzed as well as the participants' expectations toward the band experience.

Solitude. The risk of solitude was investigated by asking participants to describe their marital status, social interactions, daily routines, recreational activities, and so forth. Among the experimental group, participants were involved in volunteer work, part-time jobs, hobbies, and/or sports. However, some people (for instance, Rick and Guy) were at risk of solitude and loneliness because of few social interactions and/or lack of recreational activities. Rick also had lost his wife a few years previously and was still grieving. Sue and Hal were solitary persons, but did not seem to suffer from this. In the

control group, most participants did not seem to experience solitude, except for two individuals: Beth mentioned having very few friends and Lily missed her family and wished she had closer relationships with them. In addition, Lily, who was still working full time, mentioned at the end of the project that she had to take a mandatory leave of absence due to mental fatigue and overwork.

Physical activity. Participants were asked to describe their level of physical activity at the beginning and end of the project using a 4-point scale ranging from sedentary to very active. In the experimental group, all participants maintained the same level of physical activity, except for Guy and Jade who became more active. Both of these musicians mentioned that walking to and from rehearsal every week had been a way to increase their level of physical activity. In addition, Jade took a gym membership and a personal trainer one month before the end of the project, after a visit to the doctor who recommended her to make serious changes to her life habits in order to control her cholesterol level. In the control group, results were less consistent. Only three persons maintained the same level of physical activity (Mary, Clara, and Greg). Three others increased their activity levels (Emma, Ryan, and Tim) while Beth and Lily decreased theirs.

Home practice. To account for the amount of instrumental practice done during the research project, participants of the experimental group were asked to track the time spent practicing at home every week using a calendar of practice. The number of rehearsals missed was also recorded for each subject during the 15 weeks of the project. Results are summarized in Table 6.3 (Rick's calendar was not used because of missing data: he completed it for the first month only and reported exclusively the time spent in band rehearsals rather than during home practices).

Table 6.3

*Time Spent Practicing at Home every Week**

	Number of rehearsals missed over 15 weeks	Mean number of days practiced in a week	Mean practice time in min/day	Mean practice time in hours/week
Joyce	1.5	6.53	37.5	4 hours/week
Hal	2	4.80	35	3 hours/week
Julia	4 (non-consecutive)	5.00	42	3,5 hours/week
Guy	0	4.40	50	4 hours/week
Jade	0	6.93	37.5	4 hours/week
Ian	1	4.40	45	3 hours/week
Sue	3	4.33	26	2 hours/week
Rick	-	-		-

**Band rehearsals not included in calculation of practice time.*

Expectations. Participants of the experimental group were asked what were their expectations regarding the band experience at the beginning, and if these expectations had been met by the end of the project. They reported their reasons for joining the band, which included the opportunity to learn new things, to challenge themselves, and to have fun. A few misconceptions about musical ability and the overall learning process were also observed.

While most participants started the project with an open-mind and few expectations (if any), some chose to participate for the challenge or for the opportunity to learn. Joyce pointed out that she hoped:

> To learn something, and it doesn't matter how much, whether it's this much or this much [laugh]. And the challenge. It's just really interesting to kind of watch oneself learn and to see that my fingers always mix up F and D, even though I know perfectly well where they should go (laugh). [...] . Yeah just to challenge myself I think that was, yeah, those are my expectations and they are already met, so (laugh). It wasn't to become a clarinetist in a symphony, no! [Laugh] (Joyce, initial interview, l. 141-149, 02/12/14)

Most participants, like Sue, decided to get involved for the fun of it:

> I expect to know more about music, know what a… be able to make nice sounds on the clarinet… What a nice instrument. My goodness, what a nice instrument... To be able to make nice sounds, and to feel happy about the sounds I make, and be able to play little songs [...] That's what I expect- I expect to be able to do things that will make me happy and not have to stress about it (Sue, initial interview, l. 326-336, 02/21/14)

Joyce also mentioned that her decision to participate was motivated by the fact that she had always considered herself "not musical":

> It's funny, I'm comfortable saying this to everybody now but for years in my life I wasn't, so it must be a scaring kind of situation: I still can remember being in grade 5 and there was a class choir, and myself and, I think, one other person were asked not to sing 'cause we couldn't hold a tune', right? So I always defined myself as kind of incapable musically. So before I decided to do this, I had to decide also to park my ego somewhere else, you know, and just give it a try and if it worked it worked, and if it didn't work, it didn't work. And I think also one of the things I had decided I really wanted to do in retirement was to kind of do things that were out of my comfort zone, to kind of deliberately force myself to do that… and this fits (laugh), it fits really well! (Joyce, initial interview, l. 128-135, 02/12/14)

Jade also considered herself not musical; participating in the band was almost like a test:

> I didn't have expectations when I started. I came here mainly out of curiosity, telling to myself: if it doesn't work, it doesn't. Because being not musical, being not a music listener, being a person who never thought would touch an instrument, except maybe the harmonica but it was not becoming a reality, so I didn't have expectations. So it fulfilled everything… It has been much more than what I expected, because I didn't expect anything actually. (Jade, final interview, l. 301-307, 06/12/14)

It was quite interesting to realize that many adult band members had misconceptions about musical ability and musical learning: some, like Joyce, were told in their childhood that they should avoid making music and thus spent the rest of their adult life thinking that music was not for them. Others seemed to think that the efforts required to learn to play an instrument were not a normal part of the process and that if they were struggling, it was because the instrument was either defective or not meant for them. For example, Guy said: "I was disappointed at first because when I bought the trumpet, I wasn't able to make any sound, I became… It didn't make sense at all, so I thought that my trumpet wasn't good, that I've been swindled […] but it was my lips that weren't there! (laugh)" (Guy, final interview, l. 262-280, 06/10/14). Julia also had serious doubts about her choice of instrument:

> Well I don't think I understand how to breathe. This is one of my irritations- I don't know if it's a limitation or it's just like, I didn't quite get it yet. My daughters gave me flute lessons for mother's day but I haven't taken them yet, I might do it in the fall. And the other thing is- I'm not quite sure if I- I'm a candidate- I don't know if it's the shape of my mouth, or just I'm not doing something quite right, the embouchure- I'm not sure if I've got it right. I don't know if it's a limitation yet, or just I have to learn more. (Julia, final interview, l. 454-459, 06/09/14)

She and others had the tendency to overlook the amount of work required to achieve musical proficiency: when they watched professional musicians, they thought it looked

easy enough and they never reflected on the years of training necessary to reach this level of accomplishment.

> I never thought it would be as hard as it was. Truthfully? It was – to play the flute, I don't know – that guy who came from the States said it's one of the most difficult ones so... I don't know if it's true but I'm like "oh yeah there's gonna be fingering and blowing" but I never realized how hard it would be. […] What I noticed physically is this [participant raised her arms]. Like, I didn't know how tiring it would be to lift [my] elbows up level with my shoulders for a long period of time. It's physically taxing which surprised me. (Julia, final interview, l. 329-332 & 391-398, 06/09/14)

Fortunately, most participants took the learning process lightly and had a sense of humor. For example, Hal said:

> I'm very much aware that my fingering is not as good, particularly in the fast parts, I can't do it- I don't know whether I strained my little finger or not, but sometimes it would hurt. So I have physical limitations and limitations on what I could learn to do. I learned I could never be a professional flutist - that's for sure. Yeah [laughs] that was clear. (Hal, final interview, l. 332-339, 06/12/14)

Over the term, participants had to de-construct the way they perceived music as an innate concept to realize that it could be acquired and nurtured. They learned that playing an instrument was not a competency that some people had naturally from birth and others did not, but was instead a discipline that everyone could take on and enjoy at any time of life.

Quality of life. To explore QoL among participants, self-perception and state of happiness were analyzed, as well as the impact of learning music on general wellbeing and the relationship between music and social interactions.

Self-perceived QoL. During baseline and final interviews, participants had to describe what a good quality of life was for them. Elements of QoL that were frequently mentioned by participants in both the experimental and control groups were being healthy and having people around. For instance, Julia pointed out that "there's no good quality of life if you don't feel like you have some people around you that you love and that love you and so on, so you need to keep your ties with your family and friends" (Julia, initial interview, l. 212-214, 02/14/14). Other important elements were to not worry too much about life, to continue to have a sense of purpose even after retirement, to be financially stable, and to remain physically and mentally active.

Overall, self-perceived QoL remained stable over time, albeit minor changes. This longitudinal stability was shown by the consistency with which participants completed the WHOQOL-Bref (Table 6.4), with variations in scores pre- and post-study of only ± 5 points for most subjects.

In the experimental group, five participants reported higher QoL scores at the end of the intervention. While Rick experienced the most drastic change in QoL (with a decrease of 11 points from his original total score), Sue and Hal both showed greater QoL at the end of the study (with an increase of seven points). In the control group, five participants also reported higher QoL at the end with marked increases for Tim (19 points), Greg (12 points), Lily and Beth (7 points each). However, it is worth pointing out that these changes in QoL were not strong enough to be considered statistically significant.

Table 6.4

Baseline and Final Scores on the WHOQOL-BREF

Experi-mental group	D1. Physical Health		D2. Psychological		D3. Social relationships		D.4 Environment		**Total score**	
	Baseline	Final	Baseline	Final	Baseline	Final	Baseline	Final	**Baseline**	**Final**
Joyce	33	33	25	24	12	12	38	36	118	115
Hal	34	34	24	28	11	13	36	37	**114**	**121**
Julia	29	31	23	24	14	13	33	34	**107**	**110**
Guy	25	27	20	22	12	13	30	29	**95**	**99**
Jade	31	29	21	22	14	12	33	34	109	107
Ian	34	35	28	28	15	14	40	38	**122**	**125**
Sue	25	27	15	17	9	11	32	32	**88**	**95**
Rick	29	24	24	21	6	7	32	27	98	87
Mean (SD)	*30 (3.66)*	*30 (3.89)*	*22.5 (3.89)*	*23.3 (3.65)*	*11.6 (2.97)*	*11.9 (2.17)*	*34.3 (3.41)*	*33.4 (3.85)*	*106 (12)*	*107 (13)*
Control group	D1. Physical Health		D2. Psychological		D3. Social relationships		D.4 Environment		**Total score**	
	Baseline	Final	Baseline	Final	Baseline	Final	Baseline	Final	**Baseline**	**Final**
Mary	30	24	24	25	14	14	34	33	111	105
Emma	32	31	25	26	13	12	34	35	**113**	**114**
Ryan	32	30	23	22	13	12	34	34	110	107
Lily	31	32	21	25	11	11	31	32	**103**	**110**
Clara	34	31	23	23	11	12	34	35	112	111
Beth	30	32	23	23	13	15	36	39	**111**	**118**
Greg	31	34	26	29	13	15	37	40	**115**	**127**
Tim	23	28	17	20	4	7	24	29	74	93
Mean (SD)	*30.38 (3.25)*	*30.25 (3.0)*	*22.75 (2.76)*	*24.13 (2.75)*	*11.50 (3.21)*	*12.25 (2.6)*	*33 (4.0)*	*34.63 (3.58)*	*106 (13)*	*111 (10)*

Minor changes were also reported during the interviews. For instance, Joyce's perceptions did not change in terms of priorities (health ranking first, having people around in second), but at the end, she added the following aspects: peace at home, being able to go out and do things, and learning new things. Julia did not mentioned health as a component of QoL during the initial interview, but because she experienced problems of hypertension during the course of the study, her priorities changed at the end of the project.

State of happiness. Once participants had defined what a good QoL was for them, they were asked if they considered themselves happy. Answers provided at the beginning of the project were compared with those provided at the end. Joyce, Julia, and Ian qualified themselves as being happy and remained the same throughout the project. For the others (namely Hal, Guy, Jade, Sue, and Rick), they said they were happy at the beginning, but mentioned some concerns as well ('I am happy, but…'). Interestingly, at the end of the study, all of them said they were happy, without bringing back any of the concerns shared at the beginning.

In the control group, they all mentioned being happy and this remained stable at the end. Two participants made comments that were noteworthy. First, Emma described herself as being "not unhappy", which is slightly different than being happy. Mary, who was hospitalized during course of the study and who was on recovery during the final interview, said that she *chose* to be happy. "Choosing to be happy" may be interpreted in different and opposite ways: one may wonder if she was really happy or if she was simply not being true to herself and others; on the other hand, this may also suggest that she decided to focus on the positive aspects of her life instead of dwelling on the negative ones.

Learning music. The importance of learning and/or stimulating the brain was the reason for which Joyce and a few others joined the band in the first place. For example, Hal mentioned how aging and learning were interconnected with his musical experience:

> The point being that aging is a very... I'm faced with it every day, I guess, I can't say I dwell on it every day but I'm faced with it every day so being able to learn something new was something that I got a big thrill out of. […] Psychologically, some things changed in my brain. There's – new connections are being made in the… I can't remember right or left hemisphere, but they're being made, that were not there before (Hal, final interview, l. 301-309, 06/12/14).

Julia also shared this perspective about the benefits of music on the brain:

> I think it's good for the brain to do things like this- it's like, well music is good for the brain. Like, it makes you think- it's physically and mentally- it makes you have to do several things at once: the fingering and breathing and the reading the notes and the trying to be loud or soft and the dynamics and everything else- so I think psychologically it helps to keep your brain active and your nerve endings and so on. (Julia, final interview, l. 403-407, 06/09/14)

Music and social interactions. There was great enjoyment derived from participating in the band and from the social interactions resulting from it. Playing music and being with others made participants feel good. As Ian pointed out: "part of when you're there, it's not just to play - it's, you know, there's social interaction so that makes you feel better (Ian, final interview, l. 515-516, 06/09/14)". Hal went further and explained:

> Being part of something with other people is very important. I would- I think this experience is much better for me than, for instance, if I was gonna learn to play the piano or something like that with an instructor and then go and practice on my own. Maybe I would've kept it up and maybe I would've enjoyed it but, but it wouldn't have been nearly as satisfying an experience, I don't think. Because there's something about everybody together working towards the common goal. That's fun - that's a lot of fun. And when, you know, the trumpet section actually gets it right, it feels good. (Hal, final interview, l. 316-327, 06/12/14)

Participants like Julia, Hal, and Joyce commented about the fact that playing in the band was a good way to keep in touch with people on a regular basis and/or to reconnect with some friends. While all participants mentioned that during the 15 weeks of the study they did not have time to develop new true friendships, almost every one of them reported that they enjoyed meeting new people. Only Rick said that he did not observe any difference regarding his social interactions with others. Hal mentioned that because he already knew some of the band members, it may have prevented him from meeting new persons more quickly in the band. As for Joyce, she said that because it was so nice to meet her friends every week during band rehearsal, "it made it very easy to not reach out to other people" (Joyce, final interview, l. 854-855, 06/12/14). At the end of the project, Julia specified that given more time, persons that she described as "acquaintances" at that moment would have possibly became real friends.

Mental health. The specific mental health issues analyzed in participants were levels of anxiety and depression, as well as the sources of these issues. In the

experimental group, the effect of music on mental health was investigated in terms of anticipation (something to look forward to) and the impact of music on moods.

Anxiety. According to the STAI (Table 6.5), the experimental group was more anxious than the control group both at the beginning and at the end of the project. On the other hand, trait anxiety decreased a little over time for the experimental group, whereas it increased in the control group. In the experimental group, Julia, Guy, Jade, and Sue suffered from trait anxiety, which did not change over time. Rick had high trait anxiety at the end of the project, but not at the beginning. In the control group, two participants suffered from high trait anxiety throughout the study (Lily and Tim). Mary experienced trait anxiety at the beginning but not at the end, and Clara, the opposite.

Table 6.5

Baseline and Final Scores on the STAI

Experimental	**Trait anxiety**		**State anxiety**	
group	**Baseline**	**Final**	**Baseline**	**Final**
Joyce	26	29	23	24
Hal	26	27	25	24
Julia	**35**	**35**	37	30
Guy	**42**	**41**	28	27
Jade	**51**	**36**	24	21
Ian	22	23	23	25
Sue	**63**	**59**	**46**	34
Rick	31	**38**	24	33
Mean (SD)	*37 (13.25)*	*36 (10.36)*	*29 (7.84)*	*27 (4.35)*
Control group	**Baseline**	**Final**	**Baseline**	**Final**
Mary	**34**	30	25	22
Emma	24	30	26	20
Ryan	28	32	34	32
Lily	**40**	**35**	31	25
Clara	29	**35**	23	22
Beth	25	25	21	22
Greg	22	21	21	20
Tim	**49**	**47**	27	23
Mean (SD)	*31 (9.20)*	*32 (7.75)*	*26 (4.63)*	*23 (3.88)*

Cut-off values for adults 50+ years old (Spielberger, 1983)
Trait anxiety: 33-34 (men) and 31-32 (women)
State anxiety: 43-44 (for men and women)
Bold *indicates individuals who reached the threshold values of anxiety.*

Generally speaking, state anxiety was higher at baseline than at the end of the project, which suggests that participants of both groups may have been a bit nervous during the first interview. Only one participant, Sue, exhibited high state anxiety during

the initial interview. This is not surprising given her similarly high score on the Trait anxiety subscale.

Depression. Regarding depression levels as assessed by the BDI, no participant was considered as having moderate or severe depression, although Tim and Rick experienced mild depression at some point during the interview process (Table 6.6).

Table 6.6

Baseline and Final Scores on the BDI

Experimental group	**Baseline**	**Final**
Joyce	0	3
Hal	3	0
Julia	5	1
Guy	8	6
Jade	9	6
Ian	0	0
Sue	9	6
Rick	9	**14**
Mean (SD)	*5,38 (3,96)*	*4,5 (4,66)*
Control group	**Baseline**	**Final**
Mary	5	7
Emma	3	0
Ryan	0	3
Lily	8	1
Clara	3	6
Beth	2	3
Greg	1	0
Tim	**18**	4
Mean (SD)	*5 (5,81)*	*3 (2,62)*

Score interpretation (Beck, Steer, & Brown, 1996):
0-13 (minimal depression); 14-19 (mild depression)
20-28 (moderate depression); 29+ (severe depression)

Sources of anxiety and depression. The sources of anxiety and depression were generally similar in both the experimental and control groups. They related primarily to family issues, which seemed to affect participants particularly deeply. For Rick, it was the lost of his wife a few years back, for Hal, the relationship with his son, and for Julia, worries about her daughters. Sue was particularly sensitive to family issues as she had a difficult childhood: **"**when somebody in my family is having a hard time, I get- I absorb it and get very depressed […] Part of that is because if I think of family and my childhood, I instantly get depressed. It was very hard" (Sue, initial interview, l. 250-254, 02/21/14).

Other concerns included financial stability, health, and fear of the unknown. The latter was especially significant for newly retired participants like Julia:

> What's stressful for me is that everything is new. Every- well not everything, obviously I still have my children and I still have my boyfriend and things like that. But the actual procedures - I don't know what word to use [laughs] - in my life they're all new, so, something as simple as "how am I going to manage or structure my finances", it's not simple […] The band is the same thing: it's new, and I could end up loving it, but right now it's very new and so it's a struggle to learn and so on. (Julia, initial interview, l. 272-276 & 285-287, 02/14/14)

This fear of the unknown was also related to the need to develop a new identity for one's self and to the importance of having and maintaining one's sense of purpose in life, even after retirement. For instance, Julia said at the end of the project:

> The thing that sometimes bothers me about the retirement is to have an identity that is meaningful to you. And when you're working full-time, you- whether you like your job or not, you have an identity well- "I am this and I'm doing that". Sometimes you might be annoyed you don't think it's useful enough - whatever it is you're doing- but I think when you're retired you need to get an identity too. Like some people do it by volunteering or by babysitting their grandchildren […]. So I guess a little bit I'm still searching for my identity except because I had that job half the time, it wasn't quite possible to find another purpose. But I think people want to feel useful - not just always enjoying themselves by reading a book or whatever. (Julia, final interview, l. 178-87, 06/09/14)

Based on some of the comments from the participants in the experimental group, active music-making was a way to feel that they could contribute. In fact, Sue and Jade both compared music to other creative activities that made them feel useful.

> I would feel bad if I weren't doing something most of the time. So I think it's really important to do something that's creative in some way. Like the needlework or the music or the bread baking- I consider them all creative so I think it's important to do something where something changes from one state to another, and at the end you can see something that's happened: that's very important. (Sue, initial interview, l. 193-198, 02/21/14)

> It's fun to be in a group, to share. I don't expect to become a professional oboist – Is this how we say it, oboist? – but just for fun, you know, just to try. It's like knitting: you start with a ball of wool that is basically nothing, and at the end you make something pretty. So I think that's it, music is the same. With keys, at the beginning you don't know what to do with them, you don't even know how to blow in it, and then all of a sudden, you can play "Au clair de la lune"… not perfectly of course, but you made the notes of "Au clair de la lune"! (Jade, initial interview, l. 274-282, 06/12/14)

As for Joyce, she made the parallel with her previous working environment and how she used active music-making and volunteering as strategies to keep her sense of purpose after retirement.

> I can see that in retirement, that sense of… you know if you're going to work it can be frustrating but you can usually come home and say you have accomplished "x" even if you think that "x" was a waste of time (laugh). It's a little bit harder to find that in retirement. I mean, you know the fact that I did laundry is fine (laugh) you know it needed to be done, but it doesn't kind of give you that sort of, that kind of satisfaction. But I guess I have avoided being in that situation by becoming a guide and doing the clarinet. (Joyce, initial interview, l. 110-115, 02/12/14)

Music as something to look forward to. It was clear for almost all participants in the experimental group that being part of the band was something they awaited every week. Joyce mentioned: "It always became something to look forward to in the week- again a sort of goal, you know?" (Joyce, final interview, l. 839-340, 06/12/14). Jade specified that, even when she did not feel like leaving her home to go to rehearsal, she always found the will to do it:

> I am looking forward to Tuesday evenings. There were nights, I must say when it was cold and all, and "ah, should I go?" But I've always found – I think I only missed once – I always found the energy after all to say "No, I'm going". And I've always been happy after, always happy to be, to have made the effort to say "yes, I'm going". (Jade, final interview, l. 384-389, 06/12/14)

At the final interview, Sue had a breakthrough when she realized how playing music made her feel:

> It always made me feel good. I didn't realize that until I said it just now. […] I don't think I ever... felt that I- that the... [Hesitation]... No I never felt negative about it. There might have been times when I would've preferred to stay at home- but I... it was a tremendously positive experience. Because I would- I always came to class - except when I wasn't - when I had something else that I had to do. And class went like that- 'cause it was so much fun. And I'd leave and I felt really good when I'd left. When I practiced, I felt good. Overall, it was extremely positive. (Sue, final interview, l. 512-521, 06/11/14)

Music and its impact on mood. A variety of emotions were experienced throughout the learning process. Several participants found that music had a relaxing effect, while a few others struggled with frustration and disappointment at some point. These emotions reflect the fact that music learning is not a static endeavor but a rather dynamic one.

Music as a calming agent. For most participants, playing music was perceived as a positive and soothing experience. During the initial interview, Jade explained how music-making affected her in a relaxing way:

> I always admired people that played music, musicians. I always admired musicians. It's an art really really… It's beautiful. It brings peace, it brings… you know, you attend a concert and you're like 'Ahh' [sigh of satisfaction]. It's… yeah. So for me, it's… that's how it feels. (Jade, initial interview, l. 283-287, 06/12/14)

At the end of the project, despite the fact that she had experienced music performance anxiety during the concert, she specified that participating in the band was enjoyable and not stressful:

> I think it's fun. It's fun, we enjoy ourselves. We don't feel stressed, like a kid at school who has to pass a test at the end of the year. For me, you know, the concert is like the big test (laugh). But, it's this, a group who has fun together. Anyway, I cannot describe it in any other way, it's beyond words. Yeah, that's what it brought to me, what it brings me. (Jade, final interview, l. 291-296, 06/12/14)

As for Hal, playing music was an experience he always wanted to try. As a beginner musician, he did not want to stress about it or put pressure on himself. He also found it very convenient to join the band and learn music right after retiring.

> So the music was something I always knew I would do and it's wonderful that it's come along when it did because it gives me the structure, and group activity makes it very good too. And because I'm a neophyte, I don't feel the stress. So that's - it's because I've always wanted to do it and it happened at the perfect time- just when I… My first week of retirement is when I could start the music, so... that's good! (Hal, initial interview, l. 221-225, 02/13/14)

Music as generator of anxiety. Despite the efforts to promote a low-stress learning environment during the experiment, sometimes participants became emotionally entangled. One of the best descriptions came from Julia who illustrated perfectly the frustration she experienced during the learning process:

> Sometimes it made me really irritated [laughs]. In the very beginning like I thought it would put me in a good mood but in the very- well not the very beginning- but the first half, sometimes I didn't wanna look at the flute, and I had to force myself to practice and I would find myself saying "after I do the laundry"- "after I do the dishes" - "oh maybe I can practice the piano for 15 more minutes- oh too late now I have to go to bed". Because I really felt irritated and discouraged. And even now- it's inconsistent. I could practice one day and I feel quite good- I never feel very excellent 'cause I never do what I wanna do - but I could feel "oh that's not too bad, I think I'm getting that". And then the next day - I have no idea why- it will be worse and sometimes I almost wanna cry or I whine [laughs] (Julia, final interview, l. 415-432, 06/09/14)

Participants also felt overwhelmed sometimes, which created a bit of stress. Joyce explained:

> Well there were times when the clarinet made me stressed and anxious- not really, really stressed and anxious, but- but... if I'd come to a practice and I just feel like it was way over my head [laughs]. And that didn't happen all the often. But that was a little stressful. It just made me go home and practice longer, but... It obviously wasn't a negative enough stress for me to stop doing it, right? It must have been an inspirational stress, you could say. (Joyce, final interview, l. 474-479, 06/12/14)

Teaching adults also meant managing the expectations of some participants who set very high standards for themselves, who were perfectionists, and who had been used to be expert in their fields but now realized that with music, it was different. Fortunately, the group dynamic helped participants like Sue to overcome these issues:

> When I'm by myself I start to get hard on myself and think I should do better and I can't play the high notes and I'll never get that good. But when I'm in the group, I'm thrilled with what we do. (Sue, initial interview, l. 316-318, 06/11/14)

Sue also mentioned that she was afraid of speaking French in the band but found out it was not as bad as she first thought it would be:

> People tell me I speak French very well, but I'm terrified- I'm terrified to speak French. And so... So I got along very well, but I was afraid all the time. But even that got better, you know? Because I would try and people were ok. So I- everything turned out better than I expected it to turn out [laughs]. (Sue, final interview, l. 419-423, 06/11/14)

Bilingualism was an element that was greatly appreciated by participants, especially from Joyce, Rick, Irvin, and Guy who indicated that it was fun to learn musical terms in both French and English.

Physical health. Physical health was assessed in order to determine whether playing a wind instrument had an impact on participants' respiratory function and blood pressure.

Respiratory function. Results from spirometry tests were all in the normal ranges, except for Guy who showed signs of mild obstruction. While values were higher in the experimental group, respiratory function remained stable over time in both groups (Table 6.7). No evidence was found to show significant changes. However, participants in the experimental group became more aware of their breathing and how they could exert voluntary control over it. Sue explained how she experienced this:

> I would pay a lot more attention to my breathing- at all times. You know- I'd breathe and then I'd think about breathing... I'd think about intercostal muscles, and I would, you know, I'd... So I think it gave me some opportunities to pay attention to my posture and my breathing and even physical strength, yes. Not so that I'd, you know, had to train for it- but I think it made me aware and it had a positive effect on those things. (Sue, final interview, l. 502-507, 06/11/14)

Joyce and Julia also commented on the fact that they knew what they had to do, even though they could not fully control their breathing yet:

> Well I learned how to breathe differently- when I remembered how to do it. But theoretically, I learned how to breathe differently. (Joyce, final interview, l. 844-845, 06/12/14)
> I think I don't have the breathing right. I think that's a physical challenge but I didn't quite get it yet. (Julia, final interview, l. 390-391, 06/09/14)

Table 6.7

Baseline and Final Spirometry Tests

	FVC		**FEV1**		**Ratio FEV1/FVC**	
Experimental group	Baseline (liters)	Final (liters)	Baseline (liters)	Final (liters)	Baseline (%)	Final (%)
Joyce	3.33	3.19	2.71	2.8	81	88
Hal	4.46	4.24	3.34	3.28	75	77
Julia	3.01	2.98	2.27	2.32	75	78
Guy	2.86	2.91	1.94	1.85	68	64
Jade	3.16	3.48	2.66	2.62	84	75
Ian	4.08	4.1	3.51	3.5	86	85
Sue	2.82	2.85	2.17	2.16	77	76
Rick	4.44	4.63	3.59	3.71	81	80
Mean (SD)	*3.52 (.70)*	*3.55 (.69)*	*2.77 (0.64)*	*2.78 (.67)*	*78 (±6)*	*78 (±7)*
Control group	Baseline (liters)	Final (liters)	Baseline (liters)	Final (liters)	Baseline (%)	Final (%)
Mary	2.09	2.13	1.73	1.61	83	76
Emma	3.12	3.2	2.48	2.44	79	76
Ryan	3.43	3.42	2.78	2.8	81	82
Lily	2.81	3.25	2.67	2.84	95	87
Clara	2.81	2.85	2.16	2.18	77	76
Beth	2.33	2.34	1.92	1.92	82	82
Greg	4.09	4.21	3.2	3.08	78	73
Tim	3.81	4.46	2.94	3.34	77	75
Mean (SD)	*3.06 (.69)*	*3.23 (.82)*	*2.49 (.51)*	*2.53 (.59)*	*82 (±6)*	*78 (±5)*

Blood pressure. Blood pressure was taken at baseline and at the end of the project, but no general trend was found (Table 6.8). In the experimental group, systolic BP (the top number) decreased or remained stable over time for Joyce, Hal, Guy, Jade, Sue and Rick, while it increased a little for Julia and Ian. In the control group, results

were divided: four participants had reduced systolic BP at the end (Mary, Lily, Beth, Tim) against four who showed increases (Emma, Ryan, Clara, Greg).

Diastolic BP (the bottom number) was not very consistent: it decreased for Joyce, Hal, Jade, Sue and Rick, and increased for Julia, Guy, and Ian. In the control group, it decreased for four subjects (Mary, Emma, Ryan, Tim), remained stable for Lily, and increased for Clara, Beth and Greg. The preliminary hypothesis that BP would be maintained or reduced at the end of the project in the experimental group proved to apply only to five out of eight participants (Joyce, Hal, Jade, Sue. Rick). In addition, results were mitigated as reductions in BP were also observed for three participants from the control group (Mary, Lily and Tim,). A larger sample would be needed to investigate the relationship between active music-making and blood pressure and to determine whether a trend exists or not.

Table 6.8

Baseline and Final Blood Pressure Tests

Experimental group	**Systolic / Diastolic**	
	Baseline	Final
Joyce	**109/62**	**102/58**
Hal	**139/93**	**139/87**
Julia	124/64	126/71
Guy	**139**/74	**133**/76
Jade	**136/70**	**136/66**
Ian	114/62	115/72
Sue	**136/75**	**121/68**
Rick	**110/63**	**91/58**
Mean (SD)	***126*** *(13)*	***120*** *(17)*
	70 *(11)*	***70*** *(10)*
Control group	Baseline	Final
Mary	**152/81**	**132/78**
Emma	123/**78**	125/**67**
Ryan	129/79	134/75
Lily	**111/58**	**102/58**
Clara	102/56	112/59
Beth	108/60	**107**/62
Greg	123/76	134/84
Tim	**124/67**	**113/51**
Mean (SD)	***122*** *(15)*	***120*** *(13)*
	69 *(10)*	***67*** *(11)*

During final interviews, participants identified specific benefits (psychological, social, and/or physical) that they had observed throughout their involvement in the band. Jade noticed the reduction in her blood pressure post- versus pre-rehearsal: "Well I think we realized it when… after. We collected blood pressure before/after, and it was lower after" (Jade, final interview, l. 395-396, 06/12/14). She was the only one to whom this happened during the three consecutive months of testing (Table 6.9). Guy showed a similar tendency, although his diastolic BP increased post-rehearsal in April. Hal and Rick also experienced lower BP levels post-rehearsal, but only in May.

Table 6.9

Pre- and Post-Rehearsal BP Tests (Experimental Group)

Month	**March**		**April**		**May**	
Rehearsal	*Pre*	*Post*	*Pre*	*Post*	*Pre*	*Post*
Joyce	101/63	108/65	105/**60**	106/**57**	100/59	111/73
Hal	143/93	155/99	131/83	136/89	**133/86**	**132/83**
Julia	186/91	176/93	153/74	153/75	136/70	139/72
Guy	**151/89**	**135/78**	**144**/74	**142**/75	**133/75**	**126/70**
Jade	**147/79**	**139/74**	**152/85**	**140/73**	**145/78**	**137/71**
Ian	124/65	112/70	126/64	129/71	121/67	126/76
Sue	146/77	156/84	140/73	152/75	150/77	143/78
Rick	104/63	114/67	115/65	120/67	**130/77**	**115/53**
Mean (SD)	*138(28)*	*137(25)*	*133(17)*	*135(16)*	*131(15)*	*129(11)*
	78 (3)	*79(5)*	*72(9)*	*73(9)*	*74(8)*	*72(9)*

Top number: Systolic BP
Bottom number: Diastolic BP

For Joyce, Julia, Sue, and Ian (and to a certain extent for Hal and Rick), BP levels tended to be higher following the rehearsals. Joyce explained:

> Physically [laughs] well- actually, I tend to be kind of cold-blooded- with the low blood pressure, I guess. And it was a great heat source- you know, I get hot when I'm practicing, 'cause you're breathing in a lot. So I'd always warm myself up when I practice [laughs]. (Joyce, final interview, l. 840-843, 06/12/14)

It is acknowledged that physical activity heightens BP level, and according to the literature, blood pressure is also known to increase with emotional distress. Both Joyce and Julia mentioned previously that while learning to play music they experienced periods of stress and/or frustration. These could therefore potentially explain why BP values increased post-rehearsals.

Music performance anxiety. In a study on MPA conducted with 241 musicians between 19 and 81 years old (Chapter 5), the average scores indicated on the PerfAIM were 62 (*SD* = 30, range 9-158) for the entire sample and 49 (*SD* = 28, range 9-110) for the 41 musicians aged 60 years old or over.

In the current study, the experimental group had scores ranging from 14 to 90, with a mean score of 57 (*SD* = 23), with women reporting higher levels of MPA (*M*=64, *SD*=21) than men (*M*=50, *SD*=27). When looking at domains, mean score for symptoms of MPA was 27 (*SD*=13), mean score for causes was 19 (*SD*=9), and temporal occurrence, 11 (*SD*=6). Results are summarized in Table 6.10.

Table 6.10

PerfAIM's Scores

Exp. group	*Causes /40*	*Temporal Occurrence /36*	*Symptoms /100*	***Total score**/176*
Hal	4	2	8	14
Sue	21	7	16	44
Joyce	24	11	15	50
Rick	16	9	28	53
Guy	15	9	32	56
Julia	22	16	34	72
Ian	19	21	38	78
Jade	34	10	46	90
Mean (SD)	*19 (9)*	*11 (6)*	*27 (13)*	*57 (23)*

All participants, except for Hal and Sue, scored higher on the PerfAIM than the mean score for people of 60+ years old shown in the previous study (Chapter 5). Nevertheless, their scores were lower than that of the entire pool of participants of the previous study. In addition, most of them commented positively on their experience. Hal, who reported the least MPA of all, described his experience as follows:

> I was surprised, I thought I'd be more nervous, but I was not nervous- maybe it's my age [laughs]. [...] Oh ok well, I guess that relates to the concert because, if I'm doing something I'm enjoying, I'm much calmer than I would've been say, 5 years ago or 10 years ago, - and more willing to go with it and see where it goes- and have much more patience. Whereas I have far less patience with something I don't wanna do. So maybe that's why I was not so nervous at the concert- 'cause I wasn't trying to prove something and I was doing something I was really enjoying. So, whatever where the chips fall, they chop- that's the way it goes. But that was good- it was very hot in the room [laughs]. It was VERY hot in the room. But- no, that was good. That was a lot of fun. (Hal, final interview, l. 399-400 & 422-436, 06/12/14)

As for Sue, who had the second lowest score, she also seemed to have focused on the pleasure and fun she got from her participation:

> I would've expected my competitiveness to make me more nervous; I wasn't at all nervous. I practiced and practiced and I felt OK, and I knew that from the way you teach it that we were going to be ok. That whatever we did was ok, and that... and that I could... I thought we did really well in the last concert! I thought everybody worked for it really hard. So I- it was just fun. It was just fun and a pleasure. (Sue, final interview, l. 663-667, 06/11/14)

On the other hand, Jade (who reported the highest MPA level) found herself experiencing stage fright for the very first time in her life and it took her totally by surprise:

> I thought, my God, it's cool, it's fun, it's gonna be OK and all that, and then as soon as I was on the chair and with my instrument in hands, Aye I…dddddd. Then I was like panicked. Panicked. But you know, people who were there, they were, they knew we were beginners, we weren't perfect, but I want to do well so much, I wanted to do well so much! So no, and you know, my fingers were shaking, yes. And I did not dare. I did not look at anyone! I did not look at anyone, and there were people I had invited that were there, so I was not looking that way at all (laugh). And the only person I was looking at was you, or my sheet, and that's it, that's all. So I had stage fright, definitely. And I think I don't know how to deal with that. I have no idea how to manage that, stage fright. (Jade, final interview, l. 531-542, 06/12/14)

As shown above, Jade was able to rationalize what happened, but could not control her reactions. As a result, she scored well above the mean on the PerfAIM (Figure 6.1).

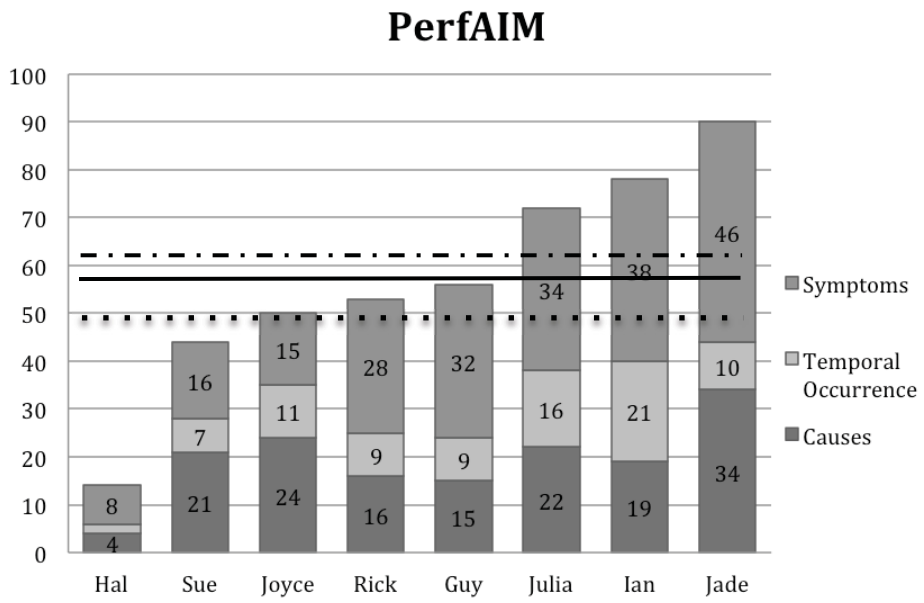

Figure 6.1. PerfAIM's scores in ranked order and divided by domains. Maximum scores per domain are as follows: symptoms /100, temporal occurrence /36 and causes /40. Full line: mean score for the experimental group (*M*=57). Dotted line: mean score reported for a sample of musicians of 60+ years old (*M=49)*. Dashed line: mean score for a sample of musicians of all age (*M=62)*.

Discussion

The aim of the present study was to investigate the extent to which participating in a community concert band affects senior citizens' quality of life, mental health, physical health, and levels of performance anxiety.

In order to investigate the benefits associated with active music-making, we referred to the Biopsychosocial model and asked participants to report any physical, psychological, and social effects they experienced during the study.

Physically, most participants mentioned that learning to play a wind instrument made them aware of how they breathe, and even if they could not totally control it yet, they described it as a definite benefit. These findings are in accordance with Rohwer (2009) who also did not find significant changes between pre- and post-rehearsal pulmonary function of older wind instrumentalists but who reported that participants perceived improvements in breathing capacity. The fact that music-making makes individuals more aware of their breathing is also in accordance with the findings of Smith and colleagues (1990) who showed that professional musicians had better neuromuscular control over their respiratory system than the norm. Another positive element found was the improvement of physical endurance regarding participants' postural muscles. An interesting side effect of the project was that a few participants started walking more because of the band: Jade and Guy both mentioned that walking to and from rehearsal once a week was a physical benefit for them.

Psychologically, the most important benefit was associated with improvements in wellbeing, which concurs with findings previously reported in the literature (Cohen, 2006; Creech et al., 2013a, 2013b; Varvarigou et al., 2011). Participants mentioned that music was fun, made them feel good and happy, was a positive, creative, and/or inspirational experience, and gave them peace. The latter aspect, however, was not necessarily shared by all participants: some, like Julia, Joyce, and Sue, mentioned that learning music was sometimes difficult and made them feel irritated or stressed, but these struggles were not enough to make them withdraw. Instead, they took up the challenge and tried to overcome difficulties by working harder.

Participants also reported that learning and stimulating the brain were important aspects of quality of life and that the band experience provided the form of knowledge

acquisition they were looking for. Similarly, Coffman's (2008) survey states that older amateur musicians reported cognitive stimulation as a benefit of participating in a New Horizons Band.

Surprisingly, all participants pointed out that receiving the instruction bilingually was quite positive and enjoyable, which was an unanticipated effect. According to Eyre (2011) who studied mentally ill patients involved in a therapeutic choir, bilingualism in Quebec was most likely to benefit French speakers rather than English speakers because the province is primarily francophone, and while Anglophones are used to hearing French, the opposite might not be as likely for Francophones. Although this contradicts the current study findings, it has to be noted that the two studies were conducted with distinct populations.

During the project, weekly rehearsals became something to look forward to, which contributed to maintain seniors' sense of purpose and identity by allowing them to achieve their personal goals, be they performing in concerts or just being part of a group and socializing. This is in accordance with Dabback (2008) who showed that participating in a New Horizons Band was an "important vehicle for identity construction and revision in later life" and that "communal engagement provide[d] structure for time and a new sense of purpose, and it contribute[d] to physical, mental and spiritual health" (p. 267).

From a social point of view, all participants enjoyed being part of a group and having the opportunity to meet new people. A few, like Hal and Joyce, also used this opportunity to keep in touch with friends they already knew or to reconnect with some they have not seen in a while. New people met during the project were mainly described, after 15 weeks of instruction, as acquaintances. A longer intervention might have potentially allowed participants to establish new friendships, but this remains to be shown.

Overall, these findings are supported by Coffman (2009) who demonstrated that musicians' motivations to participate in community ensembles could be "broadly categorized as personal (e.g. self-expression, recreation, self-improvement and use of leisure time), musical (e.g. involvement with the music, such as professed love of music, performing for one's self and others, and learning more about music) and social (e.g.

meeting new people, being with friends and having a sense of belonging)" (Coffman, 2009, p. 230-231).

Regarding MPA in context of a concert band for beginner musicians, results showed that the majority of participants tended to report some form of MPA. In fact, six people out of eight scored higher on the PerfAIM than the older musicians' mean scores mentioned in another study (Chapter 5). On the other hand, the variability in scores was quite wide in the current sample (i.e. 14-90) as well as in the sample in Chapter 5 (i.e. 9-110), which means that people of 60 years old and over tend not to be affected to the same extent by MPA. According to Kenny's (2010) definition of performance anxiety[6], this is not surprising as MPA "affects musicians across the lifespan and is at least partially independent of years of training, practice, and level of musical accomplishment" (p.433). In other words, MPA is a phenomenon that may be experienced by people throughout their lives and is not exclusively reserved for professional musicians: it may affect children as well as senior musicians, it may affect people who practice many hours a week as well as people who do not, and it may affect novice players as well as highly proficient performers. In all training situations, including the ones involving older amateur musicians, it is thus advised to thoroughly describe what MPA is and to provide stress management strategies early on in the music instruction process.

Limitations. Participants were recruited in only one community band to ensure consistency in the teaching methods and learning experience among the entire experimental group. However, this band was intergenerational and despite the fact that all the 60+ years old band members agreed to participate, the initial sample comprised only 12 subjects in the experimental group. This number was further reduced to eight because of attrition.

Due to the small sample size, statistical analyses showed no significant difference between the experimental and control group at baseline and at the end, as well as no significant change over time for both groups. The lack of significance may also partly be attributed to the length of the intervention. It would be worth replicating this study with more subjects in a longitudinal context, especially to verify whether the correlations that almost reached significance – i.e. comparisons of values for respiratory function and

[6] Full definition provided in Chapter 1.

blood pressure at baseline and at the end for the experimental group, as well as BP levels collected pre- and post-rehearsal – would prove to be meaningful in larger settings and longer interventions.

Regarding the dual role of research-practitioner, some limitations must be acknowledged. Because people already knew Barbeau and wanted to help her complete the study, recruiting subjects in the MNHB was easier to do than in any other band: all musicians were committed to the band and strongly believed in the project's mission. However, this desire to help also meant that participants might have, consciously or not, overestimated the positive effects of active music-making in order to "help" the investigator reach a satisfactory outcome. Therefore, results had to be monitored closely. In addition, because of their weekly interactions with the investigator, participants might have chosen to withhold information during the interviews. Nevertheless, as their musical director, Barbeau reported that during rehearsals participants were honest and transparent regarding musical instruction. They seemed at ease and willing to let her know when something was not working optimally or when the pacing of the rehearsals was not right for them. It is likely that this honesty was reflected in the participants' answers during the interviews. Furthermore, her role as researcher-practitioner allowed Barbeau to observe the weekly evolution of participants more accurately than from a standard external researcher's standpoint where the participants would have been met only at the beginning and end of the project. For instance, it is Barbeau who first noticed that some musicians who struggled with the learning process were showing signs of frustration during rehearsals. This led her to question participants about these particular instances at the final interviews. Without these observations and further questioning, participants may not have shared their insights for fear of being too negative or unhelpful to the project. Therefore, the presence of the researcher on-site every week resulted in meaningful findings.

Applications. Results from the current study may inform musical directors and music teachers about benefits and challenges to be expected when teaching older adults in community settings. While our conclusions may not extend beyond the population under study, certain tips may easily be transferred to other situations where one may be creating musical initiatives for senior citizens who never played music before.

For instance, the findings showed that some adults had misconceptions about music. The first one was that music was an innate concept rather than an acquired one. The second one was the habit of beginner musicians to attribute their struggles during music instruction to faulty or defective instruments. The third one was that difficulties were the result of the instrument not being a good fit for the individual. It is a normal and protective response to find causes other than oneself when confronted with new situations, and because of that, it becomes essential to establish a low-stress environment in which participants feel safe and secure despite their vulnerability. Music teachers must be patient and understanding, as people sometimes arrive with preconceptions such as "not being musical". Physically, it may take a while for beginner musicians to develop adequate posture, breathing, and coordination. Because general strength tends to diminish with age, older musicians may find it physically taxing to hold the instrument and to maintain the same position for long periods of time. Endurance must be developed slowly and progressively. Careful observations and support is essential to help them overcome limitations and make them understand that learning music is an activity deeply gratifying, but it requires time and commitment. Fortunately, retired adults have more time to spend and usually more patience than younger generations, thanks to years of professional work and life experiences.

As part of the intervention, each rehearsal included a coffee break with beverages and sweets to encourage social interactions between band members. These breaks were managed by musicians, which contributed to increase their involvement and sense of purpose. Teamwork opportunities were provided by encouraging players to engage in committees, meet with other members to play in smaller ensembles, become mentors, and so forth. In alignment with the New Horizons International Music Association's mission, values of respect, support, and collaborations were promoted between musicians, no matter their age or level of expertise. The strategies adopted here proved to be effective and greatly appreciated by study participants and band members.

Conclusion

The aim of this chapter was to examine the effects of active music-making on healthy older adult beginner musicians. Findings showed that participating in an intergenerational and bilingual community band for 15 weeks had an impact on participants' quality of life, mental health and physical health as determined by the qualitative analysis of the interviews and questionnaires. Although not supported by statistical evidence, results show promising trends that would deserve to be investigated further. Studies would need to be developed to replicate the protocol with a larger sample and to increase the length of the intervention. It would also be interesting to analyze the impact intergenerational music education had on the senior citizens as well as on the younger generations of musicians involved in the same ensemble.

Chapter 7

Discussion

The articles presented in this dissertation show that performing music influences musicians physically, psychologically, and socially, and that this experience has the power to both calm and stress individuals. In keeping with the Biopsychosocial model (Chapter 2), health outcomes are influenced by the interaction between biological, psychological, and social factors. Therefore, active music-making may play a role in improving or damaging health because of its impact on the human stress response (Bittman et al., 2005). This dissertation's main research questions were as follows:

1. Does performing music yield biological benefits for musicians and do biological parameters, such as gender and age, influence levels of music performance anxiety (MPA)?

2. Does performing music yield psychological benefits for musicians and do psychological aspects, such as trait anxiety and identity, influence levels of MPA?

3. Does performing music yield social benefits for musicians and do social aspects, such as interpersonal interactions and the performers' environment, influence levels of MPA?

This chapter seeks to establish relationships between the Biopsychosocial model, the outcomes of the present research, and findings from the literature. The research questions are explored to determine whether performing music is soothing, stressful, or both.

Measuring MPA

In order to address the research questions, a valid and reliable questionnaire had to be utilized to assess MPA among musicians from different backgrounds. Using the newly developed Performance Anxiety Inventory for Musicians (PerfAIM), Chapters 4 and 5 provided information on the intensity of anxiety reported by 241 classical and non-classical musicians. The PerfAIM includes a variety of items that may be classified based on biological, psychological, and social components and also based on their relatedness to the NUTS recipe for stress (Appendix 7). Some of these items were found to generate more or less anxiety in musicians. For instance, items related to memory, level of preparedness, specific types of performances, worries about not performing as well as one could, and perceived lack of control were found to have means above the middle value of the scale, which indicated heighten MPA in a majority of musicians. It is worth noting that all of these items are categorized as psychological factors, which is supported by findings from the literature that suggest MPA levels are more strongly influenced by the cognitive components of MPA than by other components, be they somatic, behavioral, or affective (Kenny & Osborne, 2006; Kleine, 1990; Reitman, 2001; Stephenson & Quarrier, 2005; Studer, Danuser, Wild, Hildebrandt, & Gomez, 2014; Yoshie, Shigemasu, Kudo, & Ohtsuki, 2009a). In addition, these items with high means targeted one or more determinants of Lupien's recipe (novelty, unpredictability, threat to the ego, sense of low control). These elements will be further discussed in the sub-section Psychological Factors.

The PerfAIM's items that had the lowest means were mostly biological factors. For instance, musicians did not report suffering from a lack of energy due to MPA (in fact, as shown in Chapter 1, a stress response triggered by events such as music performances may create an opposite reaction and generate a boost of energy due to the activation of the sympathetic division of the autonomic nervous system and the release of

adrenalin into the bloodstream). Symptoms of stress such as shortness of breath, excessive perspiration, numbness, and impaired coordination were not found to cause a marked elevation in MPA. Other items with low means were associated with a few psychological factors (such as anticipation and control). For example, musicians were not particularly troubled by MPA a week before a performance or at other specific times such as following a concert. Finally, unfamiliar venues were not reported to induce high levels of anxiety. These elements are analyzed in the next sub-sections along with more general parameters influencing MPA.

A Biopsychosocial approach to understanding the effects of music performances on musicians

Biological Factors. Hypertension, respiratory problems, biological aging, hearing or vision impairments, and walking disabilities are among the physical factors that may influence health outcomes (McInnis-Dittrich, 2002). While biological parameters such as gender or age have been found to mediate stress response in music-related contexts through performance anxiety (Chapter 5), playing music has also been acknowledged to positively influence people's lives through better physical endurance and breath control (Chapter 6). The following sub-sections discuss the effect of music-making in association with these biological parameters.

Gender and MPA. As presented in Chapter 3, the literature regarding gender and MPA demonstrates a lack of agreement between authors. While most studies seem to indicate that women have more MPA than men (Iusca & Dafinoiu, 2012; Kenny, Driscoll, & Ackermann, 2014; Wesner, Noyes, & Davis, 1990), some studies do not report conclusive evidence that self-perceived MPA differs between male and female performers (Barbar, Crippa, & Osório, 2014; Kubzansky & Stewart, 1999; Wolfe, 1989). In addition, a few authors have reported instances where men expressed higher MPA than women in terms of anxious behaviors (Ryan, 2004), systolic blood pressure (Abel & Larkin, 1990), and the ability to cope with stress (Hamilton, Kella & Hamilton, 1995). Furthermore, catastrophization has been suggested to be a better predictor of MPA than gender, perfectionism, and trait anxiety (Liston, Frog, & Mohr, 2003). These mixed results seem to indicate that, while women tend to report more anxiety in the context of

music performance, other factors may be mediating the impact of gender on MPA. For instance, if women are more prone to catastrophization than men, they may tend to have higher MPA.

As evidenced in Chapter 5, the research project conducted with 241 musicians demonstrates that women report significantly more MPA than men. In the study on active music-making examined in Chapter 6, four male and four female beginner musicians filled out the PerfAIM following their first concert, and these results also indicated a tendency for women (M=64, SD=21) to be more anxious than men (M=50, SD=27).

An important finding regarding gender and anxiety was that musicians' performance style might mediate men's and women's levels of MPA. In fact, the findings from Chapter 5 showed that female musicians who specialized in only one area (be it classical or popular music) were significantly more stressed than those performing in more than one style. Among men, a significant difference in MPA was found only between classical and popular musicians (and not between male musicians playing both styles). When comparing men and women across performance styles, female popular musicians reported significantly more MPA than male popular performers. However, no other correlations were found between men and women among the sample of classical performers or among the sample of musicians playing both styles. Therefore, performance style may be an indicator of trends in MPA, which differs based on musicians' gender (an illustration of the trends in MPA is provided in Figure 7.1). We are thus left with some unresolved questions: Why does playing popular music yield different levels of MPA between men and women, and why does playing more than one style have such an effect for female performers? It would be important to inform music educators of this trend and to make them aware of potential differences between female and male musicians so that they may approach MPA issues more efficiently.

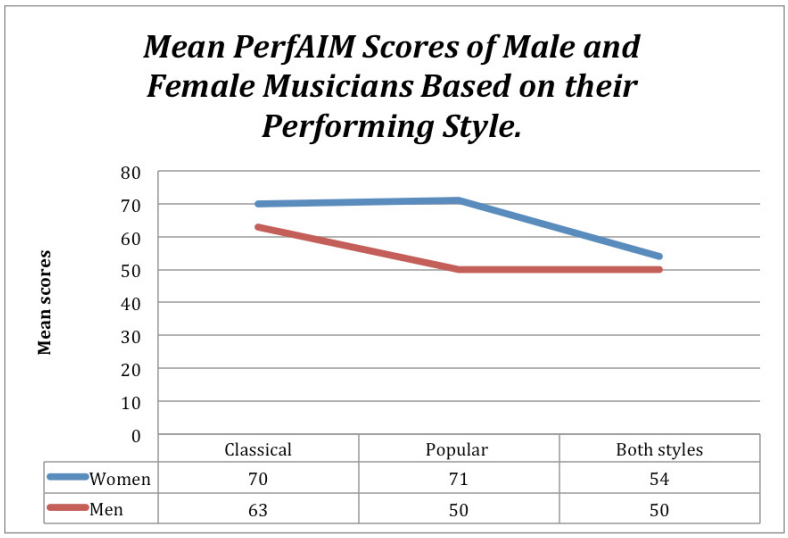

Figure 7.1. Trends in MPA based on musicians' gender and performing style. Adapted from data reported in Chapter 5 (Table 5.5).

Age and MPA. Over the course of their lives, people who seek to become professional musicians go through various career stages that may be more or less stressful. Although it has been suggested that MPA may affect musicians differently based on their age group, other factors may impact MPA based on professional stages of development. For example, competition is fierce and not everyone succeeds in making a living from music. Similar to the results reported in Chapter 5, the literature seems to indicate that younger musicians have higher MPA than older musicians (Ackermann, Kenny, O'Brien, & Driscoll, 2014; Fishbein & Middlestadt, 1988; Kenny et al., 2014; Wolfe, 1989). Indeed, younger musicians who go through a musical training program are constantly judged and evaluated. Then, while building their careers, they must audition and establish their credibility to find their place on the musical scene. By contrast, once musicians have reached a certain level of recognition in their art and start to be sought out to perform, they may become more confident and feel like they have less to prove, which might reduce their anxiety levels. In addition, some performers who do not become professional musicians may decide to pursue music as a hobby. In this case, stakes not being as high, MPA may decrease. Regarding older musicians, factors that may explain lower levels of MPA relate to the types of performers sampled and their self-appraisal regarding music-making: a) some may be professional musicians with stable careers, b) some may be retired musicians, and c) some may be amateur musicians. As shown in

Chapter 5, expert musicians were found to have significantly less MPA than advanced musicians, which indicates that professional musicians may not suffer greatly from performance anxiety. Retired musicians are not likely to have debilitating MPA either, since they not longer play professionally, or if they do, it is not in a context of promoting their career (although some may argue that playing less may increase MPA). As for amateur musicians, because they choose to play music recreationally, they may be less stressed about performing in public than formally trained musicians. Interestingly, results provided in Chapter 6 suggest that most of the adults interviewed who started playing music at or after 60 years old experienced elevated MPA compared to the cohort of older musicians studied in Chapter 5. In fact, the eight participants' mean scores in Chapter 6 were higher on the PerfAIM (M=57, SD=23) than the 41 older musicians' mean scores mentioned in Chapter 5 (M=49, SD=28). However, among the latter sample, only five people considered themselves beginners (compared to 18 intermediate, 11 advanced musicians, and 7 experts), and these five beginners reported relatively high MPA mean scores (M=60, SD=27) similar to participants examined in Chapter 6. Studies on musicians beginning to play music later in life are scarce, and elderly beginners' learning process should be thoroughly documented to determine its exact relationship with MPA.

It is interesting to note that beginner musicians, both young and old, tend to report experiencing heightened MPA. This suggests that teaching methods should be adapted for novice musicians to take into account issues related to performance anxiety and to provide further strategies to manage stress at the beginning of any musical training. One may also wonder whether specific actions might be undertaken to address the level of competition within music institutions and between music learners.

Music-making and biological wellbeing. In Chapter 6, benefits identified for biological health included learning to breathe properly, maintaining stable blood pressure over time, and improving one's physical endurance. Research on respiratory function seems to suggest that playing music improves neuromuscular control but does not result in improved pulmonary function (Rohwer, 2009; Smith, Kreisman, Colacone, Fox, & Wolkove, 1990). This is consistent with the findings reported in Chapter 6, in which the cohort of older beginner musicians indicated that they learned to breathe more efficiently,

even if no significant change was observed in measures of FVC, FEV_1, and FEV_1/FVC. Although at the end of the intervention some were still not able to fully control their respiration while playing, learning about breathing techniques made them more aware of their own respiratory patterns. This increased awareness has been verified in prior studies conducted with wind instrumentalists and singers (Clift & Hancox, 2001; Schorr-Lesnick, Teirstein, Brown, & Miller, 1985). Current findings provide evidence for the benefits of music in improving voluntary control over breathing. Regarding MPA, data from the PerfAIM's validation (Chapter 4) revealed that shortness of breath did not generate much anxiety among performers. Musicians' awareness of breathing and the voluntary control they exert over their respiratory apparatus may partially explain this. In accordance with Lupien's recipe for stress (presented in Chapter 2), to trigger a stress response, the person must interpret the situation as novel, unpredictable, threatening to the ego, or uncontrollable. Hence, if musicians feel that shortness of breath can be controlled in performance contexts by using breathing techniques (and the issue is not appraised as something new, unpredictable, or threatening), this symptom of MPA might not be perceived as a debilitating problem.

Another indicator of biological stress is people's blood pressure, as explained in Chapter 1. The findings in Chapter 6 demonstrate that BP decreased or remained stable over the course of the study for most participants. Reductions in systolic BP almost reached significance when comparing baseline and final measurements, as well as when comparing pre- and post-rehearsal measurements in the first month of testing. These are important findings considering the small sample size used for the analysis. On the one hand, according to Singh, Rao, Prem, Sahoo, and Keshav Pai (2009), listening to self-selected music has been associated with significant reductions in systolic BP among COPD patients. On the other hand, no other studies identified in the literature have provided conclusive evidence that music interventions targeting healthy senior beginner musicians could significantly affect BP levels in this population.

While the literature recognizes that risks of hypertension increase with age (Chobanian et al., 2003), non-pharmacological treatments such as meditation or music therapy have been shown to be effective in managing stress and lowering BP (Kulkarni, O'Farrell, Erasi, & Kochar, 1998). The findings from Chapter 6 also suggest that music

was perceived as a calming agent, as attested to in comments such as “It’s beautiful. It brings peace” (Jade), “Because I'm a neophyte, I don't feel the stress” (Hal), and “Class went like that 'cause it was so much fun. And I'd leave and I felt really good when I'd left. When I practiced, I felt good. Overall, it was extremely positive” (Sue). These testimonies demonstrate that music-making might be an adequate preventive strategy to help older adults feel generally calmer, and that it may contribute to making BP levels more stable over time, in addition to potentially minimizing the risks of hypertension.

Two participants (Jade and Guy) experienced constant monthly reductions in BP from pre- to post-rehearsal measurements. Interestingly, they also indicated that walking to and from rehearsals every week was a positive side effect of the experiment. Walking is an activity that has been associated with BP reduction in older adults (Miyazaki, Kotani, Tsuzaki, Sakane, Yonei, & Ishii, 2015) and people with hypertension (Iwane, Arita, Tomimoto, Satani, Matsumoto, Miyashita, & Nishio, 2000). While the effect of walking could have been a confounding bias if not accounted for, the research protocol ensured that participants were at rest for at least 30 minutes before BP testing. Therefore, while the change observed in Jade and Guy’s BP was not directly influenced by the fact that they had walked to get to rehearsals, this still demonstrates the importance of various factors’ interactions on people’s perception of health and wellbeing.

One last biological benefit observed by participants was the improvement in physical endurance, especially regarding postural muscles. Musicians noticed that it was physically demanding to simply hold the instrument in place using an adequate posture and noted that the increased muscle endurance allowed them to play for progressively longer periods at a time. Strength and functional capacity has been shown to decrease with age (Huang, Ruben, & McLeod, 1999). Furthermore, Stelmach, Populin and Müller (1990) have suggested that older adults have an “impaired postural system which is slow to stabilize the body prior to movement initiation” (p.188). Involving the elderly in musical activities that are recognized to be postural muscle strengtheners may thus contribute to improving seniors’ biological health and wellbeing.

Psychological Factors. Factors related to psychological functioning include, for instance, emotional wellbeing, memory, intelligence, and personality (McInnis-Dittrich, 2002). The following section analyses some of these factors by examining the

relationship between music performance and emotions, memory and learning, and personality. The effects of active music-making on psychological wellbeing are also discussed.

Emotions and MPA. Anxiety, as well as self-appraisal and coping skills, are some elements associated with psychological factors influencing emotional wellbeing.

Anxiety. As shown in Chapter 1, anxiety is characterized by intense worry, fear, and feelings of apprehension and uncertainty (Norman, Burrows, & Olver, 2003). Symptoms of anxiety are multi-dimensional in that they are expressed in somatic, behavioural, cognitive and affective reactions. Spielberger (1966) distinguished between two types of anxiety: state anxiety, which is triggered by situations that generate an immediate stress response, and trait anxiety, which is the tendency to be generally anxious in life. The literature has shown that trait anxiety is a predictor of MPA (Esplen & Hodnett, 1999; Hamann, 1982; Kenny & Osborne, 2006; Osborne & Kenny, 2008; Papageorgi et al., 2007). Findings reported in Chapter 5 support this conclusion, as musicians with trait anxiety were found to have significantly higher MPA than non-anxious musicians. In Chapter 6, four people (Julia, Guy, Jade, and Sue) in the experimental group met the critical cut-off for trait anxiety, both at the beginning and at the end of the study. Interestingly, while Sue showed the highest trait anxiety levels, she was the least affected by MPA compared to the other three musicians. Maybe the fact that she struggled with anxiety in her personal life helped her rationalize the musical experience, a possibility supported by a few comments she made during the interviews. Initially, Sue's expectation was that she would be able to enjoy herself in a stress-free environment ("I expect to be able to do things that will make me happy and not have to stress about it"). Over the weeks, she sometimes struggled with the high standards she tended to set for herself, but the group experience helped her find joy in the music-making process ("When I'm by myself I start to get hard on myself and think I should do better […] But when I'm in the group, I'm thrilled with what we do"). Finally, after the concert, she reflected on her experience and realised that doing her best to prepare beforehand and choosing to trust the musical director allowed her to feel confident about performing in front of others ("I would've expected my competitiveness to make me more nervous; I wasn't at all nervous. I practiced and practiced and I felt OK, and I knew that

from the way you teach it that we were going to be ok."). Her experience was different from Jade's, who suffered from MPA for the first time in her life during that same concert. Interestingly, both of them had realistic expectations regarding music-making during the entire project. For instance, Jade said at the beginning that she was curious about trying an instrument and that she appreciated the group dynamic ("It's fun to be in a group, to share. I don't expect to become a professional oboist […] but just for fun, you know, just to try"). At the end, she still had a similar opinion of her learning experience within the band ("It's fun, we enjoy ourselves. We don't feel stressed"). However, everything changed the moment she arrived on stage: While she expected to appreciate this opportunity to play in front of people she knew, she instead suffered from acute anxiety.[1] Her desire to do well, coupled with her inability to cope with symptoms such as trembling hands, probably made her feel vulnerable and not in control, exacerbating the effects of MPA. This suggests that performance appraisal may play an important role in anxiety. The next sub-section further examines the impact of self-appraisal and coping skills on levels of MPA.

Self-appraisal and coping skills. Chapters 1 and 2 have shown that anxiety may generate a stress response in the body, based on individual appraisal of any given situation as a potential threat. Lazarus's theory of cognitive appraisal, developed in the 1980s, explains the relationship between stress, appraisal, and coping (Lazarus & Folkman, 1984, and Chapter 2). The NUTS recipe for stress (Lupien et al., 2006) is also based on psychological components related to self-appraisal. This theory states that in order for a situation to induce anxiety, it must be appraised as novel, unpredictable, threatening to the ego and/or uncontrollable. In Chapters 4 and 5, the NUTS recipe for stress helped explain the origins of MPA, the sources that may trigger stress response. The exploratory factor analysis conducted in Chapter 4 showed that three factors explaining a part of the variance in the PerfAIM were related to Lupien's theory (i.e. unpredictability, threat to the ego, and decreased sense of control), whereas the fourth factor was associated with anticipation (rather than novelty). PerfAIM's individual items

[1] "I thought, my God, it's cool, it's fun, it's gonna be OK and all that, and then as soon as I was on the chair and with my instrument in hands, Aye I…dddddd. Then I was like panicked. Panicked. […] I wanted to do well so much! […] my fingers were shaking […] I did not look at anyone, and there were people I had invited that were there, so I was not looking that way at all (laugh). […] So I had stage fright, definitely"

were also categorized by these factors (Chapter 4, Table 4.4). For instance, symptoms that may have affected performance outcomes due to their unpredictability (e.g. trembling lips, racing heart, cold hands, insomnia the night prior to a concert) were associated with Factor 1, those related to anticipation (e.g. anxious thoughts and worries up to a week prior to a concert) were associated with Factor 2, those being self-perceived as threatening to the ego (e.g. lack of self-confidence, fear of being judged or of making mistakes) with Factor 3, and those linked to a sense of low control (e.g. impaired coordination, numbness, difficulty concentrating) with Factor 4. These results indicate that self-appraisal may have a considerable impact on MPA when musicians perceive music performances (or the associated consequences of stress response on their body and mind) as a threat. Enlightening examples come from the findings in Chapter 6, which showed that participants in the experimental groups appraised public performances differently from one another. In fact, Hal had the least MPA during the final concert, whereas Jade reported the highest score of the group. While Hal did not perceive the experience as threatening and was able to accept uncontrollable or unpredictable issues that may have arisen ("I was not so nervous at the concert- 'cause I wasn't trying to prove something and I was doing something I was really enjoying. So, whatever where the chips fall, they chop- that's the way it goes."), Jade on the other hand felt she had no control over how she felt during the performance ("I have no idea how to manage that, stage fright"). In her case, MPA was not only threatening and uncontrollable, it was also something new with unpredictable consequences (such as shaky fingers, avoiding eye contact, and feelings of panic). Interestingly, perceived lack of control and worries about not being able to perform as well as one should were two items that were among the most troublesome for musicians in the analysis of the PerfAIM in Chapter 4. These aspects of self-appraisal and control also relate to other theories of MPA. For instance, while the Four-stage model of stress (Figure 2.3, Chapter 2) relies on the individual's perception of environmental demands to trigger a stress response, Jones's model of facilitative and debilitative anxiety (Figure 2.8, Chapter 2) attributes the interpretation of anxiety as positive or negative to issues of control and coping abilities.

Coping skills are the ability to face a threat in the most optimal way for the body, to adapt to a threatening situation using a set of strategies:

> Coping is a response aimed at diminishing the physical, emotional, and psychological burden that is linked to stressful life events and daily hassles. Therefore, by this definition, coping strategies are those responses that are effective in reducing an undesirable "load" (i.e., the psychological burden). The effectiveness of the coping strategy rests on its ability to reduce immediate distress, as well as to contribute to more long-term outcomes such as psychological wellbeing or disease status. (Snyder, 1999, p.5)

Examples of coping strategies include using planning and problem-focused approaches, seeking support from others, avoiding anxiety-inducing situations, and denying problems (Snyder, 1999). Some of these strategies are more or less conducive to long-term psychological wellbeing. In Chapter 6, one strategy used by participants to manage anxiety was to practice more. Sue mentioned this previously and Joyce commented on it as well ("Well, there were times when the clarinet made me stressed and anxious […] It just made me go home and practice longer"). On the other hand, Julia displayed some avoidance behaviors ("Sometimes I didn't wanna look at the flute, and I had to force myself to practice and I would find myself saying 'after I do the laundry'- 'after I do the dishes' – 'oh maybe I can practice the piano for 15 more minutes- oh too late now I have to go to bed'. Because I really felt irritated and discouraged"). While Sue and Joyce used a problem-focused approach as coping mechanism, Julia chose to avoid confronting her difficulties and these issues lingered for a while as a result. As explained by Snyder (1999, p.119), "because avoidance- and denial-based strategies fail to resolve the underlying problems that are generating stress, they can be expected to lead to greater long-term distress than more active, problem-focused approaches". Overall, participants were divided in their experience of MPA (as shown by wide ranges of scores on the PerfAIM [i.e. 14-90, Chapter 6]), but in the end, most of them gave positive feedback about the public performance. In these instances, self-appraisal of the musical experience proved favorable for performers.

Memory, learning, and MPA. The analysis of individual items of the PerfAIM (Appendix 7) revealed that statements addressing memory reliability and level of preparedness were among the highest means reported. This suggests that musicians are particularly concerned with these issues and that performing without sheet music or a new/not yet mastered repertoire are elements that tend to increase MPA. As indicated in

Chapter 1, impaired memory is a symptom of stress (Table 1.1) due to the interactions between the hippocampus, amygdala, prefrontal cortex and HPA axis during stress response (Figure 1.3). The emotion-based theoretical model of MPA proposed by Kenny (2011, Chapter 2, Figure 2.11) indicates that anxious apprehensions are related to conditioning and learned responses, which generate specific psychological vulnerabilities to MPA. This suggests that MPA may also be learned, similar to fear (as defined in Chapter 1). Fortunately, successful performances may help alleviate anxiety and provide an exit point from MPA (Kenny, 2011).

While many positive comments were shared in Chapter 6 regarding music-making's psychological benefits, the learning experience was also demonstrated to potentially generate some stress, which is in keeping with Taylor and Hallam's (2008) findings about the relationship between achievement, frustration and empowerment. For instance, Julia did not expect it to be as difficult as it was to learn the flute ("I'm like 'oh yeah there's gonna be fingering and blowing' but I never realized how hard it would be") and when she was confronted with challenges, she felt irritated and discouraged. Like many learning experiences, hers did not follow a constant and regular progression. Instead, it was full of ups-and-downs, set-backs, and plateaus ("And even now- it's inconsistent. I could practice one day and I feel quite good […] And then the next day -I have no idea why- it will be worse and sometimes I almost wanna cry or I whine"). According to Watson (2009), this experience is normal because developing motor skills takes time and practice. When learning to play an instrument, Watson (2009) explains that the initial learning period occurs rapidly and is characterized by a marked improvement in performance followed by a consolidation period of six to eight hours after the end of the activity. "During the next few weeks, daily practice sessions produce additional improvement, but the increments in improvement become progressively smaller until an upper level of proficiency is reached. To break through this ceiling requires a considerable increase in effort" (Watson, 2009, p.252). He goes on to detail the reasons why motor learning may involve some set-backs before mastery can be achieved:

> When the task is carried out for the first time, activity is seen in the primary motor cortex on the hemisphere that controls the hand making the movements (i.e., the one on the opposite side). When first repeated, the activity in the cortex is at first reduced. This is due to an effect called habituation, which is a common phenomenon in the nervous system. However, when the finger sequence has been repeated a certain critical number of times […], the signal in the cortex becomes larger, and it stays larger during the training sessions on subsequent days. During this stage it is thought that new connections are made between nerve cells, resulting in a modification of the motor map in the cortex. (Watson, 2009, p.252)

Julia had not anticipated these types of challenges when she started the project, and as a result, she had to modify her initial expectations. Contrary to other participants such as Guy, Hal, and Jade who had almost no expectations regarding the learning experience, Julia expected that learning flute would make her feel better. This may explain why the former were pleasantly surprised by the benefits they observed following the project, while Julia had to change her perspective about learning flute over the course of the study. Another factor that may explain Julia's disappointment was that she had previous musical experience with piano playing. Therefore, being able to achieve a certain musical standard on the piano but not on the flute may have had an impact on her sense of self-efficacy. Papageorgi and colleagues (2010) studied music students and demonstrated that self-efficacy beliefs could be classified under four categories: (a) avoidance behaviour; (b) lack of confidence; (c) self-reliance and perseverance; and (d) lack of motivation. Additionally, they found that having "lower musical self-efficacy was moderately associated with higher levels of self-reported performance anxiety" (p.437). Julia's sense of self-efficacy may have had an impact on her experience learning the flute, which may have mitigated the positive effects she might have reported.

Personality and MPA. While personality was not a variable specifically examined in this dissertation, a few elements stood out regarding personality and MPA during the course of the studies, which are worth mentioning briefly in this sub-section.

Kenny (2011) indicated that coping and personality were closely related constructs. In fact, reporting Eysenck's (1988) definition, she specified that personality was "a function of coping style" (Kenny, 2011, p. 69) and that factors such as optimism, neuroticism and extraversion could have a considerable influence on coping. When examining musician's personality traits, authors have reported high neuroticism among both classical performers (Kemp, 1981) and popular performers (Dyce & O'Connor,

1994; Wills & Cooper, 1987). In popular musicians, Dyce and O'Connor (1994) have also indicated tendencies to arrogance, dominance, and extraversion. Perdomo-Guevara (2014) found that popular musicians were more people-oriented and showed greater positive emotions than classical musicians, who were more self-oriented and displayed more negative performance-related emotions. One is led to wonder about the exact nature of the relationship between personality, choice of musical specialty, and MPA: Are some specific personality types more attracted to classical (or popular) music than others, and if so, does this explain why MPA is experienced differently across performance styles? Further research is needed to answer these questions.

Music-making and psychological wellbeing. Benefits of active music-making observed in Chapter 6 were associated with increased psychological wellbeing, cognitive stimulation, and identity transformation.

Increased wellbeing. A common feature of active music-making was participants' overall enjoyment, which is consistent with previous research (Cohen, Perlstein, Chapline, Kelly, Firth, & Simmens, 2006; Creech, Hallam, Varvarigou, & McQueen, 2014). All musicians commented positively on their experience, explaining that it was fun and made them feel good and happy. Although participants sometimes felt frustrated or overwhelmed during the learning process, music was still considered to have calming properties. Group rehearsal became something to look forward to, which helped reinforce a sense of purpose within the community. This was especially important for participants like Rick, who had lost his wife a few years prior and had begun to play trombone afterward to combat his solitude.

Cognitive stimulation. Learning and challenging the brain were elements that stood out during the research process. Participants were well aware of the cognitive benefits associated with music learning, as illustrated through comments made by Julia ("Music is good for the brain") and Hal ("Some things changed in my brain"). Additionally, the fact that the research project occurred in a bilingual environment helped challenge the brain even more, which the musicians greatly appreciated. Furthermore, learning strategies to improve physical functioning (such as breathing techniques and posture) was also found to be useful and helped increase body awareness. As a result, learning was a central part of the experience and an important benefit of the experiment.

Identity transformation. As indicated in Chapter 6, several participants had retired shortly before joining the MNHB. During the months following their retirement, they experienced stress and worries associated with the significant transition stage between professional life and retirement. These participants struggled with developing a new and meaningful identity, finding a purpose, and continuing to feel useful.[2] Joyce and Julia, who went through this stage while playing in the band, situated active music-making differently within their reality of new retirees:

> I can see that in retirement, that sense of… you know if you're going to work it can be frustrating but you can usually come home and say you have accomplished "x" […] It's a little bit harder to find that in retirement. But I guess I have avoided being in that situation by becoming a guide and doing the clarinet. (Joyce)

> The actual procedures […] in my life they're all new, so something as simple as "how am I going to manage or structure my finances", it's not simple […] The band is the same thing: it's new, and I could end up loving it, but right now it's very new and so it's a struggle to learn and so on." (Julia)

While Joyce used music and her volunteer work as a guide to find a new sense of purpose, Julia was ambivalent about the band experience because she perceived it as added to her current stress load. They thus appraised the situation differently, which generated different responses. Taylor and Hallam (2008) consider music learning as a potential strategy for identity construction in later life and explain (p.287):

> Adult beginners are in a special position, because after a lifetime of experiencing themselves as musical listeners they suddenly have a range of possible musical selves to explore which tap into dreams and strivings which they were previously unable to express (Emmons 1989). During their learning, they can transform themselves from music listener to music practitioner, a huge shift in musical identity. They can use their music learning to structure their identity as a musician even if they would not think of calling themselves one (Trevarthen, 2002). Acquiring instrumental skills is just one way in which music learning can interact with personal and musical identity throughout adulthood, adult identity formation being characterised by personal growth and change (Tennant, 1997).

These authors suggest that music-making may be used to facilitate life transitions through the development of a musical identity that fosters personal growth.

[2] Julia commented specifically: "The thing that sometimes bothers me about the retirement is to have an identity that is meaningful to you. […]. I'm still searching for my identity except because I had that job half the time, it wasn't quite possible to find another purpose. But I think people want to feel useful - not just always enjoying themselves by reading a book or whatever." (Julia)

Social Factors. Social factors include education, cultural traditions and religious beliefs, family backgrounds, interpersonal relationships, socioeconomic status, support network, lifestyle choices, and environment (McInnis-Ditrich, 2002; Zittel, Lawrence, & Wodarski, 2002). Studies presented in Chapters 4, 5 and 6 have focused on specific social contexts and their relationship to MPA. The following section discusses the influence of education, lifestyle choice, interpersonal interactions, and environment on musicians experiencing performance anxiety. In addition, it analyses the impact of music-making on social health.

Education and MPA. In this thesis, performer's education refers to choice of instrument to study, years of training in music, and level of expertise achieved. In Chapter 5, it was found that singers, arched string players and keyboardists were the three most anxious groups of performers. On the opposite side of the spectrum, brass players were found to have the least MPA of all instrumentalists. Studies on MPA have acknowledged that singers and string players report marked MPA (Iusca & Dafiniou, 2012) and that brass player tend to be less anxious than other instrumentalists (Levy, Castille, & Farley, 2011). However, findings reported in Chapter 5 demonstrate that keyboard players were also significantly more anxious than brass players, which contradicts Iusca and Dafiniou's (2012) results regarding pianists.[3] One factor that may explain these different outcomes is that the latter studied a cohort of undergraduate music students only, whereas the sample used in the study presented in Chapter 5 included a wider representation of musicians from 18 to 81 years old.

In accordance with the literature (Esplen & Hodnet, 1999; Kubzansky & Stewart, 1999; Reitman, 2001; Zakaria, Musib, & Shariff, 2013), the findings in Chapter 5 showed that years of training did not correlate with MPA levels. However, it is worth pointing out that musicians with the least training (0-9 years of training) reported higher MPA levels (M=67, SD=31) than those with 10 to 15 years of training (M=61, SD=30) and those with 16 or more years of training (M=60, SD=29). Interestingly, the results shared in Chapter 6 demonstrate that older adult beginner musicians had lower mean MPA scores (M=57, SD=23) than the sample of musicians with 0 to 9 years of training assessed in Chapter 5. This suggests that the former may be less subject to performance anxiety

[3] Pianists were found to have levels of MPA that were similar to woodwind and brass players.

than younger musicians with similarly few years of training. Nevertheless, three participants in the former sample reported PerfAIM scores[4] (Chapter 6, Table 6.10) that were above the mean scores mentioned above. It is thus important to remember that MPA may still affect individuals differently across the lifespan, regardless of their age or years of training (Kenny, 2010).

Level of expertise had a significant influence on MPA, as indicated in Chapter 5. Advanced musicians (which include music students at the university level) were found to have significantly more MPA than expert musicians. Although there seems to have been a lack of agreement between authors in the literature (Chapter 3), some research suggests that professional musicians tend to have less MPA than music students (Biasutti & Concina, 2014; Steptoe & Fidler, 1987) and amateur musicians (Barbar, Crippa, & Osório, 2014). These results are aligned with the current study findings.

Lifestyle choices and MPA. Making the decision to become a musician and selecting an area of specialization are important lifestyle choices. Raeburn (1987b) and Vervainioti and Alexopoulos (2015) respectively examined rock and classical performers' job-related stressors and demonstrated that musicians faced a variety of stressors. Some of them were similar across performing styles, others less so (Chapter 3, Table 3.1). However, even if some elements (such as MPA or job insecurity) were identical for classical and popular musicians, this does not mean that both types of performer experienced them the same way. In fact, results in Chapter 5 indicate that classical musicians tend to have significantly more MPA than popular musicians and musicians playing both styles, which is similar to Papageorgi, Creech, and Welch's (2013) findings. In younger musicians on the other hand, mean PerfAIM scores were high and did not significantly differ between popular and classical performers (Chapter 5, exploratory analyses). This could suggest that age may be a stronger predictor of MPA than style of music performed, or that another factor, such as catastrophizing cognitions (as suggested by Liston, Frost, and Mohr, 2003), might be better to predict MPA in young musicians. In fact, one may ask if younger musicians are more prone to catastrophization than older musicians, or if classical musicians (men and women included) suffer more intensely from catastrophizing thoughts than popular musicians.

[4] Julia scored 72, Ian scored 78, and Jade scored 90.

Raeburn (1999) claims that major differences exist between classical and popular musicians, especially in terms of educational context, working conditions, values and beliefs, reference groups, and social support. These factors depend of the lifestyle choice made by musicians who, once they have selected an area of specialization, are then immersed in their music training, integrated in new reference groups and face specific working conditions depending on their performing style. Further research is needed to better understand the extent to which environmental and social factors may influence stress levels in performers in different musical traditions.

Interpersonal interactions and MPA. Stress may have an impact on social interactions as it may influence the quality of communications. For instance, someone who is stressed may become irritated for futile reasons, which may lead to tension between players. Furthermore, musicians may attribute great importance to their interactions with the public and how they appraise the crowd's reactions to their performance. Raeburn (1987) confirms in her study that two thirds of the stress episodes reported by rock musicians involve interpersonal relationships, be they with fellow musicians, promoters, or the audience. This suggests that interpersonal interactions are closely connected with MPA. One interesting example in the current thesis comes from Jade's reaction during her first concert (Chapter 6): While friends and relatives came to support her at the event, she felt so anxious that she could not look at any of the attendees, including those she personally invited.

As confirmed in Appendix 7, the simple presence of an audience may increase stress response and produce worries related to performance quality or issues of control. Additionally, performing in evaluative settings such as competitions and auditions, having to play from memory, or offering a new/challenging repertoire to the public are elements that have been found to heighten MPA in musicians. Furthermore, soloists have been reported to suffer considerably more from MPA than musicians performing in small or large ensembles, which is consistent with findings in the literature (Cox & Kenardy, 1993; Miller & Chesky, 2004; Nicholson, Cody, & Beck, 2015; Papageorgi et al., 2013; Ryan & Andrews, 2009). The latter could be explained by the fact that peer support is more common among musicians performing in ensembles than among solo performers, or by the fact that soloists may have to thrive in a context that is often more competitive.

Being in constant competition with others certainly may impact interpersonal interactions between performers and result in stressful working conditions for musicians (Cooper & Wills, 1989).

Raeburn (1987) suggests that social support is a factor that seems to differ between classical and non-classical musicians. Making the choice to become a musician within a specific musical tradition has consequences on performers' lifestyles and on the environment in which they evolve throughout their career. For instance, Kenny, Davis, and Oates (2004) studied opera singers and found a relationship between trait anxiety and social support. They hypothesized that anxious individuals may be more prone to seeking social support and using their personal resources "as an adaptive way of coping with their high anxiety" (Kenny et al., 2004, p.771) than less anxious people. Biasutti and Concina (2014) examined MPA in advanced music students and reported that they used social support strategies more often than professional musicians. In addition, they indicated that women utilized this coping mechanism more frequently than men. Social support may thus be a factor that contributes to alleviating MPA.

Environment and MPA. Musicians' performing environment relates to the settings in which they usually perform. This environment is different depending on whether or not musicians are classically trained, and MPA may be partially determined by the types of concerns that these groups of musicians emphasize (Perdomo-Guevara, 2014, p.72). In the study reported in Chapter 5, performance settings that generated the highest to the lowest MPA ranked as follow: Solo setting (M=71, SD=31), both solo and group setting (M=65, SD=29), large ensemble setting (M=59, SD=30), and small ensemble setting (M=55, SD=27). Solo performances are recognized to be the most anxiety-inducing situations (Cox & Kenardy, 1993; Kenny et al., 2014; Miller & Chesky, 2004; Ryan & Andrews, 2009). People who are both solo and group performers also report high MPA, which has not been investigated previously in the literature. A prior study conducted among classical musicians has found that large ensemble settings were considered a little less stressful than small ensemble settings (Kenny, Driscoll, & Ackermann, 2014). However, results shared in Chapter 5 indicated the opposite, which was attributed to the larger ratio of popular performers in the sample (as compared to

classical performers) and to the fact that popular musicians tend to perform more frequently in small bands – which are also more self-directed – than in large ensembles.

MPA was not affected by the style of music performed when the samples of soloists and small ensemble performers were investigated separately. In fact, exploratory analyses demonstrated that among soloists, classical and popular musicians reported identical mean MPA score (i.e. M=72) whereas both-style soloists reported less anxiety (i.e. M=66). In the small ensemble setting, classical musicians reported more MPA than popular musicians, who in turn reported more MPA than musicians playing both styles (M=63 versus M=55 and M=39). However, none of these differences were considered statistically significant.

Regarding the study presented in Chapter 6, the stress-free environment promoted during the rehearsals helped participants perceive the musical performance in a more playful rather than formal way. For instance, Hal mentioned that because he enjoyed himself, he was less nervous ("I was surprised, I thought I'd be more nervous [...] I guess that relates to the concert because, if I'm doing something I'm enjoying, I'm much calmer"), while Sue placed her trust in the supporting environment that the musical director and band members built over time ("I knew that from the way you teach it that we were going to be ok […] I thought everybody worked for it really hard. So I- it was just fun […] and a pleasure").

Music-making and social wellbeing. The main social benefits derived from active music-making included being part of a group, meeting new people, and reconnecting with friends (Chapter 6). Participants appreciated the opportunity to keep in touch with friends on a weekly basis, especially those who were retired and had previously worked for the same employer. Interestingly, a few people were almost hesitant to confess that they joined the band exclusively for social reasons rather than musical ones. This is not surprising, since according to Coffman (2009), older adults' motivation to join ensembles usually falls into three categories: Personal, musical, or social. Therefore, the desire to meet new people, to spend time with friends, and to find a sense of belonging are important factors to promote in musical activities.

Limitations

The purpose of this thesis was to examine the relationship between music and stress, or more broadly, to focus on the impact of music on global health and wellbeing. The challenge with contrasting research interests, such as MPA and the benefits of active music-making on older adults, was to find a common ground where all topics could meet, in addition to providing a relevant analysis of the relationships between the three studies conducted. Consequently, some limitations must be acknowledged.

As indicated in the current chapter, elements such as musicians' self-appraisal and coping skills, personality, or job-related stressors were not specifically targeted in the initial research questions. While these aspects stood out during the course of the studies and deserved a brief mention in this chapter, it is worth pointing out that they were not thoroughly analyzed as they were not part of this thesis' main focus. There is considerable literature on each of these topics which the reader could refer to, if interested.[5] Having said that, research projects comparing the specific relationships between MPA and personality, self-appraisal, and coping skills among classical and non-classical musicians still need to be developed. These investigations would have to be conducted within the same study to reliably compare both populations.

In Chapter 4, the underlying constructs of the PerfAIM were explored using an Exploratory Factor Analysis (EFA), a data-driven method that verifies whether the items of a questionnaire adequately reflect a construct which cannot be measured directly (Beavers, Lounsbury, Richards, Huck, Skolits, & Esquivel, 2013). Principal Component Analysis (PCA) is a method for data reduction (Albright & Park, 2009; Suhr, 2005) that has been used by a few researchers to validate their questionnaires (Kenny, 2009a, 2011; Çırakoğlu & Şentürk, 2013). A critique was formulated from the comparison between EFA and Principal Component Analysis (PCA), regarding the validity of the latter in factorial analysis (Costello & Osborne, 2005; Field, 2009; Suhr, 2005). A third type of statistical analysis exists—Confirmatory Factor Analysis (CFA). Çırakoğlu and Şentürk (2013) used CFA in their article's second study, as did Sâberscu and Dorgo (2014), who

[5] For instance, readers may consult Lazarus & Folkman (1984) for information on self-appraisal and coping ; Kemp (1981, 1996), Dyce and O'Connor (1994), Gillespie and Myors (2000) for personality of classical and non-classical musicians ; or Raeburn (1987), Vervainioti and Alexopoulos (2015) for job-related stressors.

tested the MPA's multidimensionality in adolescent musicians. Albright and Park (2009) explain that CFA is a theory-driven method used to test hypotheses regarding factors. The authors specify: "Unlike EFA, CFA produces many goodness-of-fit measures to evaluate the model but do not calculate factor scores" (Albright & Park, 2009, p.3). During the PerfAIM validation, EFA was preferred to PCA and CFA thanks to its data-driven approach. However, now that underlying factors have been identified, further analysis should be undertaken to confirm these factors through the use of CFA.

In Chapter 5, the statistical analysis yielded significant findings regarding the relationship between MPA and parameters such as gender, age, instrument played, performance settings, and level of expertise. However, the exploratory analysis' results must be interpreted cautiously. The results seem to indicate trends, but further research is warranted due to statistical issues. Replicating the study with equal sample sizes would help confirm the findings and determine the exact relationship between performance style and MPA, especially among female musicians, young performers, music students, and in specific performance settings (e.g., solo, small ensemble). In addition, further differentiation should be made within the category of popular performers, as one could argue that jazz musicians may experience MPA differently than musical theatre performers, or that world music artists may differ from professional commercial music artists. Furthermore, the self-reported nature of the PerfAIM's findings could be complemented eventually by the use of physiological and behavioural measures of anxiety in order to deepen our understanding of the MPA experience.

Some issues also must be raised in Chapter 6. First, the study was limited in terms of participant recruitment, as the cohort under study came from only one musical ensemble. As a result, the sample size of eight participants per group was too small to provide concrete evidence of changes to the parameters under study. For statistically significant differences to be found between the experimental and control groups and/or over time, changes would have had to be considerably large. Additionally, the participants recruited were not all retired: Some were still working, some had been retired for years, and several had just retired before joining the study. Thus, it is safe to assume that they were not all in the same state of mind. This study should be replicated with

people who are all retired and have been so for at least a year, in order to ensure that they have had time to adapt to their new life situation.

Second, the intervention's length seemed too short. While the qualitative analysis proved to be insightful, the study only followed participants over 15 weeks, not a period long enough to provide evidence of change from a quantitative standpoint. Similar issues have been reported in the literature. For example, Engen (2005) investigated the effect of singing in persons suffering from emphysema over 6 weeks and no statistically significant change was detected in physical health. Davidson, McNamara, Rosenwax, Lange, Jenkins, and Lewin (2014) completed an 8-week singing program intended to enhance older adults' wellbeing that did not yield significant changes, although positive gains were reported after analysis of the interviews. Lord and colleagues' (2012) made similar conclusions based on their study following a singing intervention occurring twice weekly for eight weeks among patients with COPD. On the other hand, Bonilha, Onofre, Vieira, Prado, and Martinez (2009), who examined pulmonary function in 23 COPD patients involved in singing classes for 24 weeks, indicated that the experimental group differed significantly from the control group at the end of the intervention in term of maximal expiratory pressure. In addition, Cohen and colleagues (2006) followed a cohort of older adults singing in a choir over the course of 12 months and reported significant positive outcomes on measures of physical health, visits to the doctor, medication use, and number of falls. These results suggest that in order to detect significant changes in participants, music interventions should be longer than 20 weeks and the minimum number of subjects per group should exceed 20 individuals. However, because these indications come from studies conducted on singers and people with respiratory limitations, further research is warranted to confirm these potential guidelines in the context of instrumental music programs for healthy older adults.

In Chapter 7, the content of all studies was synthesized and findings were analyzed in light of the Biopsychosocial model. Further research is warranted regarding biological, psychological, and social factors. Biologically, there is a need to clarify the relationship between gender, MPA, and performing style, which should involve studying not only samples of classical and popular musicians, but also musicians playing both styles. Among older adults, there is a need to more thoroughly explore the effect of MPA

among people who begin their musical instruction after 60 years old and also to investigate the benefits of learning on aging people's memory skills. While music may be good for the brain on the one hand, experiencing MPA may trigger a stress response that leads to memory lapses while performing. These elements deserve further study, potentially from a neuropsychological perspective. Results from the respiratory function and blood pressure tests conducted in Chapter 6 did not provide enough evidence to conclude that music-making significantly affects these parameters. However, some statistical analyses almost reached significance, and thus indicate promising trends that deserve to be examined again in the context of a longitudinal study. Posture and physical endurance were elements that were mentioned by participants as biological benefits of active-music making (Chapter 6). Further studies undertaken in collaboration with researchers in physiotherapy and occupational therapy would be needed to assess postural strength in older adult beginner musicians to determine whether playing music may be an effective strategy to maintain the stability of postural muscles over time and to increase physical endurance.

Psychologically, this chapter demonstrated how anxiety was associated with self-appraisal and coping. Theories such as the Four-stage process model of stress (Figure 2.3), Jones's model of facilitative and debilitative anxiety (Figure 2.8), and the NUTS recipe for stress (Chapter 2) have also been used to explain the interconnections between these elements. These theories all stress the importance of psychological appraisal to generate (and thus, to potentially control) anxiety. Self-appraisal was also important in the context of the identity transformation of older adults (Chapter 6). In fact, during participants' transition from work to retirement, music was either appraised as a positive tool to help adapt to retired life or as an additional source of stress.

Socially, it has been shown that classical and popular musicians differed in terms of training, working conditions, values and beliefs, reference groups, and social support (Raeburn, 1999). All these elements may affect musicians and have serious consequences for their stress levels. This may in turn increase instances of MPA. Therefore, more studies are needed to evaluate the extent to which job-related stressors may differ between classical, popular and both-style musicians, and how they may mediate the experience of MPA.

Contributions

The PerfAIM is a new questionnaire that has been developed and validated to assess MPA among classical and non-classical musicians (Chapter 4). It is an educational questionnaire that evaluates MPA in the here-and-now and is a practical tool for researchers, teachers, and musicians. Rather than focusing on MPA from a clinical perspective (as is often the case with psychological questionnaires), it asks healthy musicians to consider recent performances where they felt highly stressed in order to help in the identification of problematic domains (i.e. causes, temporal occurrences, symptoms). Used on a regular basis, the PerfAIM could be a useful tool to monitor the effectiveness of certain stress-management strategies (although further investigation into the questionnaire's responsiveness is suggested). The PerfAIM is the first psychometrically sound measure that has been associated with the NUTS Recipe for Stress (Lupien et al., 2006), a recipe based on self-appraisal that has demonstrated relevance for stress among children, adolescents, adult workers, and the elderly (Lupien, 2010, 2012). Factors identified in the EFA contributed to show that unpredictability, threat to the ego, sense of low control, and anticipation were particularly important when assessing MPA, as they explained most of the variance in the PerfAIM.

To evaluate MPA accurately, it is essential to use tools that are valid and reliable (Foster & Cone, 1995; Haynes, Richard, & Kubany, 1995; Nevo, 1985; Streiner & Norman, 2009; Vogt, King, & King, 2004). It is also important to provide procedures for development, which has rarely been done in the literature (Kenny, 2006; Osborne & Kenny, 2005). In the last ten years, Dr Kenny worked to fill that gap and has been followed by other authors, such as Çırakoğlu and Şentürk (2013). However, none of them have addressed the separation that exists between research on MPA conducted on classical musicians, and research conducted on non-classical musicians. The PerfAIM is the first questionnaire establishing a bridge between studies on classical and popular musicians, and that studies the experiences of musicians performing both styles of music. It serves as grounds for comparison between performance traditions to better understand the various trends in MPA.

The PerfAIM has been validated in both French and English, which means that MPA may now be reliably compared between musicians who speak different languages. This contribution is particularly important for Canadian researchers, as the official languages in this country are English and French. Furthermore, it provides a tool that can be used in joint studies conducted in French-speaking and English-speaking countries to advance research on MPA.

In Chapter 5, the PerfAIM was utilized to investigate the extent to which MPA affects musicians based on parameters such as trait anxiety, gender, age, years of training, instrument, performance setting, and level of expertise, and in the light of the style of music performed by musicians. The study was the first to explore not only classical and popular performers, but also people playing both styles. Interestingly, findings suggest that being versatile in terms of performing styles has a positive influence on musicians. Indeed, people performing both classical and popular music tend to report considerably less MPA than the others. Significant differences have also been observed between men and women regarding performance anxiety. While this is in keeping with several other studies reported in the literature (Chapter 3), it is the first time that exploratory analyses have exposes the different trends that exist between MPA, gender, and performing style (Chapter 5, Table 5.5). Trait anxiety was found to be a predictor of MPA, as previously suggested by research (Esplen & Hodnett, 1999; Hamann, 1982; Kokotsaki & Davidson, 2003; Papageorgi et al., 2007). This study's other contributions include the significant differences in MPA outlined between age groups (younger versus older musicians), levels of expertise (advanced versus expert musicians), performance settings (solo versus small ensemble), and types of instruments (singers, arched string players, and keyboardists versus brass players).

Chapter 6 offered a unique opportunity for senior members of a community ensemble to share personal experiences about music-making, performances, and anxiety. Since MPA has never been investigated among this population, the study provided basic foundations on which empirical studies might later be developed. Regarding quantitative analyses, it has been acknowledged that the intervention was too short and the sample size too small to provide statistical evidence of changes. Nonetheless, the analysis of

respiratory function[6] and systolic blood pressure[7] almost reached significance. These parameters would deserve to be explored further by replicating the study in a longitudinal context and with more participants.

This study was one of the first to provide insights about the initial phases of music learning for aging people. The findings indicated that novice musicians perceived improvements in muscle endurance and breathing awareness, as well as in emotional wellbeing, cognitive stimulation, and identity construction. Participants also appreciated being part of a group, sharing a common goal, meeting new people, and having weekly contact with friends. The results suggest that benefits may take longer than expected to appear for older adult beginners because they go through stages of struggle, ups and downs, and plateaus during the first weeks of musical instructions, which means the musical experience is sometimes difficult. On the other hand, once the basic technique is acquired, musicians begin to appraise the musical experience more positively, looking forward to weekly rehearsals and enjoying the process more fully.

Pedagogical considerations were provided for music educators interested in teaching older adults. For example, providing a stress-free learning environment may contribute to encourage positive appraisal of music-making. For instance, offering a safe place where mistakes are allowed to happen may help novices try new things more easily. Using humour during rehearsal may increase enjoyment and, if participants enjoy themselves, they may feel less nervous about performing. In addition, it is important to address some issues about elderly people's learning experience when they begin musical instruction. In fact, it is often important to correct a few misconceptions about music. For instance, some older adults may strongly believe that they are not musical, some may think that their struggle is due to a faulty or defective instrument, and some others may become convinced that they chose the wrong instrument, which they see as the reason learning is so difficult. Music educators must be sensitive to people's concerns and never forget how challenging playing an instrument can be for beginners. Finally, one must remember that novice musicians, regardless of their age, may suffer from MPA. Therefore, issues regarding performance anxiety should be addressed within the context

[6] Comparison of initial and final measurements of FEV1 and FEV1/FVC.
[7] Comparison of initial and final measurements, as well as pre- and post-rehearsal measurements on the first month of intervention.

of music instruction and stress management strategies provided. As suggested by Kenny (2011), MPA is not solely innate but may also be learned. Therefore, music teachers should be aware that if MPA may be learned, it may also be unlearned.

On a related note, it is worth pointing out that these findings originate from novice musicians living in Canada, where music-making is often associated with a culture of high performance expectations . This brings forward new interrogations about the relationship between MPA and musicians' culture, environment, and settings in which they live and perform. It would be interesting to investigate MPA from an ethnomusicological perspective through societies from non-European descent, where active music-making is part of the community life rather than an activity often reserved to a selected group or for the elite.

Conclusion

This thesis was intended to examine the extent to which performing music might affect musicians. To do this, two perspectives were adopted on active music-making: one focused on the deleterious effect of music performance anxiety and the other on the benefits of playing music, specifically on older adults' health and wellbeing.

As an introduction to this thesis, Chapter 1 provided the biological foundations of stress, fear, anxiety, depression, and MPA to show the impact that music may have on human stress response. Multiple theories have been developed over the years to explain health, stress, and anxiety, and Chapter 2 offered an historical overview of the main theories related to stress and MPA, from the 1900s to the present. The Biopsychosocial model was also introduced to provide a general framework explaining the impact of biological, psychological, and social factors on health outcomes. Chapter 3 reviewed and synthesized findings from the literature, with a specific emphasis on MPA and the health-related benefits of playing music. Chapters 4, 5 and 6 consisted of three studies examining the extent to which music-making might affect musicians both positively (through increased wellbeing) and negatively (through MPA). While two studies carried

out for this project focused exclusively on MPA, the third one also investigated the benefits music had on people's lives.

The first study (Chapter 4) presented the revision, translation, and validation of the Performance Anxiety Inventory for Musicians, a questionnaire originally developed a few years ago (Barbeau, 2011). The psychometric properties of the PerfAIM were estimated by calculating the internal consistency (Cronbach's *alpha* coefficient = .93), reliability (ICC = .89 with 95% CI), convergent validity (r value of .48, $p < .05$) and concurrent criterion-related validity using with a sample of 69 musicians. An exploratory factor analysis was performed using a maximum likelihood extraction method with oblique rotation (direct oblimin), which revealed that four factors explained over 52% of the variance when combined (1- Unpredictability; 2- Anticipation; 3- Threat to the ego; 4- Sense of control). These findings demonstrate that the domains selected from the literature review (i.e. Causes, temporal occurrence, symptoms) and the theoretical framework used to design the PerfAIM (i.e. Lupien's Recipe for Stress; Lupien et al. 2006) were relevant parameters to integrate into the foundations of a questionnaire on MPA.

Once the psychometric properties of the PerfAIM were established in French and English among classical and non-classical musicians, the second study (Chapter 5) investigated the impact of MPA on musicians, based on specific parameters (i.e. trait anxiety, gender, age, years of training, instrument, performance setting, level of expertise), and explored how the musician's performing style influenced the relationship between these parameters and MPA. Female performers were found to have higher MPA than their male counterparts; musicians with trait anxiety also suffered more from performance stress than those without; vocalists and arched string players were significantly more anxious than plucked string/woodwind/brass players; advanced musicians had higher levels of stress than experts; and classical musicians experienced higher MPA than popular performers and musicians playing both styles. Not surprisingly, solo settings induced more MPA than small ensemble settings.

Finally, a cohort of beginner musicians aged 60 or more were followed over one semester (Chapter 6) to determine the effect of active music-making on their quality of life, mental health (as shown by their levels of anxiety and depression) and physical

health (as evaluated by blood pressure tests and changes in respiratory function). A control group was used for comparison. The intervention was followed by a performance and MPA was also assessed in the experimental group. Novice musicians reported multi-faceted outcomes that aligned with the Biopsychosocial model of health.

This thesis has shown that music can be both soothing and stressful for musicians. With regards to the three research questions, we may conclude that yes: (1) Musicians' MPA levels are influenced by biological aspects such as gender and age, but older adult beginner musicians report that performing music also yields biological benefits (especially regarding muscle endurance and breathing awareness); (2) Musicians' MPA levels are influenced by psychological aspects such as trait anxiety and personality, but performing music also yields psychological benefits (especially regarding wellbeing, cognition, and identity); and finally (3), musicians' MPA levels are influenced by social aspects such as interpersonal interactions and the performers' environment, but performing music also yields marked social benefits (especially regarding feelings of inclusion and belongingness, as well as social interactions).

Learning and performing music are not always easy. They require motivation, perseverance, and dedication. Fortunately for most performers, the benefits of active music-making far outweigh the negative effects of performance anxiety. Even among beginner musicians who sometimes struggled with music learning, playing music was perceived as a positive experience. Participatory music yields multiple biological, psychological and social benefits for individuals. People need only to overcome the first obstacles before they begin to reap the rewards of their labour and discover the unique sense of accomplishment that comes with performing music.

Appendices

Appendix 1

Portrait of the Older Adults in Quebec

Portrait of the Older Adults in Quebec				
Gender[1]	Male	44.7%	Average life expectancy for males[2]	79.6 yrs
	Female	55.3%	Average life expectancy for females[2]	83.6 yrs
Education[1]	Less than a high school diploma	52.9%		
	High school diploma	20.4%		
	College or university degree	26.7%		
Living situation[1.2]	Percentage living with someone[1]	68.3%	Percentage living alone	31.7%
	Percentage living at home[2]	63%	Percentage not living at home	37%
Self-perceived financial situation[1]	With enough income to meet basic needs	88%	Poor or very poor	12%
Global health (people living at home)[2]	Healthy	63%	Unhealthy	37%
Social life[1]	Satisfying or very satisfying	94%	Unsatisfying	6%
Physical activity[2]	Active	41%	Not active	59%
Psychological distress[1]	Low psychological distress	81.2%	High psychological distress	18.8%

[1] ISQ (2012a); [2] ISQ (2012b)

Appendix 2

Timeline: Theories of Stress and MPA

Early 1900s	The principle that the mind may play a role in physical illness starts receiving increased attention in the field of medicine[1.]
1908	Yerkes and Dodson lay the foundations for the inverted-U hypothesis [2. 3. 4. 5.]
1929	Cannon introduces the term homeostasis[1. 6. 7. 8.]
1936	Selye's General adaptation syndrome (GAS) [1. 6.]
1943	The Drive theory is proposed by Hull [2.]
1945	After the war, the term "stress" starts to become used and accepted in research related to human psychology and physiology[1. 9.]
Late 1950s	Stress is now accepted as a legitimate subject in research and is associated with the field of psychology [1.]
1966	Spence and Spence adapt the Drive theory [2.]
1966	Spielberger's State-trait anxiety theory[2. 10.]
1966	Lazarus' initial theory of psychological stress based on threat, appraisal and coping[11.]
1968	Mason reports three psychological determinants of stress (Novelty, Unpredictability, Control)[12.]
1970	McGrath's four-stage process model of stress [2.]
1971	Lang's three-system model of fear [3.]
1976	Apter's theory of psychological reversals[2.]
1978	Hanin's individual zone of optimal functioning (IZOF)[4.]
1984	Lazarus' theory of cognitive appraisal[13.]
1984	Application of Lang's three-system model to music performance anxiety[14.]
1985	The reversal theory, based on Apter's theory of reversals, is popularized by Kerr[2.]
1988	The catastrophe model[15.]
1990	Multidimensional anxiety theory[2. 3. 16.]
1990	Salmon's theory of MPA[17.]
1994	Leblanc's theoretical model representing sources of variation in MPA[18.]
1995	Jone's model of facilitative and debilitative anxiety[2.]
2000	Barlow's triple vulnerability model[3.]
2002	Wilson's three-dimensional model of MPA[3.]
2002	Dickerson and Kemeny propose a 4th determinant of stress (social evaluative threat)[19. 20.]
2006	Lupien's recipe for stress, using four determinants: Novelty, unpredictability, control, threat to the ego[7. 21.]
2007	Conceptual framework for understanding MPA, based on Wilson's model[22.]
2010	Kenny's emotional-based theoretical model of MPA[23.]

Sources: *1. Cooper & Dewe, 2004; 2. Gould, Greenleaf, & Krane, 2002; 3. Kenny, 2011; 4. Hanton & Mellalieu, 2006; 5. Williamon, 2004; 6. Selye, 1993; 7. Lupien et al. 2006; 8. Caccioppo, Tassinary, & Berntson, 2000; 9. Lazarus, 1993; 10. Spielberger, 1966; 11. Lazarus & Opton, 1966; 12. Mason 1968; 13. Lazarus & Folkman 1984; 14. Craske & Craig, 1984; 15. Hardy & Parfitt, 1991; 16. Martens et al., 1990; 17. Salmon, 1990; 18. Leblanc, 1994; 19. Dickerson & Kemeny, 2002; 20. Lupien et al., 2007; 21. Marin et al., 2009; 22. Papageorgi, Hallam, & Welch, 2007; 23. Kenny, 2009, 2011.*

Appendix 3

Synthesis of Findings about the Benefits of Music-Making for Older Adults

Domain	Benefits reported in the literature	Authors
Physical health	Arthritic discomfort	Zelazny (2001)
	Breath control and support	Clift & Hancox (2001); Davis et al. (2008)
	Efficacy of the immune system	Creech et al. (2014); North, Hargreaves, & Tarrant (2002)
	Flexibility and range of motion	Jeong & Kim (2007); Zelazny (2001)
	Improvements in physical health	Bungay & Skingley (2008); Skingley & Bungay (2010)
	Pain management	Creech et al. (2014); Finley & Anil (2016)
	Physical relaxation	Clift et al. (2008); Clift & Hancox (2001); Gembris (2008)
	Physical wellbeing	Clift et al. (2008); Coffman (2008); Lord et al. (2010); Li & Southcott (2012)
	Reaction times	Khemptong et al. (2012)

Domain	Benefits reported in the literature	Authors
Psychological	Autonomy	Creech et al. (2013a); Creech et al. (2013b); Dabback (2006); Hays & Minichiello (2005)
	Cognitive stimulation	Clift et al. (2008); Clift & Hancox (2001); Coffman (2008); Creech et al. (2013a); Skingley & Bungay (2010)
	Concentration	Bugos et al. (2007); Bungay & Skingley (2008); Clift et al. (2008)
	Coping with stress	Clift et al. (2008); Clift & Hancox (2001); Dabback & Smith (2012); Eyre (2011)
	Enjoyment	Bungay & Skingley (2008); Clift et al. (2008); Gembris (2008); Perkins & Williamon (2014); Skingley & Bungay (2010); Varvarigou, Creech, Hallam, & McQueen (2011)
	Identity construction in later life	Bruhn (2002); Creech et al. (2013b); Dabback (2008); Hays & Minichiello (2005)
	Learning	Bruhn (2002); Clift et al. (2008); Davis et al. (2008); Skingley & Bungay (2010); Solé, Mercadal-Brotons, Gallego, & Riera (2010); Veblen & Olsson (2002)
	Meeting new challenges, developing new skills	Creech et al. (2013a); Gembris (2008); Varvarigou et al. (2011)
	Memory	Bungay & Skingley (2008); Bugos et al. (2007); Clift et al. (2008); Dabback & Smith (2012); Hanna-Plady & MacKay (2011); Moser (2003); Skingley & Bungay (2010)
	Mental health	Skingley & Bungay (2010)
	Mood/morale	Clift et al. (2008); Clift & Hancox (2001); Cohen et al. (2006); Eyre (2011); Jeong and Kim (2007); Skingley & Bungay (2010)
	Self-confidence, feeling competent	Dabback (2006); Hays & Minichiello (2005); Lord et al. (2010)
	Self-esteem	Clift et al. (2008); Creech et al. (2013b); Hays & Minichiello (2005)
	Self-expression	Aigen (2012); Eyre (2011); Gembris (2008); Varvarigou et al. (2013); Veblen & Olsson (2002)

(Table continued)

Domain	Benefits reported in the literature	Authors
Psychological	Sense of accomplishment	Coffman & Adamek (1999); Lord et al (2010); Perkins & Williamon (2014)
	Sense of purpose	Clift et al. (2008); Creech et al. (2013a); Creech et al. (2013b); Southcott (2009)
	Spirituality, personal growth	Clift & Hancox (2001); Hays & Minichiello (2005); Southcott (2009)
	Wellbeing (mental, personal, emotional or subjective)	Bungay & Skingley (2008); Clift & Morrison (2011); Clift et al. (2008); Clift & Hancox (2001); Coffman (2008); Coffman & Adamek (1999); Creech et al (2013a); Creech et al. (2013b); Lord et al (2010); Perkins & Williamon (2014); Skingley & Bungay (2010); Li & Southcott (2012); Varvarigou et al. (2011)

Domain	Benefits reported in the literature	Authors
Social relationships	Collaborations	Varvarigou et al. (2011)
	Connecting with other and socializing (social network)	Bungay & Skingley (2008); Clift & Hancox (2001); Coffman (2008); Hays & Minichiello (2005); Solé et al. (2010); Southcott (2009); Varvarigou et al. (2011)
	Reduced loneliness	Cohen et al. (2006); Dabback & Smith (2012); Davis et al. (2008); Hays & Minichiello (2005)
	Relatedness, shared interests	Dabback (2006); Clift et al. (2008); Li & Southcott (2012); Varvarigou et al. (2011)
	Sense of belonging and inclusion in the community	Bruhn (2002); Clift et al. (2008); Gembris (2008); Jones & Langston (2012); Veblen & Olsson (2002); Veblen & Waldron (2012)
	Social affirmation	Creech et al. (2013a; 2013b)
	Social interactions	Bungay & Skingley (2008); Coffman & Adamek (1999); Gembris (2008); Jeong and Kim (2007); Perkins & Williamon (2014); Skingley & Bungay (2010); Varvarigou et al. (2013)
	Social support (giving and receiving peer support)	Creech et al. (2013a); Clift et al. (2008); Lord et al. (2010)

Appendix 4

Means, Standard Deviations and Item-total Correlations for the PerfAIM

PerfAIM-44	Pilot version of the PerfAIM *	Mean (SD) *n*=241	Item-total correlations
1.	1. I have music performance anxiety when I play/sing in front of an audience.	**1.78 (1.11)**	**.78**
2.	2. I am nervous when I perform a new or not yet mastered repertoire.	**2.55 (1.01)**	**.71**
3.	3. I have trouble sleeping the night before a performance.	**1.05 (1.08)**	**.61**
4.	4. I worry about the audience's reaction to my performance.	**1.68 (1.27)**	**.65**
5.	5. I make music mistakes due to performance anxiety.	**1.64 (1.22)**	**.73**
6.	6. Negative thoughts adversely affect my performance.	**1.77 (1.31)**	**.70**
7.	7. I worry about not performing as well as I am able to.	**2.20 (1.25)**	**.75**
8.	8. I have nervous behaviours (I pace, tap my foot, etc.).	**1.20 (1.17)**	**.61**
9.	9. I am afraid of making mistakes.	**1.99 (1.29)**	**.72**
10.	10. Performing without sheet music stresses me.	**2.42 (1.45)**	**-.29**
11.	12. When performing, I feel that I am in control.	**2.01 (1.06)****	**-.47**
12.	14. I fear the worst will happen.	**1.13 (1.18)**	**.68**
13.	15. I have difficulty concentrating when I am performing.	**1.14 (1.20)**	**.65**
14.	16. I fear people will judge me.	**1.71 (1.25)**	**.65**
15.	17. I tend to have memory blanks.	**1.13 (1.10)**	**.51**
16.	18. I am short of energy when I am nervous.	**.58 (.92)**	**.40**
17.	19. I let my mistakes get the better of me.	**1.05 (1.09)**	**.67**
18.	20. I enjoy performing in public.	**1.27 (1.21)****	**.36**
19.	21. I am over-sensitive to or I over-react for the slightest reason (wrong notes, ambient noise, inattentive audience, poor lighting, etc.).	**1.13 (1.14)**	**.51**
20.	23. I worry about the same things over and over.	**1.22 (1.08)**	**.67**
21a	24a. I am anxious, worried or stressed: the week before a performance.	**.90 (1.01)**	**.39**
21b	24b. I am anxious, worried or stressed the night before a performance.	**1.38 (1.11)**	**.60**
21c	24c. I am anxious, worried or stressed before going on stage.	**1.99 (1.26)**	**.74**
21d	24d. I am anxious, worried or stressed when I go on stage.	**1.85 (1.34)**	**.79**
21e	24e. I am anxious, worried or stressed during the initial pieces I play/sing.	**1.73 (1.32)**	**.79**
21f	24f. I am anxious, worried or stressed between pieces.	**1.10 (1.08)**	**.74**
21g	24g. I am anxious, worried or stressed during the most difficult pieces.	**1.76 (1.19)**	**.74**
21h	24h. I am anxious, worried or stressed at other times (for example, after a performance).	**.49 (.95)**	**.49**
22a	25a. In front of an audience, my level of music performance anxiety increases due to: a lack of self-confidence.	**1.46 (1.29)**	**.68**
22b	25b. In front of an audience, my level of music performance anxiety increases due to: an audience that makes me feel intimidated.	**1.39 (1.25)**	**.58**
22c	25c. In front of an audience, my level of music performance anxiety increases due to: the presence of people that are close to me.	**1.24 (1.22)**	**.59**
22d	25d. In front of an audience, my level of music performance anxiety increases due to: an unfamiliar venue.	**.88 (1.01)**	**.42**
22e	25f. In front of an audience, my level of music performance anxiety increases due to: a difficult/challenging repertoire.	**1.67 (1.01)**	**.48**

(Table continued)

PerfAIM-44	Pilot version of the PerfAIM *	Mean (SD) *n*=241	Item-total correlations
22f	25g. In front of an audience, my level of music performance anxiety increases due to: a specific type of performance (e.g. an audition; solo performance).	**2.40 (1.22)**	**.56**
23a	26a. When I have music performance anxiety, I experience the following symptoms: muscle tension and stiffness.	**1.41 (1.28)**	**.58**
23b	26b. When I have music performance anxiety, I experience the following symptoms: upset stomach / knots in my stomach.	**1.22 (1.23)**	**.53**
23c	26c. When I have music performance anxiety, I experience the following symptoms: cold hands or sweaty palms.	**1.63 (1.31)**	**.58**
23d	26d. When I have music performance anxiety, I experience the following symptoms: trembling lips, voice, fingers or legs.	**1.31 (1.27)**	**.68**
23e	26e. When I have music performance anxiety, I experience the following symptoms: racing and/or pounding heart.	**1.72 (1.30)**	**.65**
23f	26f. When I have music performance anxiety, I experience the following symptoms: shortness of breath.	**.86 (1.08)**	**.50**
23g	26h. When I have music performance anxiety, I experience the following symptoms: excessive perspiration / hot flashes.	**.86 (1.17)**	**.42**
23h	26i. When I have music performance anxiety, I experience the following symptoms: numbness / tingling.	**.37 (.82)**	**.44**
23i	26k. When I have music performance anxiety, I experience the following symptoms: impaired coordination.	**.73 (1.10)**	**.52**
24	27. I am generally an anxious person.	**1.30 (1.07)**	**.43**

* Items were removed in the pilot version, so the items' numbers were adapted in the final version (PerfAIM-44).
** Inverted scale: 0= Greatly to 4=Not at all

Appendix 5

Performance Anxiety Inventory for Musicians (PerfAIM)

The statements below deal with the stress and anxiety associated with playing a musical instrument or singing in front of an audience. Think of your **recent musical performances where you felt highly stressed** and indicate the extent to which each statement applies to you.

Respond taking into account your most recent musical performances where you felt very stressed.	Not at all	A little	Moderately	Very much	Greatly
1. I have music performance anxiety when I play/sing in front of an audience.	**0**	**1**	**2**	**3**	**4**
2. I am nervous when I perform a new or not yet mastered repertoire.	**0**	**1**	**2**	**3**	**4**
3. I have trouble sleeping the night before a performance.	**0**	**1**	**2**	**3**	**4**
4. I worry about the audience's reaction to my performance.	**0**	**1**	**2**	**3**	**4**
5. I make music mistakes due to performance anxiety.	**0**	**1**	**2**	**3**	**4**
6. Negative thoughts adversely affect my performance.	**0**	**1**	**2**	**3**	**4**
7. I worry about not performing as well as I am able to.	**0**	**1**	**2**	**3**	**4**
8. I have nervous behaviours (I pace, tap my foot, etc.)**.**	**0**	**1**	**2**	**3**	**4**
9. I am afraid of making mistakes.	**0**	**1**	**2**	**3**	**4**
10. Performing without sheet music stresses me.	**0**	**1**	**2**	**3**	**4**
11. When performing, I feel that I am in control.	**0**	**1**	**2**	**3**	**4**
12. I fear the worst will happen.	**0**	**1**	**2**	**3**	**4**
13. I have difficulty concentrating when I am performing.	**0**	**1**	**2**	**3**	**4**
14. I fear people will judge me.	**0**	**1**	**2**	**3**	**4**
15. I tend to have memory blanks.	**0**	**1**	**2**	**3**	**4**
16. I am short of energy when I am nervous.	**0**	**1**	**2**	**3**	**4**
17. I let my mistakes get the better of me.	**0**	**1**	**2**	**3**	**4**
18. I enjoy performing in public.	**0**	**1**	**2**	**3**	**4**
19. I am over-sensitive to or I over-react for the slightest reason (wrong notes, ambient noise, inattentive audience, poor lighting, etc.)**.**	**0**	**1**	**2**	**3**	**4**
20. I worry about the same things over and over.	**0**	**1**	**2**	**3**	**4**

Respond taking into account your most recent musical performances where you felt very stressed.	Not at all	A little	Moderately	Very much	Greatly
21. I am anxious, worried or stressed:					
a. the week before a performance.	**0**	**1**	**2**	**3**	**4**
b. the night before a performance.	**0**	**1**	**2**	**3**	**4**
c. before going on stage.	**0**	**1**	**2**	**3**	**4**
d. when I go on stage.	**0**	**1**	**2**	**3**	**4**
e. during the initial pieces I play/sing.	**0**	**1**	**2**	**3**	**4**
f. between pieces.	**0**	**1**	**2**	**3**	**4**
g. during the most difficult pieces.	**0**	**1**	**2**	**3**	**4**
h. at other times (for example, after a performance).	**0**	**1**	**2**	**3**	**4**
Please specify :_____					
22. In front of an audience, my level of music performance anxiety increases due to :					
a. a lack of self-confidence.	**0**	**1**	**2**	**3**	**4**
b. an audience that makes me feel intimidated.	**0**	**1**	**2**	**3**	**4**
c. the presence of people that are close to me.	**0**	**1**	**2**	**3**	**4**
d. an unfamiliar venue.	**0**	**1**	**2**	**3**	**4**
e. a difficult/challenging repertoire.	**0**	**1**	**2**	**3**	**4**
f. a specific type of performance (e.g. an audition; solo performance).	**0**	**1**	**2**	**3**	**4**
Please specify :_____					
23. When I have music performance anxiety, I experience the following symptoms :					
a. muscle tension and stiffness.	**0**	**1**	**2**	**3**	**4**
b. upset stomach / knots in my stomach.	**0**	**1**	**2**	**3**	**4**
c. cold hands or sweaty palms.	**0**	**1**	**2**	**3**	**4**
d. trembling lips, voice, fingers or legs.	**0**	**1**	**2**	**3**	**4**
e. racing and/or pounding heart.	**0**	**1**	**2**	**3**	**4**
f. shortness of breath.	**0**	**1**	**2**	**3**	**4**
g. excessive perspiration / hot flashes.	**0**	**1**	**2**	**3**	**4**
h. numbness / tingling.	**0**	**1**	**2**	**3**	**4**
i. impaired coordination.	**0**	**1**	**2**	**3**	**4**
24. I am generally an anxious person.	**0**	**1**	**2**	**3**	**4**

Questions related to your general state of being.

25a. Physical condition: Since your physical condition can influence the intensity of your performance anxiety, please indicate all known physical health issues (Raynaud's Disease, tachycardia, etc.).

_____
_____
_____

25b. Mental condition: Since your mental state can influence the intensity of your performance anxiety, please indicate all known mental health issues (anxiety, depression, etc.).

_____
_____
_____

Comments and additional information:

_____
_____
_____

Information

The Performance Anxiety Inventory for Musicians (PerfAIM; Appendix 1) is a 44-item questionnaire divided into 24 statements. Of these statements, 21 are stand-alone items, and three include sub-items. Numbers appear beside each item to facilitate completion and decrease missing answers. The numbers are not inverted in the scale, in order to avoid distracting the participants, but the computation of scores has to be modified accordingly: the scale for the positive items (i.e. #11 and #18) needs to be inverted afterwards, then sum up with the score of negative items to obtain the final score. Scores are also calculated for each domain separately, as explained below.

Steps to compute scores for the PerfAIM

- Reverse the scale for items #11 and #18 (i.e., 0=4, 1=3, 2=2, 3=1, 4=0).
- Sum up all items and sub-items to get the total score.
- To obtain the score for each domain, sum up the following items and sub-items:
  - "Causes": 1+ 2+ 10+ 22+ 24
  - "Temporal Occurrence": 3+ 21
  - "Symptoms": 4+ 5+ 6+ 7+ 8+ 9+ 11+ 12+ 13+ 14+ 15+ 16+ 17+ 18+ 19+ 20+ 23

Results

Causes	**/ 40**
Temporal occurrence	**/ 36**
Symptoms	**/ 100**
Total Score	**/ 176**

To interpret results of individual respondents and compare them with a cohort of 241 musicians, please refer to Barbeau's dissertation "*Is performing music soothing or stressful? Two perspectives: Music performance anxiety among musicians and the effect of active music-making on seniors' health*" (Chapter 5; 2017).

Appendix 6

Performance et anxiété, un inventaire pour musiciens (PerfAIM)

Vous trouverez plus bas des énoncés qui ont tous trait au *stress* et à l'*anxiété* associés au fait de jouer ou de chanter devant un auditoire. En pensant aux **représentations musicales qui vous ont le plus stressé récemment**, indiquez à quel point les énoncés suivants s'appliquent à vous.

Répondez en fonction des représentations musicales qui vous ont le plus stressé récemment.	Pas du tout	Un peu	Modérément	Beaucoup	Énormément
1. J'ai le trac lorsque je joue (chante) devant un auditoire.	**0**	**1**	**2**	**3**	**4**
2. Je suis nerveux lorsque le répertoire que j'interprète est nouveau ou moins bien maîtrisé.	**0**	**1**	**2**	**3**	**4**
3. J'ai de la difficulté à dormir la veille d'une représentation.	**0**	**1**	**2**	**3**	**4**
4. Je crains la réaction de l'auditoire.	**0**	**1**	**2**	**3**	**4**
5. J'ai tendance à faire des erreurs musicales à cause du trac.	**0**	**1**	**2**	**3**	**4**
6. Les pensées négatives et l'inquiétude me dérangent lorsque je joue (chante) en public.	**0**	**1**	**2**	**3**	**4**
7. Je crains de ne pas être à la hauteur en tant qu'interprète.	**0**	**1**	**2**	**3**	**4**
8. J'ai des tics nerveux (je fais les cent pas, je tape du pied, etc.)	**0**	**1**	**2**	**3**	**4**
9. J'ai peur de faire des erreurs.	**0**	**1**	**2**	**3**	**4**
10. Jouer (chanter) sans partition me stresse.	**0**	**1**	**2**	**3**	**4**
11. Je sens que je contrôle la situation.	**0**	**1**	**2**	**3**	**4**
12. J'appréhende le pire.	**0**	**1**	**2**	**3**	**4**
13. J'ai de la difficulté à me concentrer en public.	**0**	**1**	**2**	**3**	**4**
14. Le jugement des autres me fait peur.	**0**	**1**	**2**	**3**	**4**
15. J'ai tendance à avoir des trous de mémoire.	**0**	**1**	**2**	**3**	**4**
16. Quand je suis nerveux, je manque d'énergie.	**0**	**1**	**2**	**3**	**4**
17. Je me laisse abattre par mes erreurs.	**0**	**1**	**2**	**3**	**4**
18. J'aime jouer (chanter) en public.	**0**	**1**	**2**	**3**	**4**
19. J'ai tendance à être trop sensible ou à réagir de façon exagérée au moindre incident (fausse note, bruit imprévu, auditoire inattentif, mauvais éclairage, etc.)	**0**	**1**	**2**	**3**	**4**
20. Je m'inquiète sans arrêt à propos des mêmes choses.	**0**	**1**	**2**	**3**	**4**

Répondez en fonction des représentations musicales qui vous ont le plus stressé récemment.	Pas du tout	Un peu	Modérément	Beaucoup	Énormément

21. Je suis anxieux, inquiet ou stressé :

i.	la semaine qui précède l'évènement;	**0**	**1**	**2**	**3**	**4**
j.	la veille de l'évènement;	**0**	**1**	**2**	**3**	**4**
k.	avant d'entrer en scène;	**0**	**1**	**2**	**3**	**4**
l.	quand j'entre en scène;	**0**	**1**	**2**	**3**	**4**
m.	pendant les premières pièces;	**0**	**1**	**2**	**3**	**4**
n.	entre les pièces;	**0**	**1**	**2**	**3**	**4**
o.	pendant les pièces les plus complexes;	**0**	**1**	**2**	**3**	**4**
p.	à d'autres moments (par exemple, après la représentation).	**0**	**1**	**2**	**3**	**4**

Veuillez préciser :_____

22. Devant un auditoire, mon trac augmente à cause :

g.	d'un manque de confiance en moi;	**0**	**1**	**2**	**3**	**4**
h.	d'un auditoire qui m'intimide;	**0**	**1**	**2**	**3**	**4**
i.	de la présence de mes proches;	**0**	**1**	**2**	**3**	**4**
j.	d'un lieu qui ne m'est pas familier;	**0**	**1**	**2**	**3**	**4**
k.	d'un répertoire difficile;	**0**	**1**	**2**	**3**	**4**
l.	d'un contexte particulier (une audition, une représentation comme soliste, etc.);	**0**	**1**	**2**	**3**	**4**

Veuillez préciser :_____

23. Lorsque j'ai le trac, les symptômes suivants se manifestent :

a.	tension et raideur musculaires;	**0**	**1**	**2**	**3**	**4**
b.	mal de ventre, nœud dans l'estomac;	**0**	**1**	**2**	**3**	**4**
c.	mains froides ou moites;	**0**	**1**	**2**	**3**	**4**
d.	tremblements (lèvres, voix, doigts, jambes, etc.);	**0**	**1**	**2**	**3**	**4**
e.	battements de cœur rapides ou très forts;	**0**	**1**	**2**	**3**	**4**
f.	essoufflement;	**0**	**1**	**2**	**3**	**4**
g.	transpiration, bouffée de chaleur;	**0**	**1**	**2**	**3**	**4**
h.	engourdissement, fourmillement;	**0**	**1**	**2**	**3**	**4**
i.	coordination altérée;	**0**	**1**	**2**	**3**	**4**

24. Je suis une personne anxieuse dans la vie de tous les jours	**0**	**1**	**2**	**3**	**4**

Questions d'ordre général

25a. État de santé physique : Puisque votre état de santé physique peut influencer l'intensité de votre trac, veuillez s'il vous plaît nous informer de tout problème de santé connu (maladie de Raynaud, tachycardie, etc.)

_____
_____
_____

25b. État de santé mentale : Puisque votre état de santé mentale peut influencer l'intensité de votre trac, veuillez s'il vous plaît nous informer de tout problème de santé connu (trouble d'anxiété, dépression, etc.)

_____
_____
_____

Commentaires et informations supplémentaires :

_____
_____
_____

Information

Le questionnaire *Performance et Anxiété, un Inventaire pour Musiciens* (PerfAIM) est un outil de 44 items divisés en 24 questions. Parmi ces questions, 21 apparaissent sous forme d'items individuels, et trois comprennent de sous-items. Un échelle est placée à côté de chaque question pour compléter le questionnaire facilement et diminuer les réponses manquantes. L'échelle demeure toujours dans le même format afin d'éviter de distraire les participants, mais le calcul des résultats doit être adapté en conséquence: l'échelle pour les items positifs (c'est-à-dire # 11 et # 18) doit être inversée avant d'additionner les résultats. Un calcul est également complété pour chaque domaine séparément, comme indiqué ci-dessous.

Étapes à suivre pour calculer les résultats pour le PerfAIM

- Inverser l'échelle pour les items #11 et #18 (c'est-à-dire 0=4, 1=3, 2=2, 3=1, 4=0).
- Additionner tous les items et sous-items pour obtenir le résultat total.
- Pour obtenir le résultat de chacun des domaines, additionner les items et sous-items suivants :
    - Causes: 1+2+10+22+24
    - Occurrence temporelle: 3 + 21
    - Symptômes: 4+ 5+ 6+ 7+ 8+ 9+ 11+ 12+ 13+ 14+ 15+ 16+ 17+ 18+ 19+ 20+ 23

Résultats

Causes	**/ 40**
Occurrence temporelle	**/ 36**
Symptômes	**/ 100**
Total	**/ 176**

Pour l'interprétation des résultats individuels des répondants et la comparaison à un échantillon de 241 musiciens, veuillez vous référer à la thèse de Barbeau : *Is performing music soothing or stressful? Two perspectives: Music performance anxiety among musicians and the effect of active music-making on seniors' health* (Chapitre 5; 2017).

Appendix 7

Components of MPA assessed in the PerfAIM, Categorized using the Biopsychosocial model and the NUTS Recipe for Stress.

Factors	NUTS[1]	Themes	PerfAIM Items	Mean (SD) n=241
Biological factors	US	Insomnia	I have trouble sleeping the night before a performance.	1.05 (1.08)
	S	Lack of energy	I am short of energy when I am nervous.	**.58 (.92)**
		Physical symptoms of anxiety	When I have music performance anxiety, I experience the following symptoms :	
	US		a. muscle tension and stiffness;	1.41 (1.28)
	US		b. upset stomach / knots in my stomach;	1.22 (1.23)
	US		c. cold hands or sweaty palms;	1.63 (1.31)
	US		d. trembling lips, voice, fingers or legs;	1.31 (1.27)
	US		e. racing and/or pounding heart;	1.72 (1.30)
	US		f. shortness of breath;	**.86 (1.08)**
	S		g. excessive perspiration / hot flashes;	**.86 (1.17)**
	S		h. numbness / tingling;	**.37 (.82)**
	S		i. impaired coordination.	**.73 (1.10)**
Psychological factors		Anticipation	I am anxious, worried or stressed:	
	S		a. the week before a performance;	**.90 (1.01)**
	U		b. the night before a performance;	1.38 (1.11)
	U		c. before going on stage;	1.99 (1.26)
	U		d. when I go on stage;	1.85 (1.34)
	UT		e. during the intial pieces I play/sing;	1.73 (1.32)
	UTS		f. between pieces;	1.10 (1.08)
	UT		g. during the most difficult pieces;	1.76 (1.19)
	S		h. at other times (for example, after a performance).	**.49 (.95)**
	UTS	Concentration	I have difficulty concentrating when I am performing.	1.14 (1.20)
	TS	Emotional turmoil	I let my mistakes get the better of me.	1.05 (1.09)
	T		I am over-sensitive to or I over-react for the slightest reason (wrong notes, ambient noise, inattentive audience, poor lighting, etc.).	1.13 (1.14)
	US	Memory	Performing without sheet music stresses me.	**2.42 (1.45)**
	TS		I tend to have memory blanks.	1.13 (1.10)
	NUT	Preparedness	I am nervous when I perform a new or not yet mastered repertoire.	**2.55 (1.01)**
		Self-confidence Self-efficacy	In front of an audience, my level of music performance anxiety increases due to :	1.46 (1.29)
	T		a. a lack of self-confidence;	
	T		e. a difficult/challenging repertoire;	1.67 (1.01)
	UT		f. a specific type of performance (e.g. an audition; solo performance).	**2.40 (1.22)**
	TS		I worry about not performing as well as I am able to.	**2.20 (1.25)**
	S	Sense of control	When performing, I feel that I am in control.	**2.01 (1.06)***
	NU		In front of an audience, my level of music performance anxiety increases due to : d. an unfamiliar venue.	**.88 (1.01)**
	TS	Trait anxiety	I am generally an anxious person.	1.30 (1.07)
	UTS		I have nervous behaviours (I pace, tap my foot, etc.).	1.20 (1.17)
	UTS		I make music mistakes due to performance anxiety.	1.64 (1.22)
	T	Worries / Catastrophization	Negative thoughts adversely affect my performance.	1.77 (1.31)
	UT		I am afraid of making mistakes.	1.99 (1.29)
	TS		I fear the worst will happen.	1.13 (1.18)
	T		I worry about the same things over and over.	1.22 (1.08)

(Table continued)

Factors	NUTS[1]	Themes	PerfAIM Items	Mean (SD) n=241
Social factors	T	Fear of being judged	I fear people will judge me.	1.71 (1.25)
	UT		I worry about the audience's reaction to my performance.	1.68 (1.27)
	S	Presence of an audience	I enjoy performing in public.	1.27 (1.21)*
	UT		I have music performance anxiety when I play/sing in front of an audience.	1.78 (1.11)
			In front of an audience, my level of music performance anxiety increases due to :	1.39 (1.25)
	T		b. an audience that makes me feel intimidated.;	
	UT		c. the presence of people that are close to me.	1.24 (1.22)

[1.] NUTS acronym (N : Novelty; U : Unpredictability; T : threat to the ego; S : Sense of low control) : Associations between PerfAIM's items and the NUTS recipe are based on the EFA analysis provided in Table 4 (Chapter 4).
* Inverted scale (Original scale: 0= Not at all; 1= A little; 2= Moderately; 3= Very much; 4= Greatly)
Bold: Means below 1; **Shaded area**: Means above 2

Appendix 8

Questions from the semi-structured interviews conducted for the study on the benefits of active music-making for older adults

Initial Interview

Family

1. Let's talk about your family and relatives: Are you close to them? How often do you see them?
2. Do you have children/grand-children? How many? How old are they?
3. Do you do activities with your family? Which ones?

Recreation and social life

4. Apart from the band you registered to, do you participate in other recreational activities? If yes, which one(s)?
5. Do you have an active social life? What do you do?
    - Do you have many friends? How often do you see them?
6. What does a regular week look like for you? What do you do usually?
7. Do you do something to keep yourself physically active (e.g. yoga, gardening, housework or chores)? What do you do exactly?

Quality of life

8. What is a good quality of life for you?
9. Do you consider yourself happy? Is there something that could improve your life quality?
10. Everyone has time when they feel stressed or anxious: What makes you stressed or anxious?
11. Everyone has time when they also feel depressed: What makes you depressed?

Music

12. Why did you decide to register to this musical activity? What made you choose to do it?
13. What do you expect from participating in such an activity?

Final Interview

1. During the last few months, did anything special happen? Something that changed your habits in a meaningful way?

Family

2. Did your relationships with your family change since the last time we met? Are you still as close to them as you were before? Do you see them as often?
3. Do you still do the same kinds of activities with your family?

Recreation and social life

4. Did you change or started new recreational activities? If yes, which one(s)?
5. Did your social life change? Are you more or less active socially?
    - Do you have many friends? How often do you see them?
    - Have you made new friends since you are in the band?
6. What does a regular week look like for you? What do you do usually?
7. Do you do something to keep yourself physically active (e.g. yoga, gardening, housework or chores)? What do you do exactly?

Quality of life

8. What is a good quality of life for you?
9. Do you consider yourself happy? Is there something that could improve your life quality?
10. Everyone has time when they feel stressed or anxious: What makes you stressed or anxious?
11. Everyone has time when they also feel depressed: What makes you depressed?

Music

12. Before being in the band, have you ever done music before? What is your background in music?
13. Do you participate in any other musical activities currently? What do you do? For how long have you been doing this?

MNHB

14. What did you get from participating in this band?
15. Was it what you expected when you started?
16. How did you like participating in an ensemble that was intergenerational? Please develop.
17. How did you like working with music ed students?
18. Would you prefer playing in a band exclusively for seniors? How so?
19. Did you perceive any benefits from participating in this band? If yes, which ones: Socially, physically and psychologically?
20. Have you experienced any limitations during your participation? If yes, which ones?
21. What kinds of learning strategies did you use in the band when you learned to read music, improvise, perform pieces, overcome technical difficulties at the instrument?
22. Did you perform at the concerts (April 10 and in June)? How would you describe your experience?

Appendix 9

WHOQOL-BREF

The following questions ask how you feel about your quality of life, health, or other areas of your life. I will read out each question to you, along with the response options. **Please choose the answer that appears most appropriate.** If you are unsure about which response to give to a question, the first response you think of is often the best one.

Please keep in mind your standards, hopes, pleasures and concerns. We ask that you think about your life **in the last four weeks.**

		Very poor	Poor	Neither poor nor good	Good	Very good
1.	How would you rate your quality of life?	1	2	3	4	5

		Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
2.	How satisfied are you with your health?	1	2	3	4	5

The following questions ask about **how much** you have experienced certain things in the last four weeks.

		Not at all	A little	A moderate amount	Very much	An extreme amount
3.	To what extent do you feel that physical pain prevents you from doing what you need to do?	5	4	3	2	1
4.	How much do you need any medical treatment to function in your daily life?	5	4	3	2	1
5.	How much do you enjoy life?	1	2	3	4	5
6.	To what extent do you feel your life to be meaningful?	1	2	3	4	5

		Not at all	A little	A moderate amount	Very much	Extremely
7.	How well are you able to concentrate?	1	2	3	4	5
8.	How safe do you feel in your daily life?	1	2	3	4	5
9.	How healthy is your physical environment?	1	2	3	4	5

The following questions ask about how completely you experience or were able to do certain things in the last four weeks.

		Not at all	A little	Moderately	Mostly	Completely
10.	Do you have enough energy for everyday life?	1	2	3	4	5
11.	Are you able to accept your bodily appearance?	1	2	3	4	5
12.	Have you enough money to meet your needs?	1	2	3	4	5
13.	How available to you is the information that you need in your day-to-day life?	1	2	3	4	5
14.	To what extent do you have the opportunity for leisure activities?	1	2	3	4	5

		Very poor	Poor	Neither poor nor good	Good	Very good
15.	How well are you able to get around?	1	2	3	4	5

		Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
16.	How satisfied are you with your sleep?	1	2	3	4	5
17.	How satisfied are you with your ability to perform your daily living activities?	1	2	3	4	5
18.	How satisfied are you with your capacity for work?	1	2	3	4	5
19.	How satisfied are you with yourself?	1	2	3	4	5

20.	How satisfied are you with your personal relationships?	1	2	3	4	5
21.	How satisfied are you with your sex life?	1	2	3	4	5
22.	How satisfied are you with the support you get from your friends?	1	2	3	4	5
23.	How satisfied are you with the conditions of your living place?	1	2	3	4	5
24.	How satisfied are you with your access to health services?	1	2	3	4	5
25.	How satisfied are you with your transport?	1	2	3	4	5

The following question refers to how often you have felt or experienced certain things in the last four weeks.

		Never	Seldom	Quite often	Very often	Always
26.	How often do you have negative feelings such as blue mood, despair, anxiety, depression?	5	4	3	2	1

Do you have any comments about the assessment?

_____

_____

[The following table should be completed after the interview is finished]

		Equations for computing domain scores	Raw score	Transformed scores*	
				4-20	0-100
27.	**Domain 1**	(6-Q3) + (6-Q4) + Q10 + Q15 + Q16 + Q17 + Q18 ☐ + ☐ + ☐ + ☐ + ☐ + ☐ + ☐	a. =	b:	c:
28.	**Domain 2**	Q5 + Q6 + Q7 + Q11 + Q19 + (6-Q26) ☐ + ☐ + ☐ + ☐ + ☐ + ☐	a. =	b:	c:
29.	**Domain 3**	Q20 + Q21 + Q22 ☐ + ☐ + ☐	a. =	b:	c:
30.	**Domain 4**	Q8 + Q9 + Q12 + Q13 + Q14 + Q23 + Q24 + Q25 ☐ + ☐ + ☐ + ☐ + ☐ + ☐ + ☐ + ☐	a. =	b:	c:

* See Procedures Manual, pages 13-15

Appendix 10

Interview transcripts used for the thematic analysis

Themes: Quality of life

Part.	INITIAL_**What is good QoL for you?**	FINAL_**What is good QoL for you?**
P2	Being healthy, having people around, being active, being able to read	Being healthy, having people around, peace at home, and "being able to go out and do things- as opposed to being at home and doing things. So- and learning new things- I guess that's something else that's important."
P3	It's a combination of health and friends and having enough money, and access to services like health, being able to get the necessities like food relatively easily. Stimulating the mind, that's really important to me, it's very important to me to keep my mind active. [...] Being physically active is very very important to me.	Health is very important- to be healthy, have no serious chronic illnesses or pain. To be reasonably psychologically happy and not worry too much. To have connections with people- to feel useful, that I'm doing something of value. Being outside- I love being outside- I try to get outside every single day for an hour or more- in fact, I miss the- one of the things I miss about work is because I would always bike to work or walk to work- so in fact I'm actually getting less exercise now than I did when I was working. So I have to make a conscious effort to get outside. But I love being outside, so I'll go for a walk, whatever.
P4	I'm just trying to figure it out- I think that I like to be active and I think that... What I've seen up until now in the 6 weeks only since I retired- so it's almost like vacation- is that I think I like to do something that feels useful. Like, even though I like to read books or practice the piano or things like that, if it doesn't feel like it's useful to anyone else, I don't feel as satisfied about my life. So I don't know what that thing is that's gonna make me feel useful for sure, but I think that to have a good quality of life- just to feel good about yourself- at least for me up until now that I need that. At the same time, it's wonderful if every day you have at least a couple of hours where you can choose to do what you want- you know, if it's watching TV or reading a book or playing the piano or whatever it is that you like to do, it's good that you will have some time every day that you'll be able to do that and not feel too rushed. And then, you will always feel better if you do some kind of exercise every day. It puts you in a better mood so it's very important to the quality of life, even if you don't feel like it. It's walking to the store in the snow banks, or if it's using the rowing machine- but if you do none of those things, you probably won't be feeling as good. And of course there's no good quality of life if you don't feel like you have some people around you that you love and that love you and so on- so you need to keep your ties with your family and friends. Yeah, so all those 4 things, I think it's about 4 things [laughs] ... Yeah.	So quality of life, the most probably important thing- although you could have a good quality of life without it though- but it's to be healthy, as healthy as you can. Which includes, you know, not being sick- as much as you can control that- but it also includes like being physically in good shape and having your eyes and your teeth and everything else looked after so you can, you know, chew well and see well and all those things. Which by the way when you're my age takes time- which I didn't mention in the weekly activities- but every week there is something about one of those things [laughs] Yeah so that's, that's very important and then it's very important to have friends and family- I don't think just family can be your friends. You need to have other people. Your family might move away and get a job in California or something like that- you don't know what's gonna happen so it's very important to have friends, and to stay in touch and to do activities with friends. Because we're social beings and that, that is part of life. But having said that- for me anyway- it's important to have alone time when you can be all by yourself and read a book or do nothing or listen to the birds sing or take a nap- so I find that if things get too busy and there's no time for that, I get irritated also. So the other thing which is the thing that sometimes bothers me about the retirement - is to have an identity that is meaningful to you. And when you're working full-time, you- whether you like your job or not, you have an identity well- "I am this and I'm doing that." Sometimes you might be annoyed you don't think it's useful enough - whatever it is you're doing- but I think when you're retired you need to get an identity too. Like some people do it by volunteering or by babysitting their grandchildren- or you know, by volunteering at the [inaudible]. So I guess a little bit I'm still searching for my identity except because I had that job half the time, it wasn't quite possible to find another purpose. But I think people want to feel useful- not just always enjoying themselves by reading a book or whatever.

Part.	INITIAL_**What is good QoL for you?**	FINAL_**What is good QoL for you?**
P7	Une bonne qualité de vie, pour moi (...) c'est d'avoir bien réussi sa vie, de ne pas avoir d'inquiétude. (...)- (AKB) Inquiétude financière vous voulez dire?- Financière et tout. Surtout financière, ça aide ben gros pour que ça aille bien.- (AKB) Pis autre chose?- La santé, ça fait parti de la qualité de vie. Pis l'entourage aussi, des gens qui t'aiment, ça aussi c'est beau. Les enfants qui arrêtent pas de me dire qu'ils m'aiment. Pis mon gars qui est assez costaud, quand il vient chez nous, il veut tout le temps que je lui fasse l'accolade. Fec là quand je lui fait l'accolade, je suis tout le temps « Ayoye, ayoye, ayoye! Arrête de niaiser là! Ayoye, ayoye, ayoye! » (rire) Fec ça ressemble à ça un peu.	Une bonne qualité de vie c'est d'être bien, financièrement, de payer le monde pour faire ton gazon, pis tes travaux, voyager plus, ce serait une bonne qualité de vie, mais tu y vas selon ton budget, fec à la place de payer le monde, c'est toi qui le fait. Ça ressemble à ça. (rire)
P8	ben la santé naturellement, parce que tout découle après ça. Et de s'entourer de gens qu'on aime. Pour moi c'est primordial. D'être bien dans sa peau, pis d'être, tsé d'avoir beaucoup d'amour, de donner beaucoup de soi, sans s'attendre à recevoir en retour. Moi je trouve que c'est... moi ça me fait tellement de donner. De faire plaisir, ça me fait tellement plaisir de faire plaisir aux autres. Je trouve ça... c'est ça qui me motive.	Ah, c'est la famille, les amis. Beaucoup d'amour, la santé, être ouverte à des expériences nouvelles comme l'orchestre. J'ai failli pas venir parce que je me disais «Ah c'est pas pour moi.» Mais, je me suis donnée un petit coup de pied, pis je regrette pas. Alors tout ça mis ensemble. Tsé prendre soin de soi aussi, ouais.
P9	Basically, it's doing more or less what I'm doing, but I'm - in the past, I always thought I would want to travel a little bit more- but just because of what I'm doing- like I would like to travel mostly in the winter, but because of the courses and stuff that I'm taking in the winter I'm reluctant to. So you know, I just gave... Well I didn't give it up, but I just [inaudible] "ok well if I really want to, I'll do it." So it's more or less like I'm a strong believer in doing what will make you happy, or make you content or whatever. [...] [Note: Ian mentioned some major dental reconstruction, so AKB asked if it affected his QoL: "Yeah [laughs]. Well, it- I have to think - one thing I enjoy to much is eating. And I have to think when I'm eating now. I have to think about where to chew, what to eat, and... and also, inevitably, if something happens and I have to run back to the dentist for, to fix it. "	It's... Basically to be able to comfortably [laughs]- to, my typical day- and yeah. Like... I value that. Yeah, every once in a while when I sit down and I think about it and I'm happy about it.
P10	I had a very insecure and very difficult childhood- so a good quality of life to me is to be secure. To be financially secure and to have a safe place to live. And those are the overriding concerns that I have in my whole life- is that my life is calm and predictable. That's- that's a... That doesn't answer the question [laughs] that's sort of a psychological question. Answer to a question about what's- I think it's important to do- I would feel bad if I weren't doing something most of the time. So I think it's really important to do something that's creative in some way. Like the needlework or the music or the bread baking- I consider them all creative- so I think it's important to do something where you- something changes from one state to another, and at the end you can see something that's happened: that's very important.	It's to... It's to be secure enough that I don't have to worry about... Money. About having enough money. To have a secure- secure, secure, secure. Having enough money to have a secure place to live and not worry about- that it's going to go away. Other than that, that's so important to be- that security is so important to me that almost anything else is extra. I don't - I'm not very sociable- I wouldn't- Iike I don't see friends and family, [inaudible]... I suppose they're important but to me it's not something that I think about very much...
P12	Une bonne qualité de vie, c'est de maintenir la santé, ça c'est important. Autrement, de bien manger, et puis avoir assez d'argent pour vivre. Comme ça j'aime bien travaillé au jardin en été, je m'occupe de mon jardin, j'ai beaucoup de fleurs.	une bonne qualité de vie c'est, ou…d'avoir la santé, de me lever tous les jours et puis euh, peut-être d'avoir plus des amis, plus une vie sociale, ça c'est peut-être euh désirable. Mais pour le moment, moi j'ai pas de…j'ai rien dans ce cas là pis j'espère un moment donné peut-être j'vais trouver d'autres amis ou d'autres gens mais pour le moment ouais je suis plutôt tout seul.

Part.	INITIAL_**What could improve your QoL?**	FINAL_**What could improve your QoL?**
P2	"Right at this moment in time I can't think of anything… (silence) No I don't… I can see at some point that I might want a more defined kind of challenge." (like doing a triathlon or something like that)	"I don't think anything, really. I'm very lucky- I'm very fortunate, yeah."
P3	I would, I feel I need to lose, say 15 pounds. You know, say, 5 to 10 kilograms. That, that would make me feel better if I lost that. But I would like to be more physically active I'm hoping now that I'm retired I can, I can do more things.	Oh there's probably many things but there's nothing that springs to mind. I don't, you know, I don't lie awake saying I wish this would happen or wish that would happen. In fact, it's a funny thing- I used to buy- the last few years 'cause work, politics at work, things were going- I wasn't enjoying it. I was buying lottery tickets almost every week. And now that I'm retired, I just don't buy lottery tickets. And I realize because I feel like I've won the lottery by being retired. There's so much less stress- so much less desire to escape that to need that dream of winning a million dollars- it's really really quite something. I would say I'm certainly happier now than I was a year ago.
P4	No. I just have to- I just have to find my way, like just find, get myself into some kind of a regular way that I'm happy with, yeah. […] (AKB): You talked about identity- the change of identity before we started the actual interview. How do you feel about that? Well, what I meant was... I, I have been divorced for more than 20 years and even before I was divorced I was mainly carrying- I was a working woman that was mainly carrying the family. So I think that I didn't realize how much my identity was tied up with keeping things going for everybody. And so it's not just that I had a job in IT at McGill, it's more that I identified myself as a working woman, you know, that was carrying everything and so if you don't need to carry everything anymore and you just get a pension or whatever it is that- then that, then you- part of your identity changes, and I think that's what I was trying to say. So now, what is my identity- I mean I'm still a mother and a friend, but I guess those were only pieces of identity before- so I, that's what I'm trying to say- it's different. [laughs]	Yeah, like I still hope- if I could find it I would accept another job like the one that I have- I'm not going to drive myself crazy trying to find one but if it came to me I would do that. But if it doesn't yeah I think I need to do something that, that makes me feel helpful or useful to some, somebodies. Like you for example is volunteering, you might know that, so, that's a good thing, you know... Yeah.
P7	Euh, si j'aurais moins niaisé jeune (rire). Être mieux financièrement, ça aurait été beaucoup mieux. J'ai dépensé plus jeune, fec là je suis correct, j'ai pas de problèmes, ben pas de problemes, faut que je fasse attention. J'ai quand même une belle vie pareil à comparer ben du monde. Ben j'ai le droit de me plaindre un peu des fois (rire).	(AKB) Qu'est-ce qui pourrait amélioré ta qualité de vie? Donc on parle surtout sur le plan financier?- Ouais, ça aiderait beaucoup.
P8	50 000 $? (rire) Non, un chalet. J'adore, j'aurais toujours voulu avoir un chalet. Ben si je l'avais tant voulu je l'aurais eu, disons que je me serais arrangée pour l'avoir. Mais tsé si il me tombait du ciel... j'aimerais ça avoir un chalet.	Ben, écoute je te dirais, ça fait 20 ans que je suis toute seule, pis je te dirais que peut-être rencontrer quelqu'un, je serais prête, à rencontrer quelqu'un. Quelqu'un de bien, qui améliorerait! (rire)

Part.	INITIAL_**What could improve your QoL?**	FINAL_**What could improve your QoL?**
P9	What could [laughs] having more time [laughs] That would be good! And also, yeah, and I guess one of the things that I've always dreamed about when I was working- well 2 things that I dreamed about- were to sit in a sidewalk cafe like on St-Denis or St-Catherine, and just sit there and watch people go by, and whatever. [laughs] I haven't done that yet-[...] ! And my other fantasy is to, on a relaxing basis, read the newspaper. And that's something that I do. Typically after I play squash I'll go down to either one of these cafeterias- either the gym or here- or in the summer go to one of the nearby parks and read the newspaper. But I haven't found the time to sit in an outdoor cafe yet. Maybe once a year I go to an outdoor restaurant, in the summer. [...] (Excerpt from the end of the interview: "When you were talking about the ideal life, of my life- one of the things that I have made a conscious effort to do is to do things at a more relaxed pace. Another something that has happened which- I didn't think of- you know something as simple as playing squash. Like when I was working: you played showered, run back to the office- I dunno where they get the time. But now you're playing, sit on the bench, chat for a while, and these are a lot of times I'm playing students, or going back, or even some employees- so I don't know where they have the time, but I never had the time to do that- so yeah, it's more of a relaxing atmosphere- when you run into someone from the club who you're not playing and you just have a side discussion and blah blah blah about things. And so... It's... different pace from when, you know, I had to be back and, or worked out lines and this and that."	What could improve it? It's... maybe, if [laughs] there were more time- it would be very hard, to... find things to improve it, yeah.
P10	... Realistically? No.	Probably not. [laughs] I would like to say more money but I know that's not a way to improve the quality of life [laughs] That's my security talking- maybe if I had more I would feel happier but I don't think so [laughs]
P12	Oui, peut-être une nouvelle connaissance, une nouvelle femme, un de ces jours. Ça pourrait grandement améliorer la qualité de vie! Pour le moment, je prends un jour à la fois.	Ouais ouais pis peut-être un de ces jours rencontrer une femme que j'peux vivre avec j'sais pas, pour le moment c'est je suis tout seul.

Theme: State of happiness

Part.	INITIAL_**Are you happy?**	FINAL_**Are you happy?**
P2	"Yeah, especially now that I have retired (laugh). It's nice being my own boss, I really like that!"	"Oh yeah, yeah. I don't have any complaints..."
P3	I would say you know I've on a scale of 1 to 10, I'm 7. And it hasn't changed much- I'm probably- I'm a little bit happier now than when I was working two months ago.	Yes
P4	Yes. I'm, I'm careful about saying that 'cause I've been a little stressed since I retired just I think because I don't have regular path anymore. But in general, happy.	I consider myself most of the time happy- I don't think everyone's always- anyone's always happy. With the... with the caveat that I'm still a little bit searching for that identity. Yeah I like sometimes wake up in the morning and say "oh, the day is ahead of me and there's many nice things I can do that I like to do, but nothing's pushing me to do anything"- I find it's a little bit weird.
P7	Des fois j'ai des petits manques.	Ouais, ouais, je suis heureux. Mais j'aimerais mieux être comme j'ai dit, ce serait plus le fun.
P8	Oui. Ben c'est ça, tout le monde a des moments de, tsé bon, on se lève le matin pis c'est pas si jojo. Mais il y a rien d'insurmontable.	Oui, oui.
P9	Yeah, yeah.	Yeah, yep.
P10	... I consider myself as happy as I will probably ever be, 'cause I suffer from depression and so it's very hard to judge whether, whether something is wrong with the world or there's something wrong with me. But I would say that where I am at the moment is as good as it could probably be- which is... controlled, safe, secure, and nothing very bad is happening. So- yes, happy [laughs] ok!	Yes.
P12	Oui, plus ou moins. Bah ouais, bah ouais.- (AKB) C'est sûr que c'est jamais toujours... pour personne.- Ouais, ouais. Non je suis, je pense je suis heureux. Je dois être heureux pour ce que j'ai et pas pour ce que j'ai perdu, pis ça va.	Ouais ouais, je suis heureux, ça dépend

Theme: Anxiety

Part.	INITIAL_**What makes you stressed/anxious?**	FINAL_**What makes you stressed/anxious?**
P2	" I don't think there's anything right now […] Life is pretty good"	"people relationships not going well- yeah that's stressful, yeah. So I guess that's why I like peace at home, you know. " and "Well there were times when the clarinet made me stressed and anxious- not really, really stressed and anxious, but- but... if I'd come to a practice and I just feel like it was way over my head [laughs]. And that didn't happen all the often. But that was a little stressful. It just made me go home and practice longer, but... It obviously wasn't a negative enough stress for me to stop doing it, right? It must have been an inspirational stress, you could say."
P3	Well I, even though my kids are adults now, I always worry about my kids.[...]. I worry about his future because he's just graduated but he's got an interim job, he's applied to go back to school next fall- whether he gets accepted or not, that's a worry- I do worry about my children. My health... Sooner or later the health, you know, if I have a heart attack my health is gonna go down. [...] So it's, that's anxious. But it's not something- it's in the back of my mind but it's not something that I dwell on, that I worry about. [...] So money I'm not too worried about- if it gets to be a problem I can sell the house, that kind of thing. But you know, I worry about people and health, I guess that's it.	At this very moment in my life? No.
P4	What's stressful for me is that everything is new. Every- well not everything, obviously I still have my children and I still have my boyfriend and things like that. But the actual procedures - I don't know what word to use [laughs] - in my life they're all new, so, something as simple as "how am I going to manage or structure my finances", it's not simple. We don't retire and get a pension- we retire and get the money that was contributed to our pension, and we have to decide what to do with it. [...] . I guess I like things to just be regular, come along 1-2-3, you know. And so the same thing, like whether I work or whether I don't work, it's a new thing I'm going to do- so I can adapt, and maybe I will love it- and it could be that I'll love it a lot more than what I used to do, but at this moment it's new. The band is the same thing: it's new, and I could end up loving it, but right now it's very new and so it's a struggle to learn and so on. So a lot of things- there's a few things in my life- like the piano and the storytellers- they're not new, so they're not stressful. But there's many things all around me that are new, and besides for that- the daughters are for various reasons having the same issues, like changing their jobs or graduated and looking for something- and so the people around me, several of them are in the same... tenuous circumstance [laughs]	I feel anxious about the younger daughter- probably more than I need to- but I mean, I worry about like the choices she will make and her finances and whether I'll get drawn into any of it. And I, probably based on some things that happened in my past - far past - but very bad financial things makes me more worried than I need to be. But yes, I get quite stressed about these things sometimes. And I also, worry - probably don't need to - but I also worry about my own finances and like, how, how should I arrange my retirement. Like should I buy and annuity or should I buy a liff? And these things you're not thinking about yet, but you will one day! Or half of annuity and half of a liff and should I put money with this company or that company... So I have spent some energy thinking about those things.

Part.	INITIAL_**What makes you stressed/anxious?**	FINAL_**What makes you stressed/anxious?**
P7	Là c'est qu'est-ce que l'infirmière me dit quand je lui ai donné du sang: c'est mon pouls. Pis ça a de l'air que si la pression est haute, ils donnent des pillules pour baisser la pression, pis je veux pas prendre de pillules. Fec c'est ça, c'est ça qui me stresse un peu là.	C'est plus des détails, genre arriver à l'heure, je savais qu'il fallait que j'arrive ici à 4h40. C'est tout des petits détails comme ça, quand je suis allé avec Louise la semaine passée, c'était pareil, checké la rue, pas me tromper de chemin. Quand on s'est en retourné de St-Eustache, j'ai pas pris le bon chemin, fec j'ai remonté St-Laurent jusqu'à la métropolitain, parce que j'ai pas été capable de la pogner avant en-bas! Ça avait l'air d'être bloqué. Fec ça c'est tout des petits stress de moments. Pour le reste, non.
P8	Mes petits-enfants. Je suis très mère poule, pis comme j'ai pas le contrôle. Ça m'inquiète, ça m'inquiète. Tsé je trouve que le monde à beaucoup changé. T'entends parler des pédophiles en ligne, ça ça m'énerve, au plus haut point! Donc c'est mes enfants et les petits-enfants pour lesquelles je suis le plus anxieuse. Et en même temps il sont tellement un grand bonheur, mais d'un autre côté... Pis je m'en fait. Je veux dire, il n'y a rien qui est arrivé. C'est du stress négatif qui a pas besoin d'être là, parce que je m'en fait pour des choses qui probablement arriveront jamais.	Incident avec un voisin (qui a brisé sa voiture dans le stationnement intéreur de son appartement): "Ah non, ça m'a tellement... J'ai trouvé ça tellement con de sa part. Pis là je suis allée raconter ça à un voisin, une connaissance, penchant sur ami. Il me dit «c'est de ta faute, tu l'as provoqué, en allant lui parler de ton miroir.» Donc ça m'a vraiment... je comprenais pas ce qui se passait, j'avais comme un nuage... Mais après ça je me suis dit «bon, c'est qu'une auto, il n'y a personne de blessé» alors je m'en suis sortie comme ça. [...] Je trouvais que c'était pas cool de sa part d'avoir fait ça. Pis l'autre non plus, qui me dit que c'était de ma faute, pis que «t'avais pas d'affaire à aller lui parler.» (Rire/soupir) Je me disais, «Pourquoi? Je mérite pas ça.»
P9	[Sighs] Piano recital [laughs]. That's probably one of the most stressful things that I do. I'm trying to think of other things... No I can't really think of other things. (AKB): And just out of curiosity, how often do you do recitals? Twice a week, a year, once a year?Yeah yeah, twice, maybe 3 times a year.	[laughs] Doing a performance.(AKB): Oh yeah-?Doing a recital... That's stressful. That's probably the most stressful thing in my life these days [laughs].(AKB): OK- have you done one recently?3, 4 weeks ago, yeah.(AKB): With the conservatory of music?It's- basically it was a group of people that I closely associated with from McGill, yeah.
P10	The thought of failure. The thought that I have done - have not done something I should've done or done something wrong. Is that a good enough answer? 'cause you want something specific, like- I'd be really stressed if I had missed the bus? [laughs]	... When I feel incompetent I feel extremely anxious and stressed. When I don't know how to do something... Or I think I've done something wrong. If I thought I'd bought the wrong smartphone I would feel bad for days.(AKB): OK.If I'd thought that I'd done something to make my partner upset, I would feel bad for days. So it's when I think I've failed at something that makes me - that can put my off balance for days at a time. Even very small things can do that.
P12	Pas grand chose, non. J'avais tout l' anxiété derrière moi. Puis comme je travaille plus maintenant, la dernière chose anxieuse était quand j'ai du liquider notre business. Après, maintenant, il y a pas beaucoup de chose qui me fait énerver ou quelque chose. Je me lève le matin je suis content que je suis toujours en vie, (rire) et puis j'essaye de continuer.	-Ouan, plus beaucoup non pasque depuis que j'ai vu ma femme être malade et mourir après ça ya pas pas beaucoup de choses qui peut stressant encore, je prend la vie un jour à la fois et puis euh, j'essaye de de ne pas me stresser. Pis j'travaille plus depuis j'ai plus de commerce et pis je travaille plus alors ya plus des des choses qui me stressent, quand j'ai eu le commerce c'est différent là ya toujours du stress. Maintenant euh ça je laisse les choses arriver tel qu'ils arrivent et pis je me stress plus. Pasque ça vaut pas la peine, ça donne rien.

Theme: Depression

Part.	INITIAL_**What makes you depressed?**	FINAL_**What makes you depressed?**
P2	"I can see that in retirement, that sense of… you know if you're going to work it can be frustrating but you can usually come home and say you have accomplished "x" even if you think that "x" was a waste of time (laugh). It's a little bit harder to find that in retirement. I mean, you know the fact that I did laundry is fine (laugh) you know it needed to be done, but it doesn't kind of give you that sort of, that kind of satisfaction. But I guess I have avoided being in that situation by becoming a guide and doing the clarinet. "	It seems that what makes her a bit depressed is the long-term aspect of retirement, not having something to look forward to, but she has strategies to deal with this: "I think it's important for me to get a reasonable amount of exercise. That always kinda - you know, if you're feeling kinda fed up, that's always a compensator, you know- changes the mood, kinda completely."
P3	Well like I mentioned, things that are- like the political situtation, the social situation- if I dwell on them, I get upset. But the reality is I can't do anything about it, and so I try not to dwell on things too much that I have no control over. What can get me depressed is if for instance if I have the same argument with my son over and over again, like we had the same difference of opinion about things. [...] I don't know, generally I'm not depressed! No because honestly there were times when I like I didn't come close to suicide or anything like that but there were times in my life when I wished I was dead. I would go to bed at night and I wished I wouldn't wake up in the morning. There were times like that. But I've lived through them and things are much much better now, so really, compared to what life used to be for me sometimes for me, I'm very happy. [laughs]	I would say at this moment, no. But I know- I've been through many ups and downs in my life. I know there will be times again when I will feel depressed and upset. I know that whatever stage you're in- it's like the weather, it's going to change. So I know its- I'm in a good place right now, but how long it's gonna last I don't know.
P4	I don't know if I'm depressed... I wouldn't say I'm just depressed, I'm more like, feel like I'm going down a rollercoaster- you wouldn't call that depressed, it's kinda [inhales sharply] [laughs] Yeah... No I don't think I'm depressed. I don't miss work, at all- it's not like that kind of feeling. It's like I dont, I don't go by that place where I used to work and say "oh I wish I was..." It's not that, it's just a little bit like the rollercoaster, yeah...	I don't think I'm really depressed... I suppose the closest I get to depressed is the mornings that I described to you- when I wake up and I'm like "there's many things to do but nobody's waiting for me to do any of them." That kind of thing comes from being a mother, like 40 years, probably.
P7	Non, ça mettons, je passe au travers de tout ça. […] Ben c'est ça, mes habitudes de vie sont pas bonnes, parce que moi c'est du restaurant tout le temps. Les seules fois que je mange à la maison c'est le déjeuné, deux petites toast au beurre de peanut. Le diner, c'est toujours au restaurant. Le souper, ben je vais chez métro, je prends des plats tous prêts, j'amène ça chez nous, fec c'est pas d'avance bien bien bon. Ça aussi faut que je regarde mon alimentation, je faisait la cuisine déjà, mais là je fais plus la cuisine. En étant seul t'es pas pour te la faire la cuisine.	Non, peut-être la routine tout le temps... Je me lève, qu'est-ce que je vais faire aujourd'hui? Ben de ces temps-là c'est l'air climatisé, pis là c'est Héma-Québec, que me tient tout ça. Mais des fois j'aimerais ça comme je sais pas, me semble que je partirais en moto, pis je le fais pas parce que j'ai des choses à faire. Fec je passe toujours les choses que j'ai à faire avant.- (AKB) Fec des fois le besoin de liberté se fait sentir un peu.- Ouais, c'est ça. Des fois, ça m'attriste, mais c'est correct.

Part.	INITIAL_**What makes you depressed?**	FINAL_**What makes you depressed?**
P8	Ben je dirais que c'est extérieur à moi. C'est pas rien dans ma vie, c'est ce que j'entends aux nouvelles, aussi. Pis le fait, je suis très consciente aussi que le fait que je regarde beaucoup beaucoup de shows, d'émissions de meurtre, pis des choses vécues. C'est sûr que ça peut pas faire autre chose que... Ça a un petit côté noir, un peu. Ouais. Je suis plus craintive disons. D'ailleurs, j'ai appris qu'il y a une femme dans mon... où j'habite - moi mon stationnement est intérieur - elle s'est faite attaquée par... ben attaquée et volée et tout ça. Donc tsé ça rend plus craintif ces choses là. C'est déprimant aussi de voir tous les sans-abris au centre-ville. Oui, ça c'est incroyable.	Euh... non, pas vraiment, c'est une belle phase. Oui, vraiment une belle phase. C'est ça, je vois mes enfants, mes petits-enfants, je m'en vais au camp musical, je prépare ça.
P9	It's not... I'm not sure if the past is the right word... Things make me feel, you know, fed up? I don't know if that counts. Oh, for example, I'm fed up / mad... in the past few years I've had less patience with organizations that I'm involved with or belong with. Like two things: work, the, you know I wasn't... happy with the way the organization was going. That's why I left- otherwise, I liked working and you know [...] (AKB): Even though you left, you know it's still-Yeah yeah yeah, oh yeah- you know as I was saying, it's multiple times a week. I'm in touch with like I know what's going on and whatever. And... it's, you know, when people have been part of each other's lives for their, you know, whole adult life, it still continues. And even though a lot of us left there are still a number of people are still there, and... Yeah, so.	Uh... That makes me depressed... That's- I can't think of anything... Off hand…
P10	... I get depressed when I think that I have- I may have failed so far in my life. That I haven't done as well as I should have. And I have no idea what I should have done- it's just this feeling that I failed. And the other thing that I mentioned is that when somebody in my family is having a hard time, I get- I absorb it and get very depressed on behalf of- especially my brother, who's bipolar. I look at him, I see somebody who can't handle things, and I get very depressed. Part of that is because if I think of family and my childhood, I instantly get depressed. It was very hard.	My brother- my brother, the bipolar guy... It's a - if I think about my family for too long, then I'll feel very depressed because my family historically was very unhappy. So it still carries forward so that I- I think of my nieces and nephews and I don't know if he's doing very well. I will get very sad for a day, I suppose, thinking about then. Until I pull myself together and realize I can't do anything about them. But I would say that what makes me feel sad is thinking about my family and... What makes me depressed is thinking about my family and things that were wrong in the past may be wrong in the future.
P12	Ah là, vous me faites pleurer encore, comme j'ai perdu ma femme.- (AKB) C'est assez récent, là. (...) Ça, ça reste un sujet difficile.- (...) Excusez... - (AKB) Prenez votre temps.- Ça c'était dur, 52 ans. (...)- (AKB) Comment est-elle décédée?- Du cancer. (...) On a eu 50 ans, 52 ans ensemble, beaucoup plus que beaucoup de gens.- (AKB) Focusons sur quelque chose de plus joyeux maintenant.- Faut l'habitude, c'est tout. (...) Excuser. On voudrait des réponses plus encourageantes, et plus "happier"- (AKB) Moi ce qui m'intéresse, c'est de comprendre où vous êtes dans votre vie, et si il y a des choses qu'on peut faire pour aider, pour aller mieux.- Non, non. Ce sont des choses que je dois travailler avec... J'espère un jour que ça va être plus simple... à supporter.	oua, pas grand chose, seulment que ma femme est plus là. Autrement… y'a pas grand chose.

Theme: Biological, psychological, and social benefits

Part.	FINAL_ **Did you perceive any benefits from participating in this band? If so, which ones?**
P2	... It always became something to look forward to in the week- again a sort of goal, you know? So that's a psychological benefit. Um... Physically [laughs] well- actually, I tend to be kind of cold-blooded- with the low blood pressure, I guess. And it was a great heat source- you know, I get hot when I'm practicing, 'cause you're breathing in a lot. So I'd always warm myself up when I practice [laughs]. That's about the only physical thing I can really think of- although I probably... Well I learned how to breathe differently- when I remembered how to do it. But theoretically I learned how to breathe differently. Socially? It was good to reconnect- well it was good to get to know B., you know. I- and it was good to reconnect with some of the people that I used to work with. Hal I kind of kept in touch with after leaving that area- but the other ones not so much- although I kind of heard about what they were doing and stuff like that. So it was a really nice way to reconnect with, with those people. I... On the other hand, it made it very easy to not reach out to other people
P3	Oh absolutely, absolutely. So I know this study relates to are there any physiological changes- like your lung capacity may be better. And there are some- I would say that the psychological benefits are more tangible- they're, they're very real I think, it's something to look forward to every week, it's something to do if you can, every day. [...] . So the point being that aging is a very... I'm faced with it every day, I guess, I can't say I dwell on it every day but I'm faced with it every day so being able to learn something new was something that I got a big thrill out of. And I figured it probably has a benefit. [...] Psychologically, something's changed in my brain- there's, new connections are being made in the - I can't remember right or left hemisphere- but they're being made, that were not there before. [...] Well, there were some people in the band that I already knew so it's not as if it made a huge difference for me. I mean, I did meet some new people but socially it didn't have a huge impact on me because I haven't made any significant friendships through the band or anything like that, so that regard it hasn't changed. But being part of something with other people is very important. I would- I think this experience is much better for me than for instance if I was gonna learn to play the piano or something like that with an instructer and then go and practice on my own. Maybe I would've kept it up and maybe I would've enjoyed it but but it wouldn't have been, nearly as satisfying an experience i don't think. Because there's something about everybody together working towards the common goal.That's fun- that's a lot of fun. And when, you know, the trumpet section actually gets it right, it feels good.
P4	Well on the social- yes, for sure. Like I said, I wanted to see those people and then I enjoyed meeting the other people- mostly the flutists, like really mostly it's Helene and Frederica that I talk to- but if I continued I would hope to get- I started at the end to get to know the rest of them a little bit more- so I enjoyed that. Enjoyed the idea of like trying to create something altogether. Physically- the, I think I don't have the breathing right. I think that's a physical challenge but I didn't quite get it yet. But what I noticed physically is this [unknown gesture] Like I didn't know how tiring it would be to - or you're taping - to lift your elbows up level with my shoulders for a long period of time. It's physically taxing which surprised me. So, it was that. Psychologically. I think it's good for the brain. I don't know if that's what you mean by psychologically but I think it's good for the brain to do things like this- it's like, well music is good for the brain. Like, it makes you think- it's physically and mentally- it makes you have to do several things at once: the fingering and breathing and the reading the notes and the trying to be loud or soft and the dynamics and everything else- so I think psychologically it helps to keep your brain active and your nerve endings and so on. Sometimes it made me really irritated [laughs] In the very beginning like I thought it would put me in a good mood but in the ver- well not the very beginning- but the first half, sometimes I didn't wanna look at the flute, and I had to force myself to practice and I would find myself saying "after I do the laundry"- "after I do the dishes" - "oh maybe I can practice the piano for 15 more minutes- oh too late now I have to go to bed"

	Because I really felt irritated and discouraged. And even now- it's inconsistent. I could practice one day and I feel quite good- I never feel very excellent 'cause I never do what I wanna do - but I could feel "oh that's not too bad, I think I'm getting that." And then the next day -I have no idea why- it will be worse and sometimes I almost wanna cry or I whine [laughs] Like [Ian]'s like "[inaudible] just stick out your stomach a little more- use your whole-" Breathing... And I'm just like "don't talk about it anymore!" [laughs] But I'm determined, so the other half of me is like "but I want to conquer it!" [laughs] Yeah, but it's not exactly joyful.
Part.	FINAL_ **Did you perceive any benefits from participating in this band? If so, which ones?**
P7	Euh physique, physique ça me fait une bonne marche, je pars de Bonaventure jusqu'à ici. Fec ça me fait faire une marche par semaine. Social? Ouais, je jase avec le monde un peu... ben c'est le fun, j'apprends, j'essaye de sortir mon anglais un peu, fec ça je trouve ça... c'est comme un atout. Quand tu travailles avec des gens, ou quand t'es avec des gens qui parlent pas français, ben ça te force à parler plus anglais. Fec ça c'est bon. -(AKB) Puis au niveau psychologique? - Psychologique? C'est (...) j'ai rien à dire, ça m'a pas traumatisé (rire) - (AKB) Non mais si on pense, au niveau émotif, ou juste du bien-être personnel, ou carrément, de la frustration. - Ouais, ouais, c'est du bien-être. - (AKB) Parce que il y en a des fois qui sortent frustrés parce que ça va pas bien... - Il y a des petites affaires, c'est pas grave, j'ai de la patience, mais tu leur fais poser des questions pendant le cours, c'est quoi, où on est rendu, tout ça. Mais c'est correct, c'est correct, je suis passé au travers! (rire) Je devrais pas dire ça, c'est enregistré! (rire)
P8	C'est juste que moi ça me fait plaisir de marcher. J'ai hâte aux mardis soir. Il y a des soirs je vais te dire, quand il faisait froid, tout ça, pis «ah, est-ce que j'y vais?» Mais j'ai toujours trouvé - je pense j'ai manqué une fois seulement - j'ai toujours trouvé le goût finalement, dire «non, j'y vais!» Pis j'étais toujours contente après, toujours contente d'être, d'avoir fait l'effort pis dire, oui j'y vais. Pis c'est beaucoup à cause de toi aussi, parce que, c'est ça, t'es... comment je te dirais, t'es une prof fantastique, je veux dire, t'es une rassembleuse. Tu rassembles ton monde, tsé t'es vraiment, vraiment épatante. On est tombés sur quelqu'un de bien. - (AKB) Merci beaucoup. Puis est-ce que tu as vu certains bienfaits au niveau physique? - Ben je pense qu'on s'en est même rendu compte quand... après. Disons on prenait la tension artérielle avant/après, pis c'était plus basse après. Euh, ça m'apporte de la joie, donc la joie ça fait juste que ton corps, tsé tu te sens mieux physiquement aussi. Euh, tsé... on est pas là pour épater la galerie, on est la pour se faire plaisir. - (AKB) S'accomplir par la musique. - Oui, oui. - (AKB) Donc au niveau psychologique, tu parles de la joie que ça t'apporte. Oui, oui. Euh ben je m'investi beaucoup dans ça. J'ai... je viens de renouveler mon hautbois pour un an, alors faudrait pas qu'on cesse d'exister (rire). J'ai renouvelé mon hautbois, pis tsé c'est rare, Audrey, que je commence un projet - c'est mon défaut - je commence beaucoup de chose pis je laisse tomber. Pis là on dirait que je laisse pas tomber. Malgré la difficulté que c'est d'apprendre le hautbois. Je le comprends pas encore, je sais pas comment ça se fait, mais j'aime ça. J'aime ça. Pis tsé je pourrais changer d'instrument, je pourrais dire, «ben je vais aller avec la flûte, la clarinette ou les percussions» parce que tsé, tu fais boum boum un peu une fois de temps en temps (rire). Mais j'aime le hautbois. J'aime ça, ça m'apporte... (inspiration) «Je joue du hautbois» (rire) ou j'essaie de jouer du hautbois! Je dis pas au gens que je joue du hautbois, je dis que j'apprends à jouer du hautbois. Oui. Et c'est ça, j'investi beaucoup de mon temps, tsé je m'en vais dans un camp musical, pour perfectionner. C'est sûr j'arriverai jamais au fait de ce qui a à apprendre, à mon âge, tsé c'est plus long à apprendre, c'est plus long à intégrer, c'est plus long à... Mais quand même, je me tape... oui. - Oui. Pis moi je suis prête à les aider, si il y en a qui joue du hautbois. Mais avec le peu de connaissances que j'ai apprises, ben là j'en ai beaucoup plus quand même que j'en avais quand j'ai commencé. Ça me dérangerais pas d'aider quelqu'un, à passer au travers.

Part.	FINAL_ **Did you perceive any benefits from participating in this band? If so, which ones?**
P9	Oh... Well I think socially it was- they were very social evenings, which is part of makes the fun- a fun evening... So I would say that would be the main… […] I don't know if it's because of the work on my mouth, but it- my mouth gets tired, quite- so you know, sometimes practicing before and then playing forces me to really push it and hopefully strengthen my mouth. So that was something that was- that will be a benefit. [...] Psychologically... Not- no, other than the- well, unless you consider part of the social benefits to improve your psychology- like if its... part of when you're there, it's not just to play- it's, you know, there's social interaction so that makes you feel better, so...
P10	(AKB): Yeah- so you said socially, you felt more comfortable- you weren't expecting that, but you were more ok with people? Yes, mhm. (AKB): Physically, we didn't talk about it. No, that's true. I think it's... It provided a... an impetus for practicing better, physical... Taking care of one's health, I think. Breathing, for sure: I would pay a lot more attention to my breathing- at all times. You know- I'd breathe and then I'd think about breathing... I'd think about intercostal muscles, and I would, you know, I'd... So I think it gave me some opportunities to pay attention to my posture and my breathing and even physical strength, yes. Not so that I'd, you know, had to train for it- but I think it made me aware and it had a positive affect on those things. Ok? (AKB): OK. And psychologically... How do you- how did you feel emotionally and- regarding your well-being and the band? It always made me feel good. I didn't realize that until I said it just now. I don't think I ever... felt that I- that the... No I never felt negative about it. There might have been times when I would've preferred to stay at home- but I... it was a tremendously positive experience. Because I would- I always came to class except when I wasn't - when I had something else that I had to do. And class went like that- 'cause it was so much fun. And I'd leave and I felt really good when I'd left. When I practiced, I felt good. Overall, it was extremely positive.
P12	Surtout sur le plan social, moi je vois pas de grande différence, plan physique pour le moment il faut que je joue dans la fanfare d'un concert, alors il semble que je peux jouer toute la nuit ça me fait pas de peine. mais surtout sur le pplan sychological ça m'aide beaucoup. Ouais ça j'aime bien parce que depuis je suis tout seul, ça c'est quelque chose pour thing et pis j'aimerais m'améliorer sur ça et pis des fois peut-être j'suis trop paresseux pour vraiment practice practice euh assez longtemps mais enfin de grand dans mes derrières pensées c'est ouais j'aimerais devenir mieux dans le trombone. Ça c'est quelque chose que.. AKB : Y'a vraiment une motivation -Ouais c'est une motivation et pis j'espère atteindre jamais le niveau de professionnel mais au moins être un bon amateur, hah!

Theme: MPA

Part.	FINAL_ **How would you describe your experience during concerts?**
P2	Um... Well, to me the two felt very different. Pollack Hall- ok it was one piece, and this is new but you're in there with all these other people like the students [laughs]. And it's much- was much more anonymous 'cause the audience was back, you know? And you can't really see them- you don't sort of know they're there. So it was sort of like an abstract, interesting experience. The next one was really a different- I think a different experience. First of all, by 4 pieces, not just one. So, that's a whole different thing somehow, I think. And the audience was that much closer- in fact, my husband sort of said "I'll come and support you" and I said "don't, you make me nervous" [laughs] So the audience felt that much- that much there, you know. So I was more conscious of making a mistake- and there weren't all these skilled students around, playing- either. Um... But that actually turned out the be a good thing, 'cause I- I discovered without kind of realizing it that when I was sitting beside B., I was sort of using her to keep track of the timing, you know? 'cause she had it, and there she was beside me [laughs] and I didn't have to make any effort. But that night we first practiced- the second to last night- with the room turned around the other way, I was in the back with the clarinets here, right? So I- I didn't have that. I couldn't rely on that, and I didn't know where I was gonna be sitting so... It sort of forced me in a way that it might not have, to really master the timing. I was probably more anxious about the second one. Because when we had the second to last night, I- some of them I was ok playing but I was also really lost at points- like I just wasn't – couldn't play fast enough and couldn't kind of keep up- so I was probably more nervous for the second one than I was for the first one. The first one I wasn't particularly nervous; I knew I could play it reasonably well, the one piece. And that there was gonna be this other mask- mask group. Sort of masking it when it didn't work [laughs] And I knew enough to stop playing if I got lost... But there was certainly a real high after that, the last session of actually kinda going through and realizing how much I had mastered compared to the week before, you know? That was... So the two experiences were very different- totally different for me, personally.
P3	I was less nervous than I thought I would be- I thought I would be more nervous. But I guess because there - there was not a - the audience was not full [laughs]. And you knew they were friends or family members of the audiences- of the band. And even though we were combined with the music education students I did not feel- I mean obviously they're better musicians but they were not intimidating or anything like that, and the conductor was good, and it was good that he came ahead of time and met with us and we ran through it. So I was surprised I thought I'd be more nervous but I was not nervous- maybe it's my age [laughs]. [...] Oh ok well I guess that relates to the concert because, if I'm doing something I"m enjoying I'm much calmer than I would've been say 5 years ago or 10 years ago- and more willing to go with it and see where it goes- and have much more patience. Whereas I have far less patience with something I don't wanna do. So maybe that's why I was not so nervous at the concert- 'cause I wasn't trying to prove something and I was doing something I was really enjoying. So, whatever, where the chips fall, they chop- that's the way it goes. Bu That was good- it was very hot in the room [laughs]. It was VERY hot in the room. But- no, that was good. That was a lot of fun.
P4	Yes. Well it was fun. It turned out better than I thought. (AKB): Ok! [laughs] There was sound coming out of my flute! [laughs] (AKB): Good for you! [laughs] [laughs] It's not always the case...

Part.	FINAL_ **How would you describe your experience during concerts?**
P7	Le premier, j'ai mieux aimé le premier. Le deuxième j'ai détesté, parce que j'avais trop chaud. Je me suis vu en photo, je suis mouillé barre en barre, les cheveux tout cotonnés. J'avais trop chaud, il y avait pas de son qui sortait. On dirait, si les lèvres collent pas comme il faut sur l'embouchure, tu peux pas travailler tes lèvres comme il faut. C'était tout le temps mouillé, ça glissait. Pis là j'ai trouvé... comment qu'il s'appelle, celui qui jouait seul à la trompette? […] - Je l'ai trouvé courageux, pis là, je me disait, j'aimerais donc ça être comme lui, être capable de jouer un morceau. Mettons que c'est un petit rêve, je sais pas si je vais le réaliser, mais j'aimerais ça, j'aimerais ça. Ça veut pas dire que je vais te dire oui! Mais j'aimerais ça, c'est un rêve. Parce que jeune, j'ai planté, fec ça fait que je vais me reprendre. - Ça veut pas dire que je vais le faire! (rire) - (AKB) C'est correct, je respecte ça! (rire) - C'est juste le genre de rêve dans ma tête, j'aimerais ça, j'aimerais ça. C'est niaiseux mais j'aimerais ça.
P8	Ben c'est ça, au début, tsé c'était... comme je l'avais bloqué de mon... je pensais pas. J'étais à la levée, pis on a parlé toi et moi, on a fait, tsé la table et les desserts et tout ça. Et là c'était les premiers, les solos. Et la je trouvais ça lefun parce que les gens se trompaient mais ils avaient pas l'air être nerveux. Ben il y en a qui étaient plus nerveux, mais [nom d'un trompettiste] tsé il était drôle, il nous a fait rire, pis il a recommencé. Pis il nous a dit, «oui, excusez-moi, je vais recommencer.» Je trouvais, mon dieu, c'est relaxe, c'est lefun, ça va être correct, tout ça. Pis là aussitôt sur la chaise pis mon instrument dans les mains, eille je.. ddddd. Là j'étais comme paniquée. Paniquée. Pourtant je veux dire, c'était des gens qui étaient là, ils étaient, ils savaient qu'on débutait, qu'on était pas parfait, mais je veux tellement bien faire, je voulais tellement bien faire! Alors, non, pis tsé les doigts me tremblaient, oui. Pis j'osais pas. Je regardais personne! Je regardais personne, pis il y avait des gens que j'avais invité qui étaient là, donc je regardais surtout pas dans ce coin-là. (rire) Et la seule personne que je regardais c'était toi, ou ma feuille, et that's it, that's all. Donc j'ai eu le trac, définitivement. Pis je trouve que je sais pas comment on gère ça. J'ai aucune idée comment on gère ça le trac.
P9	About the concert in April: "Oh it was neat [laughs] Yeah I mean- it was only- it was short, on our part was short... But I guess it was- it was fun to get up there for one- for one piece and do something- yeah, yeah."
P10	It was just one. Again, I would've expected my competitiveness to make me more nervous; I wasn't at all nervous. I practiced and practiced and I felt OK, and I knew that from the way you teach it that we were going to be ok. That whatever we did was ok, and that... and that I could... I thought we did really well in the last concert! I thought everybody worked for it really hard. So I- it was just fun. It was just fun and a pleasure.
P12	Ah non c'est bon c'était bon surtout les quatre morceaux qu'on a joué c'était- c'est sûr je sais pas si l'audience s'est rendu compte que, par exemple, la plupart des gens y'a 5 mois y'ont jamais su sur quel coté faut soufflé dans l'instrument hen, et pis comme ca on a été capable quand meme de présenter 3-4 morceaux qui étaient assez plaisant, ouais. Et pis c'était aussi, comment dire, les solos là ok ça c'était quelque chose d'un peu... de « Entertainment » -Et pis pourquoi pas? Ça a donné un aperçu aux gens aussi les difficultés que c'est de jouer un instrument pis plus difficultés encore de pas jouer et pis de se noyer dans le bruit de tout le monde mais d'être ici et pis, on les entends. Ça et pis fallait avoir du courage quand même, oh ouais, surtout le gars avec la trompette là y'était oh boy, ça prend du courage

Appendix 11

Statistical analyses: Reports

Results of randomization tests for the dependent variables under study: Quality of life, anxiety, depression, respiratory function, and blood pressure.

Report for Quality of Life

WHOQOL-Bref: Total score

Table 1

Randomization Tests for Quality of Life (Total scores)

	Before	After	Count of RSS[1]	Randomization tests (analogs small-n repeated measures design)
Experimental Group	*M*=106 *SD*=12	*M*=107 *SD*=13	506 (RSS=129)	.25*
Control Group	*M*=106 *SD*=13	*M*=111 *SD*=10	244 (RSS=715)	.36*
Count of arrangement statistics	1979	1169		
Randomization tests (analogs one-way two conditions)	.99*	.58*		

[1] Count of RSS at least as small as experimental value

[2] Count of arrangement statistics at least as large in absolute value as absolute (test)

* Not Significant

Results

Randomization tests (analogs one-way two conditions): **Experimental versus control group**

In a randomization test of the prediction that quality of life would increase in the experimental group as compared with the control group at the end of the intervention, 58% of the rearrangement statistics was at least as large as our experimental value. This is much larger than 5%, so we cannot reject the null hypothesis: Our experiment did not provide evidence that participating in a community band for 15 weeks improves quality of life in beginner musicians of 60 years old or over.

Randomization tests (analogs small-n repeated measures design): **Before versus after**

A randomization test of the null hypothesis that quality of life does not change for the experimental group over time gave 25% of a random sample of 2000 rearrangement statistics at least as small as our experimental value. This is higher than the 5% level, so we cannot reject the null hypothesis: Our experiment did not provide evidence that quality of life changes after an intervention of 15 weeks.

WHOQOL-Bref: Domain 1

Table 2

Randomization Tests for Quality of Life (Domain 1: Physical Health)

DOMAIN 1	Before	After	Count of RSS[1]	Randomization tests (analogs small-n repeated measures design)
Experimental Group	*M*=30 *SD*=3.66	*M*=30 *SD*=3.89	385 (RSS=21)	.19*
Control Group	*M*= 30.38 *SD*=3.25	*M*= 30.25 *SD*=3	44 (RSS=507)	.25*
Count of arrangement statistics	1783	1887		
Randomization tests (analogs one-way two conditions)	.89*	.94*		

[1] Count of RSS at least as small as experimental value
[2] Count of arrangement statistics at least as large in absolute value as absolute (test)
* Not Significant

WHOQOL-Bref: Domain 2

Table 3

Randomization Tests for Quality of Life (Domain 2: Psychological Health)

DOMAIN 2	Before	After	Count of RSS[1]	Randomization tests (analogs small-n repeated measures design)
Experimental Group	*M*=22.5 *SD*=3.89	*M*=23.3 *SD*=3.65	248 (RSS=16)	.12*
Control Group	*M*=22.75 *SD*=2.76	*M*=24.13 *SD*=2.75	731 (RSS=11)	.37*
Count of arrangement statistics	1902	1292		
Randomization tests (analogs one-way two conditions)	.95*	.65*		

[1] Count of RSS at least as small as experimental value
[2] Count of arrangement statistics at least as large in absolute value as absolute (test)
* Not Significant

WHOQOL-Bref: Domain 3

Table 4

Randomization Tests for Quality of Life (Domain 3: Social Relationships)

DOMAIN 3	Before	After	Count of RSS[1]	Randomization tests (analogs small-n repeated measures design)
Experimental Group	*M*=11.6 *SD*=2.97	*M*=11.9 *SD*=2.17	485 (RSS=8)	.24*
Control Group	*M*=11.5 *SD*=3.21	*M*=12.25 *SD*=2.6	120 (RSS=8)	.06*
Count of arrangement statistics	2000	1631		
Randomization tests (analogs one-way two conditions)	1.00*	.82*		

[1] Count of RSS at least as small as experimental value
[2] Count of arrangement statistics at least as large in absolute value as absolute (test)
* Not Significant

WHOQOL-Bref: Domain 4

Table 5

Randomization Tests for Quality of Life (Domain 4: Environment)

DOMAIN 4	Before	After	Count of RSS[1]	Randomization tests (analogs small-n repeated measures design)
Experimental Group	*M*=34.3 *SD*=3.41	*M*=33.4 *SD*=3.85	503 (RSS=15)	.25*
Control Group	*M*=33 *SD*=4	*M*=34.63 *SD*=3.58	244 (RSS=13)	.12*
Count of arrangement statistics	1124	1176		
Randomization tests (analogs one-way two conditions)	.56*	.59*		

[1] Count of RSS at least as small as experimental value
[2] Count of arrangement statistics at least as large in absolute value as absolute (test)
* Not Significant

Results

Randomization tests (analogs one-way two conditions): **Experimental versus control group**

In a randomization test of the prediction that specific domains of quality of life would increase in the experimental group as compared with the control group at the end of the intervention, 94% of the rearrangement statistics was at least as large as our experimental value for Domain 1, 65% for Domain 2, 82% for Domain 3, and 59% for Domain 4. This is much larger than 5%, so we cannot reject the null hypothesis: Our experiment did not provide evidence that participating in a community band for 15 weeks improves physical health, psychological health, social relationships or the environment of beginner musicians of 60 years old or over.

Randomization tests (analogs small-n repeated measures design): **Before versus after**

A randomization test of the null hypothesis that specific domains of quality of life do not change for the experimental group over time gave 19% of a random sample of 2000 rearrangement statistics at least as small as our experimental value for Domain 1, 12% for Domain 2, 24% for Domain 3, and 25% for Domain 4. This is higher than the 5% level, so we cannot reject the null hypothesis: Our experiment did not provide evidence that physical health, psychological health, social relationships, and the environment changed after an intervention of 15 weeks.

Report for Anxiety

State-Trait Anxiety Inventory

State Anxiety

Table 6

Randomization Tests for State Anxiety

STATE ANXIETY	Before	After	Count of RSS[1]	Randomization tests (analogs small-n repeated measures design)
Experimental Group	*M*=29 *SD*=7.84	*M*=27 *SD*=4.35	492 (RSS=136)	.25*
Control Group	*M*=26 *SD*=4.63	*M*=23 *SD*=3.88	476 (RSS=22)	.24*
Count of arrangement statistics	967	154		
Randomization tests (analogs one-way two conditions)	.48*	.07*		

[1] Count of RSS at least as small as experimental value

[2] Count of arrangement statistics at least as large in absolute value as absolute (test)

* Not Significant

Trait anxiety

Table 7

Randomization Tests for Trait Anxiety

TRAIT ANXIETY	Before	After	Count of RSS[1]	Randomization tests (analogs small-n repeated measures design)
Experimental Group	*M*=37 *SD*=13.25	*M*=36 *SD*=10.36	243 (RSS=147)	.12*
Control Group	*M*=31 *SD*=9.20	*M*=32 *SD*=7.75	268 (RSS=66)	.13*
Count of arrangement statistics	779	896		
Randomization tests (analogs one-way two conditions)	.39*	.45*		

[1] Count of RSS at least as small as experimental value

[2] Count of arrangement statistics at least as large in absolute value as absolute (test)

* Not Significant

Results

Randomization tests (analogs one-way two conditions): **Experimental versus control group**

In a randomization test of the prediction that state and trait anxiety would decrease in the experimental group as compared with the control group at the end of the intervention, 7% of the rearrangement statistics was at least as large as our experimental value for state anxiety and 45% for trait anxiety. This is larger than 5%, so we cannot reject the null hypothesis: Our experiment did not provide evidence that participating in a community band for 15 weeks lowers anxiety in beginner musicians of 60 years old or over.

Randomization tests (analogs small-n repeated measures design): **Before versus after**

A randomization test of the null hypothesis that anxiety does not change for the experimental group over time gave 25% of a random sample of 2000 rearrangement statistics at least as small as our experimental value for state anxiety, and 12% for trait anxiety. This is higher than the 5% level, so we cannot reject the null hypothesis: Our experiment did not provide evidence that anxiety levels changed after an intervention of 15 weeks.

Report for Depression

Beck Depression Inventory

Table 8

Randomization Tests for Depression

	Before	After	Count of RSS[1]	Randomization tests (analogs small-n repeated measures design)
Experimental Group	*M*=5.38 *SD*=3.96	*M*=4.5 *SD*=4.66	534 (RSS=37)	.26*
Control Group	*M*=5 *SD*=5.81	*M*=3 *SD*=2.62	503 (RSS=123)	.25*
Count of arrangement statistics	1861	1046		
Randomization tests (analogs one-way two conditions)	.93*	.52*		

[1] Count of RSS at least as small as experimental value

[2] Count of arrangement statistics at least as large in absolute value as absolute (test)

* Not Significant

Results

Randomization tests (analogs one-way two conditions): **Experimental versus control group**

In a randomization test of the prediction that depression would decrease in the experimental group as compared with the control group at the end of the intervention, 52% of the rearrangement statistics was at least as large as our experimental value. This is larger than 5%, so we cannot reject the null hypothesis: Our experiment did not provide evidence that participating in a community band for 15 weeks lowers depression in beginner musicians of 60 years old or over.

Randomization tests (analogs small-n repeated measures design): **Before versus after**

A randomization test of the null hypothesis that depression does not change for the experimental group over time gave 26% of a random sample of 2000 rearrangement statistics at least as small as our experimental value. This is higher than the 5% level, so we cannot reject the null hypothesis: Our experiment did not provide evidence that depression levels decreased after an intervention of 15 weeks.

Report for Respiratory Function

Spirometry tests

Forced Vital Capacity

Table 9

Randomization Tests for Forced Vital Capacity (FVC)

FVC	Before	After	Count of RSS[1]	Randomization tests (analogs small-n repeated measures design)
Experimental Group	*M*=3.52 *SD*=.70	*M*=3.55 *SD*=.69	135 (RSS=.10)	.07*
Control Group	*M*=3.06 *SD*=.69	*M*=3.23 *SD*=.82	234 (RSS=.20)	.12*
Count of arrangement statistics	419	879		
Randomization tests (analogs one-way two conditions)	.21*	.44*		

[1] Count of RSS at least as small as experimental value
[2] Count of arrangement statistics at least as large in absolute value as absolute (test)
* Not Significant

Forced Expiratory Volume in 1 Second

Table 10

Randomization Tests for Forced Expiratory Volume in 1 Second (FEV1)

FEV1	Before	After	Count of RSS[1]	Randomization tests (analogs small-n repeated measures design)
Experimental Group	*M*=2.77 *SD*=.64	*M*=2.78 *SD*=.67	113 (RSS=.019)	**.057***
Control Group	*M*=2.49 *SD*=.51	*M*=2.53 *SD*=.59	755 (RSS=.103)	.38*
Count of arrangement statistics	641	823		
Randomization tests (analogs one-way two conditions)	.32*	.41*		

[1] Count of RSS at least as small as experimental value
[2] Count of arrangement statistics at least as large in absolute value as absolute (test)
* Not Significant

Ratio FEV_1 / FVC

Table 11

Randomization Tests for the Ratio of FEV_1 over FVC

FEV1/FVC	Before	After	Count of RSS[1]	Randomization tests (analogs small-n repeated measures design)
Experimental Group	*M*=.78 *SD*=.06	*M*=.78 *SD*=.07	112 (RSS=.008)	**.056***
Control Group	*M*=.82 *SD*=.06	*M*=.78 *SD*=.05	503 (RSS=.004)	.25*
Count of arrangement statistics	705	1801		
Randomization tests (analogs one-way two conditions)	.35*	.90*		

[1] Count of RSS at least as small as experimental value
[2] Count of arrangement statistics at least as large in absolute value as absolute (test)
* Not Significant

Results

Randomization tests (analogs one-way two conditions): Experimental versus control group

In a randomization test of the prediction that respiratory function would improve in the experimental group as compared with the control group at the end of the intervention, 44% of the rearrangement statistics was at least as large as our experimental value for FVC, 41% for FEV1, and 90% for the ratio FEV1/FVC. This is larger than 5%, so we cannot reject the null hypothesis: Our experiment did not provide evidence that participating in a community band for 15 weeks improves respiratory function in beginner musicians of 60 years old or over.

Randomization tests (analogs small-n repeated measures design): Before versus after

A randomization test of the null hypothesis that respiratory function does not change for the experimental group over time gave 7% of a random sample of 2000 rearrangement statistics at least as small as our experimental value for FVC, 5.7% for FEV1, and 5.6% for the ratio FEV1/FVC. This is a little higher than the 5% level, so we cannot reject the null hypothesis: Our experiment did not provide evidence that respiratory function improved after an intervention of 15 weeks. However, these results almost reached significance, so we may hypothesize that reproducing the experiment over a longer period of time and/or with a larger sample might provide significant changes, which would deserve to be explored further.

Report for Blood Pressure

Systolic and Diastolic Blood Pressure

Systolic Blood Pressure

Table 12

Randomization Tests for Systolic Blood Pressure

SYSTOLIC	Before	After	Count of RSS[1]	Randomization tests (analogs small-n repeated measures design)
Experimental Group	*M*=126 *SD*=13	*M*=120 *SD*=17	112 (RSS=217)	**.056***
Control Group	*M*=122 *SD*=15	*M*=120 *SD*=13	496 (RSS=416)	.25*
Count of arrangement statistics	1136	1922		
Randomization tests (analogs one-way two conditions)	.57*	.96*		

[1] Count of RSS at least as small as experimental value
[2] Count of arrangement statistics at least as large in absolute value as absolute (test)
* Not Significant

Diastolic Blood Pressure

Table 13

Randomization Tests for Diastolic Blood Pressure

DIASTOLIC	Before	After	Count of RSS[1]	Randomization tests (analogs small-n repeated measures design)
Experimental Group	*M*=70 *SD*=11	*M*=70 *SD*=10	256 (RSS=144)	.13*
Control Group	*M*=69 *SD*=10	*M*=67 *SD*=11	125 (RSS=212)	.06*
Count of arrangement statistics	1773	1252		
Randomization tests (analogs one-way two conditions)	.89*	.63*		

[1] Count of RSS at least as small as experimental value
[2] Count of arrangement statistics at least as large in absolute value as absolute (test)
* Not Significant

Results

Randomization tests (analogs one-way two conditions): **Experimental versus control group**

In a randomization test of the prediction that blood pressure would decrease in the experimental group as compared with the control group at the end of the intervention, 96% of the rearrangement statistics was at least as large as our experimental value for systolic BP, and 63% for diastolic BP. This is larger than 5%, so we cannot reject the null hypothesis: Our experiment

did not provide evidence that participating in a community band for 15 weeks reduces BP levels in beginner musicians of 60 years old or over.

Randomization tests (analogs small-n repeated measures design): **Before versus after**

A randomization test of the null hypothesis that blood pressure does not change for the experimental group over time gave 5.6% of a random sample of 2000 rearrangement statistics at least as small as our experimental value for systolic BP, and 13% diastolic BP. This is higher than the 5% level, so we cannot reject the null hypothesis: Our experiment did not provide evidence that blood pressure levels decreased after an intervention of 15 weeks. It is worth pointing out that the result for systolic BP almost reached significance, which would deserve to be explored further in another study.

Pre- and Post-Rehearsal Blood Pressure

Table 14

Randomization Tests for Pre- and Post-Rehearsal Blood Pressure Tests

	Pre-rehearsal *Mean (SD)*	Post-rehearsal *Mean (SD)*	Count of RSS[1]	Randomization tests (analogs small-n repeated measures design)
March:				
Systolic BP	138 (28)	137 (25)	115 (RSS=475)	**.058***
Diastolic BP	78 (13)	79 (12)	134 (RSS=134)	.067*
April:				
Systolic BP	133 (17)	135 (16)	142 (RSS=167)	.07*
Diastolic BP	72 (9)	73 (9)	243 (RSS=123)	.12*
May:				
Systolic BP	131 (15)	129 (11)	145 (RSS=249)	.07*
Diastolic BP	74 (8)	72 (9)	1037 (RSS=460)	.52*

[1] Count of RSS at least as small as experimental value

* Not Significant

Results

Randomization tests (analogs small-n repeated measures design): **Pre- versus post-rehearsal**

A randomization test of the null hypothesis that blood pressure does not change from pre- to post-rehearsal gave 5.8% (systolic BP) and 6.7% (diastolic BP) of random samples of 2000 rearrangement statistics at least as small as our experimental values in March, 7% (systolic BP) and 12% (diastolic BP) in April, and 7% (systolic BP) and 52% (diastolic BP) in May. This is higher than the 5% level, so we cannot reject the null hypothesis: Our experiment did not provide evidence that blood pressure levels decreased post-rehearsal in comparison with pre-rehearsal. It is worth pointing out that the result for systolic BP taken in March almost reached significance.

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