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The Effects of Monaural Beat Technology on Learners' Experiences of Music Performance Anxiety (MPA)

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ABSTRACT

Music performance anxiety (MPA) is related to the experience of persisting, distressful, apprehensions 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 (Salmon 1990). This research project set out to investigate learners' subjective experiences of the effects of monaural beat (MB) vibrational frequencies on their experiences of MPA.

The research project was a qualitative study based on a phenomenological research paradigm, which fundamentally aims to explore an experience in its own terms (Smith et al. 2009). The research participants consisted of four subject music pupils at St Andrew's College and The Diocesan School for Girls and were interviewed through in-depth, semi-structured interviews over two practical examinations.

The results suggested that various factors contribute to the experience of music performance anxiety, such as the performers' perceptions of audience reactions, as well as the context of the performance. Self-esteem and the performer's fragile sense of self-worth and self-confidence also play an important role in influencing their music performance anxiety. However, listening to monaural beats during a performance has the ability to lower levels of music performance anxiety by eliciting the following effects: an improved sense of confidence within the listeners; a sense of calm; the monaural beats working on a passive awareness level that allows the beat to operate at a sub-conscious level; the ability to focus better on the task at hand as well as benefit the listener in non-musical contexts such as studying; general concentration or ordinary tasks such as gardening or going for a run.

The research suggests that listening to monaural beats during a musical performance can benefit the performer by lowering levels of MPA. As a result, the performer will experience an improved sense of confidence, calmness and the ability to focus better on the task at hand. Monaural beats have also shown to be a useful method of dealing with MPA instead of resorting to pharmaceutical drugs or other methods of coping such as playing games for distraction.

TABLE OF CONTENTS

Chapter 1: Introduction ...…….....1
1.1 Background……. ...……..……..…1
1.2 Rationale…… ...……..…….....2
1.3 Aims of research .....……..……...…4
1.4 Research questions …….……4
1.5 Methodology ……..……..4
1.6 Definition of key concepts ……..……6
1.7 Chapter outline ……9

Chapter 2: Literature review……..…….....…10
2.1 Introduction……10
2.2 A brief theoretical overview of brain responses to frequencies ……10
2.3 An overview of research in Brainwave Entrainment ……15
2.3.1 Empirical research focussing on monaural beats ……. ……...16
2.4 Altered states of consciousness ……18
2.4.1 Extended reticular-thalamic activation system: how a state of consciousness is regulated ……...19
2.5 Flow ……...20
2.6 Music performance anxiety (MPA)…….……...22
2.7 A theoretical overview of research in music and emotions …….……..……...26
2.8 Summary ……..…….28

Chapter 3: Methodology ……..……...…….…29
3.1 Introduction ……...……29
3.2 Research design …….……...…….29
3.3 Participants …….....31
3.4 Construction of the interview schedule ……...……..32
3.5 Procedures and data collection strategy ……..….....33
3.5.1 Contacting the participants, letter of consent ……...33
3.5.2 Conducting the interviews……34
3.6 Pilot Study ……...…….35
3.7 Data Analysis ……...……...…….....35

3.8 Ethical Considerations ……..…..38
3.9 Summary ……...…....40

Chapter 4: Analysis ……..……41
4.1 Introduction ……...41
4.2 Superordinate theme 1: Factors contributing to MPA ……...……45
4.2.1 Subordinate theme 1: Performance related factors ……...45
4.2.2 Subordinate theme 2: Self-esteem……48
4.2.3 Subordinate theme 3: MPA Coping Methods ……..……49
4.2.3.1 Medication ……..49
4.2.3.2 Games for the purpose of distraction ……..50
4.2.3.3 Performance experience ……..51
4.3 Superordinate theme 2: Effects of monaural beats ……...53
4.3.1 Subordinate theme 1: Sense of calm ……53
4.3.2 Subordinate theme 2: Improved confidence ……54
4.3.3 Subordinate theme 3: Passive awareness ……55
4.3.4 Subordinate theme 4: Focus ……56
4.4 Summary ……...58

Chapter 5: Discussion ……...……..…..59
5.1 Introduction ……...59
5.2 Superordinate theme 1: Factors contributing to MPA ……..59
5.3 Superordinate theme 2: Effects of monaural beats ……...66
5.4 Summary ……..…….....69

Chapter 6: Summary and conclusion ...……...……71
6.1 Introduction……71
6.2 Addressing the research questions……71
6.2.1 What factors influence or contribute to learners' MPA? ……...71
6.2.2 How does MPA affect practical performance? …….....73
6.2.3 What kinds of methods do learners generally use to manage MPA……...73
6.2.4 To what extent are learners consciously aware of monaural beat technology when played simultaneously during a performance? ……74
6.2.5 How do learners' experiences of MPA compare when background monaural beats are present or absent? ……74

6.3 Answering the main research question: what are the effects of monaural beat technology on MPA in learners performing practical examinations? ……74
6.4 Limitations of the study……..75
6.5 Recommendations for future research ……...76
6.6 Conclusions ……...76

References ……..78

Addenda

Addendum A: Interview Agenda ……87
Addendum B: Permission letter to Director of DR Wynne Music School …….88
Addendum C: Request for permission to conduct research at DSG ……..89
Addendum D: Request for permission to conduct research at SAC ……...89
Addendum E: Invitation to participants and parents or guardians ……..90
Addendum F : Letter of informed consent ……..92

LIST OF TABLES

Table 1.1: Definition of key concepts ……...6
Table 4.1: Superordinate and subordinate themes, raw data and keywords ……...41

LIST OF FIGURES

Figure 1: Monaural and binaural beat stimulation ……..16

Chapter 1

Introduction

1.1 Background

Research suggests that monaural beats can affect the human mind or body leading to altered states of consciousness and healing resulting in affected mood states in terms of levels of anxiety and well-being (Engelbrecht, Meijburg, Schulten, Pogarell & Deijen, 2019). Music performance anxiety, which affects individuals in various aspects such as the experience of persisting, distressful, apprehensions about and/or actual impairment of performance skills in a public context, to a degree unwarranted given the individual's musical aptitude is a disorder associated in the Beta 12–35 Hz brainwave frequency (Engelbrecht et al. 2019). Monaural beats appear to affect brainwave frequencies associated with different levels of consciousness through brainwave entrainment (Engelbrecht et al. 2019). Therefore, monaural beats are able to synchronise the brainwaves' neural activity to a specific auditory frequency that alters the human consciousness to a mental state associated with that specific auditory frequency (Pratt, Starr, Michalewski, Dimitrijevic, Bleich & Mittelman, 2010).

Monaural beat stimulation at theta 6Hz, alpha 10Hz and gamma 40Hz frequencies are effective in reducing stress-anxiety (Chaieb, Wilpert, Hoppe, Axmacher & Fell, 2017). However, it is interesting to note that although there is evidence that cortical responses to monaural-beat stimulation are more prominent than binaural beats, the majority of studies using auditory beat stimulation have been performed using binaural beats as stimuli. However, the findings of Chaieb et al. (2017) suggest a potential role for monaural-beat stimulation in treating symptoms of anxiety disorders, in a fast and non-invasive manner. A few examples in which the use of vibrational frequencies may be harnessed in the field of education include: background music in the classroom during lessons to promote a healthy learning environment that is conducive to heightened states of concentration, during examinations (both theoretical and practical across all subjects), when studying or doing homework and even before sport fixtures to once again manage performance anxiety with hopes of learners being able to perform to the best of their ability without unnecessary hindrance.

Performance anxiety is the fear of doing something in front of a group of people, which can cause symptoms such as a racing pulse, rapid breathing, dry mouth, tight throat, trembling, sweating, nausea and an uneasy feeling in the stomach (Rootberg 2011). Craske and Craig

(1984) state that situational factors influencing the occurrence and experience of performance anxiety can be related to the mere presence of an audience, its size, and status. Furthermore, the size of the presenting group influences the level of anxiety, with solo settings eliciting the highest degree of anxiety, followed by smaller ensembles, orchestras, and teaching settings (Cox and Kenardy 1993).

There exist numerous ways of coping with the impairing condition of performance anxiety, the most popular being the use of medication or pharmaceutical drugs (Fishbein, Middlestadt, Ottati, Straus & Ellis 1988). Fishbein et al. (1988) maintain that the use of drugs was reported as the most common strategy to cope by 40% of those with severe stage fright. Beta adrenoceptor blocking drugs are frequently used, often without medical prescription. However, according to Wesner, Noyes and Davis (1990) other studies investigating student samples report much lower rates of drug usage (below 4%). Interestingly, Wesner et al. (1990) maintain that nearly half of the students impaired by performance anxiety and still about one third of the unimpaired students would accept taking prescribed drugs, if necessary, to cope with performance anxiety. Some performers rely on a range of additional coping strategies that do not include the use of drugs such as hypnosis, massage, yoga and positive self-instruction (Fehm & Schmidt 2004).

In addition to performance anxiety, Salmon (1990) has proposed the term ‘musical performance anxiety’. Musical performance anxiety is related to the experience of persisting, distressful, apprehensions 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 (Salmon 1990). Musical performance anxiety is a relatively neglected psychological phenomenon that rarely appears in mainstream psychological journals or textbooks (Kenny & Osborne 2006). Salmon (1990) maintains that performance anxiety extends to individuals in a wide range of specialised skills and capabilities and has been documented in areas such as public speaking, test taking, athletics, military skills training, writing, sexual functioning and of course musical performance. The term ‘musical performance anxiety’ (MPA) is therefore proposed as a more appropriate term than ‘performance anxiety’ to characterize the generalized psychological distress reported by musicians well in advance as well as during performances.

1.2 Rationale

The rationale for this research stems from my introduction to binaural beats in an undergraduate course in Music Psychology offered at the Department of Music and Musicology, Rhodes University. When two carrier (sinusoidal) tones with a slight frequency difference are heard simultaneously in different ears through stereo headphones, the listener's brain perceives an illusion of a third beating frequency (Ioannou & Bhattacharya 2012). This third frequency is equal to the frequency mismatch between the two tones and is referred to as a Binaural beat. My subsequent personal experiences of the beneficial effects of Binaural beats, which can powerfully influence human consciousness through creating relaxed, meditative states, and the reduction of stress, inspired me to review the scientific literature relating to binaural beats in an Honours paper.

Researchers claim that these vibrational frequencies have the power to alter human consciousness (Atwater, 1997; Lane, 1998; Kasprzak, 2011; Chaieb, 2017; Wilpert, 2017). While binaural beats need to be used in conjunction with earphones in order to experience the full benefits of this phenomena, monaural beats may be used without the use of earphones to elicit similar effects on human consciousness.

This research expands on my previous research and explores another vibrational frequency phenomenon called monaural beats. During my experience as a music educator, I have noticed common trends emerging with certain musicians each time they are expected to perform either in a concert or practical examination. While practicing, these musicians are generally calm, focused and absorbed in the music. Their musical experience is synonymous with "Flow" experience, a term coined by Csikszentmihalyi (1990) to describe a heightened state of consciousness characterised by complete absorption in a task, enjoyment, and intense concentration. It results from a perfect balance between a person's skill and the challenge of specific task. Csikszentmihalyi (1990) maintain that these moments of optimal experience and functioning only occur when a person invests themselves completely in an activity that they wish to achieve success with regards to their end goal. While these musicians are experiencing this state of Flow, they are able to perform their pieces and scales flawlessly. However, upon entering the practical examination venue, this state of Flow is disrupted and replaced with a certain amount of anxiety, referred to in the literature as music performance anxiety. This in turn, has a negative effect on their performance of the pieces that they were able to play fluently. The music performance anxiety can become so overwhelming that basic tasks, such as technical work, is unsuccessful. It is extremely distressing and demotivating that music

performance anxiety can have such a negative impact on the learners, in spite of months of hard work and exam preparation resulting in underachievement.

1.3 Aims of research

This research investigates whether musicians could potentially benefit from the effects of monaural-beat vibrational frequencies by altering their state of consciousness in order to control their music performance anxiety. If learners are able to use vibrational frequencies to reduce music performance anxiety and thereby perform to their satisfaction during their practical examination, this research will contribute meaningfully to the existing knowledge and understanding of the beneficial functions of vibrational frequencies.

1. 4 Research questions

The main research question is:

What are the effects of monaural-beat technology on music performance anxiety in learners performing practical examinations?

The main research question is subdivided into the following sub-questions:

- What factors influence or contribute to learners' music performance anxiety?
- How does music performance anxiety affect practical performance?
- What kinds of methods do learners generally use to manage music performance anxiety?
- To what extent are learners consciously aware of monaural-beat technology when played simultaneusly during a performance?
- How do learners' experiences of music performance anxiety compare when background monaural beats are present or absent?

1.5 Methodology

This section outlines a brief overview of the methodology. Chapter 3 will discuss the methodology in more detail.

This research is a qualitative study based on the phenomenological research paradigm. A qualitative methodology in psychology collects data through interviews and the observation of

research participants (McLeod 2008). The data is then analysed through themes which emerge through the descriptions of the research participants. According to Larkin and Thompson (2011) phenomenology is the philosophical study of 'Being'.

The research participants' who participated in this study consist of four subject music pupils at St Andrew's College and The Diocesan School for Girls. The research participants' were purposefully selected based on the following criteria.

1) The participants should all experience high levels of music performance anxiety when performing in public.

2) The participants should all be subject pupils who should perform two graded practical examinations.

3) The research context is a live practical examination. All interviews should be conducted following the completion of the practical examination of each participant.

While the research participants were informed that one of their two practical examinations would have monaural beats playing in the background, they were not informed which exam this would be.

The research data was collected in two phases:

Phase 1: This took place during the participants half-term practical examinations. After their examination, I conducted the first interview consisting of three open-ended questions.

Phase 2: This took place during the participants' end of term practical examinations. Each research participant entered the examination venue while monaural beats were playing through speakers in the auditorium. The research participants once again performed another practical examination. After the completion of the second examination, I conducted the second interview with the participants. The research participants knew that one of their practical examinations would have monaural beats playing in the background, but they did not know which exam would have the monaural beats. This was to eliminate any placebo effect that might compromise the results.

Special permission was granted by Mr Johan Pretorius (Head of Music at DR Wynne Music School, the combined music school of St Andrew's and DSG) to allow for the research

participants to have additional practical examinations should it be found that the learners were disturbed during these exams.

A pilot study was conducted before proceeding with the interviews used in this research. The purpose of this was to help me learn to adhere to my interview schedule and questions. This preparation helped me to conduct my interviews in a professional manner that enabled me to gather all the relevant information I was looking for, as well as to develop or make changes with regards to my schedule. The research participant in the pilot study was not particularly talkative, which resulted in my asking him the prompt questions. I then decided to ask the prompt questions in each interview in order to elicit as many insights from my participants as possible.

Each recording from both phases of interviews were transcribed. I followed a strict content data analysis based on the framework laid out by Smith, Flowers and Larkin (2009). The transcription process was undertaken througout three phases: reading and re-reading the data, initial noting, and developing emerging themes. The seven emergent themes were categorised into subordinate themes falling under two superordinate themes. These identified themes were written up and discussed in Chapter 4.

This research complied with the ethical protocol as outlined in the Rhodes University Ethics Standards Committee (RUESC) Handbook (v1.01, 21 Nov 2014). Ethical consent and ethical clearance were obtained from the Rhodes University Higher Degrees Committee (RUESC) and the RUESC, respectively. Participation was voluntary and anonymous, and there was no financial incentive or remuneration. Participants could withdraw at any time.

1.6 Definition of key concepts

The following key concepts as outlined in Table 1.1 will be used throughout this research.

Table 1.1

Performance anxiety	A disorder that affects individuals in various scenarios, from test taking, public speaking, sport, performing arts in dance, acting, and music (Kenny 2016).

Music performance anxiety (MPA)	The generalised psychological distress reported by musicians before and during performances (Salmon 1990).
Monaural beat	The phenomenon induced when two sinusoidal plane waves with the same amplitude but a slight frequency difference are summated and presented to both ears simultaneously. The interference results in amplitude modulations perceived as monaural "beats" (Pratt, Starr, Michalewski, Dimitrijevic, Bleich and Mittelman 2010).
Binaural beat	An auditory illusion caused by listening to two tones of slightly different frequency, one in each ear. The difference in frequencies creates the illusion of a third sound, a rhythmic beat (Perez, Dumas, Lehmann 2020).
Frequency	Measured in hertz (Hz) units, is the rate at which vibrations and oscillations occur (Sessums 2019).
'Frequency following' response (FFR)	The FFR is a non-invasive means of reliably measuring the fidelity and precision with which the brain encodes sound. Measures derived from the FFR (e.g. timing, amplitude, consistency, and pitch tracking) reveal an individual's mapping between a stimulus and the brain's activity, which may be impaired by disease or enhanced through expertise (Coffey, Nicol, White-Schwoch, Chandrasekaran, Krizman, Skoe, Zatorre & Kraus 2019).

Vibrations	Refer to the oscillating and vibrating movement of atoms and particles caused by energy (Sessums 2019).
Auditory beat stimulation (ABS)	Technique for non-invasive brain stimulation using amplitude modulated tones with modulation frequencies (Chaieb et al. 2017).
Brain waves	Oscillating electrical voltages in the brain measuring just a few millionths of a volt (Abhang & Mehrotra 2016).
Brain-wave entrainment	A method to stimulate the brain into entering a specific state by using a pulsing sound, light, or electromagnetic field. The pulses elicit the brain's 'frequency following' response, encouraging the brainwaves to align to the frequency of a given beat (Brainworks 2020).
Cortical response	The brain's attempt to minimize the free energy induced by a stimulus and thereby encode the most likely cause of that stimulus (Friston 2005).
Consciousnes	Refers to individual awareness of unique thoughts, memories, feelings, sensations, and environments (Cherry 2020).
Altered state of consciousness	A change in one's normal mental state as a result of trauma or accident, or induced through meditation and drugs (Srinivasan 2015).
Reticular-thalamic activation system (RAS)	A network of neurons located in the brain stem that project anteriorly to the hypothalamus to mediate behavior, as well as

	both posteriorly to the thalamus and directly to the cortex for activation of awake, desynchronised cortical EEG patterns (Stevens & Hening 2007).

1.7 Chapter outline

Chapter 1 provides an introduction to the research, the background, aims, methodology, definition of key concepts and research questions.

Chapter 2 discusses current theories relating to the uses of monaural-beat technology in treating music performance anxiety in the field of music psychology. The theories include Flow psychology, monaural beats, performance anxiety and music performance anxiety.

Chapter 3 outlines the methodological procedures used for this research and includes the research design, research participants, the construction of my questionnaire and interview schedules, data collection strategy, pilot study, data analysis, ethical considerations as well as a brief discussion relating to the reliability and validity of the study.

Chapter 4 presents an IPA analysis of the transcribed interview data collected from the research participants. The data analysis resulted in the emergence of two superordinate themes and eight subordinate themes.

Chapter 5 presents a discussion of the identified emergent themes in relation the current academic literature.

Chapter 6 provides a conclusion and summary of the research.

Chapter 2

Literature Review

2.1 Introduction

Performance anxiety is the fear of doing something in front of a group of people which can cause symptoms listed in Chapter 1, including a racing pulse, dry mouth, and nausea (Rootberg 2011). In order to manage these unpleasant symptoms of performance anxiety, performers often turn to either pharmaceutical or non-pharmaceutical remedies so that their performances are not negatively affected. One such non-pharmaceutical remedy is the use of monaural beats to entrain brainwave frequencies. Research suggests that monaural beats, through manipulating the specific brainwave frequencies, may induce an altered level of consciousness (Engelbrecht, Meijburg, Schulten, Pogarell & Deijen 2019). Music performance anxiety is a disorder associated with the Beta 12–35 Hz brainwave frequency. Research suggests that monaural beats are able to synchronise the brainwaves' neural activity to a specific auditory frequency that alters the human consciousness to a mental state associated with a desirable auditory frequency (Pratt, Starr, Michalewski, Dimitrijevic, Bleich & Mittelman 2010).

Chapter 2 discusses current theories relating to the uses of monaural-beat technology in treating music performance anxiety in the field of music psychology. The theoretical overview reviews brain responses to frequencies, monaural beats, the effects of monaural beats on mood, anxiety and well-being, Flow, performance anxiety and music performance anxiety. The Chapter concludes with a summary.

2.2 A brief theoretical overview of brain responses to frequencies

The human brain has the capacity to synchronise brainwaves through a process known as brainwave entrainment (Engelbrecht et al. 2019). Also known as brainwave synchronisation or neural entrainment, it refers to the way in which external stimuli such as a pulsing sound, light, or electromagnetic field, naturally trigger a specific brainwave frequency, inducing an altered state of mind (Engelbrecht et al. 2019). The pulses set off the brain's 'frequency following' response, causing the brainwaves to align with, or mirror the specific frequency of a given beat. In the instance of sound waves, the 'frequency following' response causes neurons to become synchronised with the auditory brainstem entrainment induced by listening to

monaural beats (Engelbrecht et al. 2019). This synchronisation enables the neurons to interpret the audible frequency difference and start to fire at that perceived difference. The auditory stimuli of monaural beats interact in the cochlea and are therefore called peripheral beats (Chaieb, Wilpert, Hoppe, Axmacher & Fell 2017). From the cochlea, the auditory stimuli are relayed to the cochlear nucleus on the brainstem and to the auditory cortex. Each ear is connected to both hemispheres of the brain, and each hemisphere has its own olivary nucleus that receives information from each ear (Rosenzweig 1961). Swann, Bosanko, Cohen, Midgley and Seed (1982) suggest that this auditory sensation is neurologically connected to the extended reticular-thalamic activation system while being simultaneously connected to the cortex, where it can be measured as a 'frequency-following' response.

Similarly, Icke (2010) claims that the human brain converts sound vibrations into electrical signals, which are later decoded to construct our physical reality. For example, all incoming information relating to the physical world can be understood as the same sensory information in different forms, and the brain "decodes this information vibrationally, electrically, electromagnetically, and chemically" (Icke 2010, p. 3). In this way, all vibrational information or waveforms are decoded via the five senses and our brain into the illusion of physicality (Icke 2010). In a similar vein, it is possible that plants, crystals and human beings might in some way be music that has taken on a visible form (Willner 2009).

In other words, every cell in the human body pulsates, reflects and interacts with acoustic oscillations of the medium in which it exists (Willner 2009). Each musical note is connected with or linked to non-audible notes of higher octaves referred to as over-tones. Exploring beyond human responses, Willner (2009) also proposes that snowflakes and flowers might be responding to some kind of universal resonance in nature, which results in their shapes taking on a sacred geometrical formation when they grow. Similarly, Williams (2004, p. 6) expands on this theory of interrelationships between sound and matter, noting that "these ideas are modern reflections of timeless principles well known to all ancient and indigenous cultures". He states, however, that science is only just beginning to explore this phenomenon and very little scientific research on natural sound frequencies exists in the current body of literature, and not much is found in non-scientific literature.

Swiss researcher Hans Jenny (2001) proposes a new scientific phenomenon called cymatics, which originates from the Greek word: κῦμα, meaning "wave". Williams (2004, p. 6), claims that Jenny conducted experiments showing that "inert powders, pastes, and liquids, when

animated by audible, pure tones, would form into flowing patterns that mirrored those found throughout Nature, art, and architecture." Williams (2004) comments that Jenny's (2001) experiments strongly suggest that there is a correlation between sound and form, and thus the matter of the universe is a physical manifestation of vibrational frequencies. The website Altered States (2015) asserts that throughout history, ancient wise men and traditional healers have believed that everything is constantly in a state of vibration. They have used this knowledge to heal the human body through the understanding that every organ and cell can "absorb and emit sound through the form of vibrations…Everything has an optimal range of vibration called resonance and when something is vibrating in its optimal range, it is said to be in balance" (Altered States 2015).

Bragin (2015) suggests that the sacred Solfeggio frequencies contain the six pure tonal notes that were once used to make up the ancient musical scale, until they were altered by the Catholic Church and Pope Gregory I who served from 590 to 604 AD. Willner (2009) states that the sacred Solfeggio frequency has the power to influence the repair and evolution of DNA, specifically to 528Hz, as mapped out by Dr Joseph Puleo in his decoding of the biblical book of numbers. These ancient Solfeggio frequencies were used in Ancient Gregorian Chants, such as the great hymn to St John the Baptist, along with others that church authorities claim were lost centuries ago. The chants and their special tones were believed to impart tremendous spiritual blessings when sung in harmony during religious masses.

Bragin (2015) refutes the Church's claims that they have "lost" 152 of these ancient Gregorian chants, claiming that they may have been purposely locked away in the Vatican archives due to the Solfeggio frequencies being so effective that they undermined the power of the Vatican. These efforts made by the church to hide the sacred solfeggio tones are still evident in our music today as the modern-day musical scale is slightly out of sync from the original Solfeggio frequencies and is, consequently, more dissonant (Bragin 2015). This seemingly results in the healing powers of the Solfeggio frequencies being eliminated. Bragin (2015) also states that a 7th note was added to the modern scale in the form of a "*ti*," as in the "*do, re, mi, fa, so, la, ti*" vocal scale, while the original Solfeggio scale was composed of only six notes: "*ut, re, mi, fa, so, la*". Sacred Solfeggio frequencies achieved this healing by re-syncing all the frequencies that cause separation from the source, be it physical, mental or spiritual, to their optimal level of vibrational frequencies necessary to be "at one" with the world around them. Just like binaural beats have different effects on consciousness depending on what frequency is heard,

sacred solfeggio frequencies also have different effects on consciousness according to what frequency is being sung.

Bragin (2015) claims that these are the Solfeggio frequencies:

- Ut – 396 Hz – liberating guilt and fear
- Re – 417 Hz – undoing situations and facilitating change
- Mi – 528 Hz – transformation and miracles (DNA repair) derives from the phrase "*MI-ra gestorum*," in Latin, meaning "miracle." This is the exact frequency used by genetic biochemists to repair broken DNA – the genetic blueprint upon which life is based.
- Fa – 639 Hz – connecting/relationships
- So – 741 Hz – awakening intuition
- La – 852 Hz – returning to spiritual order.

Yudkin (1989, p. 251) claims that, "Music on Earth was a reflection of the greater music of the spheres, a harmony created by relative distances and rates of motions of the planets, a harmony that was constantly present if only people were sufficiently sensitive to hear it." Smith (2014) measured the speed of light as approximately 300,000 km/sec and one cycle is the circumference of the Earth, which is approximately 40,000 km/cycle. When the speed of light is divided by the circumference of the Earth, we get 7.5 cycles/ second. A cycle/sec is just 1 Hz, so 7.5 cycles/second is equal to 7.5 Hz. According to Smith (2014) the Earth has natural frequencies, called Schumann resonances, which are measured at 7.5Hz. These frequencies emit electromagnetic radiation while the human brain also consists of natural frequencies that emit electromagnetic radiation. Smith (2014) maintains that the natural frequencies of the Human Brain are: Beta waves (14 to 30 Hz), Alpha waves (8 to 13 Hz), Theta waves (4 to 7 Hz), and Delta waves (1 to 3 Hz). Smith (2014) claims that the human brain's alpha and theta states are in tune with the Earth's Schumann resonance. Therefore, when an individual is accessing frequencies in these alpha and theta states, they are then 'at one' and are vibrating at the same frequency of the Earth. Smith (2014) also claims that alpha frequencies have been associated with meditation and relaxation, and theta frequencies have been associated with dreamy, creative states.

The sound of “Ohm” is believed by Hindus and Buddhists to be the vibration by which creation was set in motion (Mazursky 2006). The website Universe (2015) mentions that Ohm is an ancient symbol with many stylistic variations. However, the Sanskrit Om is most widely known. Universe (2015) suggests that the vibrational tone of Ohm is based on the measured frequency of the Earth’s orbit as it travels around the Sun. Based on this knowledge; ancient cultures consider Ohm an Earth tone. Historically, Universe (2015) suggests that Ohm symbolises birth and death, the waking and dream states, and our corporal and transcendent selves. The "O" represents birth, and the "M" represents death. Universe (2015) suggests that the added "h" in the spelling for this symbol provides a visual *axis mundi*, "as above, so below", connecting spirit and matter. The phonetic addition of the "h" reflects the individuals desire to emphasise the element of air, and thus breath, vital to life and the healing process.

As suggested by Smith (2014), planet earth’s natural frequencies, called Schumann resonances, are measured at 7.5Hz. Therefore, the sound of Ohm registers at 7.5 Hz, which is the same frequency as the Earth as it rotates around the Sun. Buddhist’s understand that humans and/or parts of humans vibrate at a ‘healthy’ frequency when well, and at a different, ‘less healthy’ frequency when under stress, injury, and/or illness (Mazursky 2006). Buddhist chanting uses sounds and other vibrations produced by ancient vibration instruments such as singing bowls which are tuned to certain frequencies (most importantly being the Ohm frequency) to reduce or eliminate stress, emotional, and/or physical pain (Mazursky 2006). Playing the bowls usually causes an immediate centring effect and the tones set up a ‘frequency following’ response that creates synchronisation between the left/right brain hemispheres. Mazursky (2006) posits that this sound therapy is used to reduce or recalibrate the ‘less healthy’ frequencies of an individual and returns them to a ‘healthy’ frequency.

According to Bedgard and Georges (2000) the human ear can only identify frequencies in the range of 20 Hz and 20 000 Hz. Any inaudible frequencies below the audible human range of 20 Hz are referred to as ‘infrasound’. These inaudible infrasound frequencies, if played loud enough, are often perceived rather than heard. Examples of infrasound technologies were already present during the Cold war as a method of identifying, locating and classifying nuclear explosions at great distances with radars (Bedgard & Georges 2000). Fitzner (2019) claims that because elephants have a hearing range that extends below 20 Hz, they use infrasound as a means of long-distance communication, as the frequencies travel through objects rather than being reflected. Infrasound is used in horror films and during haunted house tours to elicit subconscious feelings of anxiety, uneasiness and fear in the audience (Sills 2020). However,

infrasound alone does not elicit these feelings and musical scores and sound effects contribute to the feelings of uneasiness (Sills 2020).

2.3 An overview of research in brainwave entrainment

Brainwave Entrainment Technology was conceptualised in 1839 by Heinrich Wilhelm Dove, a German scientist and researcher known for his research of binaural beats (Kasprzak 2011). The technology became recognised by the wider scientific community in 1973 when Gerald Oster published his research on the effects of auditory beats in the brain in the *Scientific American* journal (Oster 1973). Since then, various brainwave entrainment systems such as monaural beats have been developed using different combinations of frequencies and sound effects to alter human consciousness (Atwater 1997; Ioannou & Bhattacharya 2012; Kasprzak 2011) and improve health (Atwater 2004).

The vibrational frequency known as a Monaural beat is a pulsating auditory stimulus that induces a frequency-following brainwave response (Chaieb et al. 2017). This stimulus, referred to as an auditory beat stimulation (ABS), delivers an audio stimulus to both ears simultaneously through earphones or speakers (Chaieb et al. 2017).

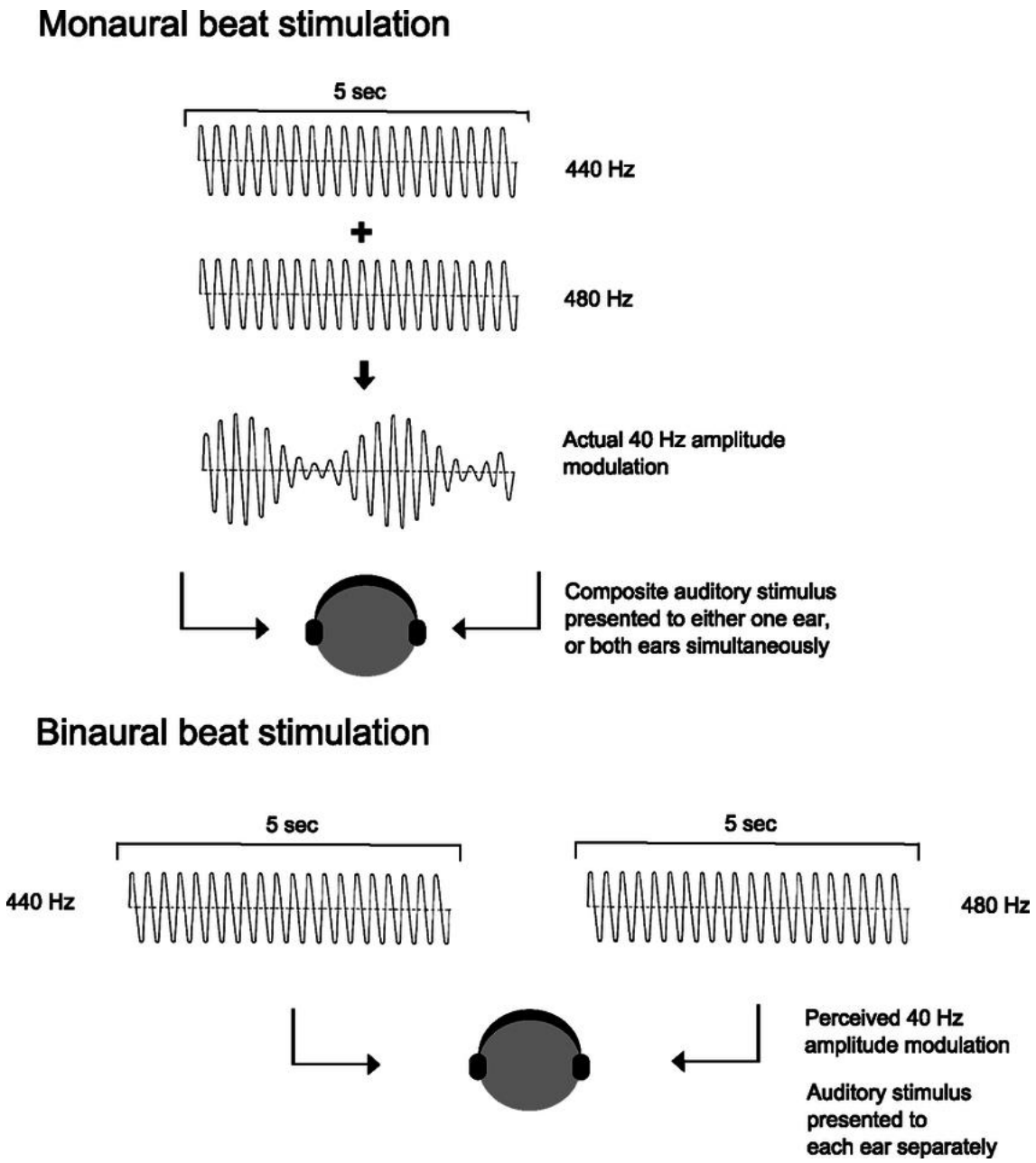
Atwater (1997, p. 2) claims that the brain's response period (cycles per second) to auditory beat stimulation corresponds with the fundamental frequency of the stimulus, causing an "electroencephalographic (EEG) frequency-following response". Atwater (1997) maintains that auditory beat stimulation produces changes in EEG patterns in the extended reticular-thalamic activation system (RAS).

The term 'Hemispheric Synchronisation' was coined by Atwater (2004) and refers to the phenomenon whereby the left and right hemispheres of the brain appear to function coherently or in sync with each other when exposed to auditory beating. Engelbrecht et al. (2019) further suggest that because of the hypothesised capacity of the brain to synchronise its brainwave frequencies with external auditory stimuli frequencies, auditory beat stimulation can elicit states of awareness, resulting in an increase of people's cognitive functioning or a change in state of mind.

When two sinusoidal plane waves with the same amplitude but a slight frequency difference are summated and presented to both ears simultaneously, the interference results in amplitude modulations perceived by the ears as monaural beats (Pratt, Starr, Michalewski, Dimitrijevic, Bleich & Mittelman 2010). The frequency of this beat will be equal to the frequency mismatch

between the two sinusoidal plane waves. This physical beat signal is modulated first in the cochlea and then relayed via brain stem neurons to the auditory cortex. Figure 1 illustrates the way monaural and binaural beats stimulate the auditory cortex (Chaieb et al. 2017).

Figure 1: Monaural and Binaural beat stimulation



2.3.1 Empirical research focusing on monaural beats (MB)

Unlike binaural beats, monaural beats occur because of an amplitude modulation of acoustic input to both ears simultaneously. They therefore do not necessarily involve convergence of activity from both ears. Very few empirical studies explore the effects of monaural beats on

brainwave frequencies, although two recent studies provide some initial insights into the phenomenon. Pratt et al. (2010) conducted a study in which brain potential associated with amplitude modulated tones (monaural beats) were compared to the perception of amplitude modulation (binaural beats). While the results of the study showed no significant differences in the effects of the two stimuli, and while both stimuli maintained a regular beat frequency, the effects of monaural beats were reported to be more pronounced than the binaural beats. For example, Pratt et al. (2010) further suggest that sources of both monaural and binaural beats were located in the vicinity of the left lateral and inferior temporal lobe, while the differences are related to the convergence of monaural and binaural pathways on similar auditory cortical regions. It is interesting to note that the majority of studies examining the effects of auditory beats have been performed using binaural beats, despite evidence suggesting that cortical responses to monaural beats are stronger than those to binaural beats (Pratt et al. 2010; Schwarz and Taylor 2005; Dragonova, Ross Wollbrink and Pantev 2008).

In a recent empirical study, Chaieb et al. (2017) explored the effects of monaural-beat stimulation on anxiety, mood and memory performance in the range of main cortical rhythms (Theta 6Hz, alpha 10Hz and gamma 40Hz) on 25 healthy male subjects. The study aimed to examine whether monaural beats would have similar impact on anxiety, as that of binaural beats. Monaural beats were presented to the participants for 5 minutes through headphones in order to prevent external noise. The monaural beats were generated using the NCA tone generator software version 2.01. and played through software installed on a laptop computer. Results concluded that monaural-beat stimulation at Theta 6Hz, alpha 10Hz and gamma 40Hz frequencies were effective in reducing stress-anxiety scores as assessed using the State-Trait Anxiety Inventory/ STAI-S. However, while the study did not directly compare the effects of binaural vs. monaural beats on anxiety levels in order to not overburden the study design and participants, there is evidence that cortical responses to monaural-beat stimulation are more prominent than binaural beats (Pratt et al. 2010; Schwarz and Taylor 2005; Dragonova, Ross Wollbrink and Pantev 2008). To the best of my knowledge, no other research projects focussing on the effects of monaural-beat on music performance anxiety exist.

Future research is needed to identify ideal target populations for monaural-beat stimulation with hopes of optimising stimulation parameters, for instance, by increasing the stimulation duration or by repetitive applications of the beat stimuli. Although auditory beat research has tended toward using binaural beats as stimuli, the findings of Chaieb et al. (2017) suggest a

potential role for monaural-beat stimulation in treating symptoms of anxiety disorders, in a fast and non-invasive manner.

Thus it seems that monaural beats can affect the human mind by leading to altered states of consciousness. This results in affected mood states in terms of levels of anxiety and well-being by entraining brainwave frequencies associated with different levels of consciousness (Chaieb et al. 2017). This research aims to contribute new empirical data to the research.

2.4 Altered states of consciousness

Tart (2009) refers to an altered state of consciousness (ASC) as a change in one's normal mental state as a result of trauma or accident or induced through meditation and drugs while the individual is still conscious. There are also many common experiences that create altered states of consciousness, such as sleeping or daydreaming, sleep deprivation, euphoria or panic (Tart 2009).

Researchers by no means agree on the elusive topic of altered states of consciousness, and human awareness thereof. Atwater (2004, p. 4) asserts that neurologists have located the mind in the brain and claim that consciousness is "the result of electrochemical neurological activity." Hunt (1995) however disagrees with this assertion, stating that there is no neurophysiological research that proves that the higher levels of mind functioning are situated in the brain. However, the neuropsychologist Owens (1995) claims that the human mind continues to work despite the brain's reduced activity under anaesthesia, maintaining that brain waves are nearly absent while the mind continues to function as if awake. Other researchers (Fischer 1971; Mavromatis 1991; West 1980) have similarly reported awareness in coma-induced patients (Hunt 1995).

According to Hunt (1995) there is a growing body of evidence which maintains that reduced cortical arousal while maintaining conscious awareness is possible. These states are often referred to as "meditative, trance, altered, hypnagogic, hypnotic, and twilight-learning states" (Atwater 2004, p. 4). This implies that the levels of higher mind functioning that facilitate the occurrence of these altered states of consciousness (Atwater 2004, p. 4) are neither influenced nor controlled by brain tissue, but are rather controlled externally through vibrational frequencies from the world around us.

These various forms of altered states rely on the "maintenance of awareness in a physiologically reduced state of arousal" (Atwater 2004, p. 4). The main approach to sensory-

information techniques is to place the individual in an environment of very low stimulation for restricted periods of less than two hours (Atwater 1997, p. 2). During these periods of reduced stimulation, the extended reticular-thalamic activating system is very "vulnerable to other sensory stimuli such as aroma, colour, music, touch and the auditory beating via cortico-thalmic adaption (Atwater 1997, p. 2). Newman (1997) supports this statement by suggesting that the extended reticular-thalamic activating system regulates brain-wave activity which is an important process in altering states of consciousness. Individuals in this sensory restricted environment are than exposed to a "combination of multiplexed auditory beats that are mixed with music, pink sound, and/or assorted natural sounds" (Atwater 1997, p. 2). According to Atwater (2004), when brain waves respond to low frequencies while a state of consciousness is maintained, an altered state begins to emerge. This process is referred to as a state of "hypnagogia or mind awake/body asleep" by the Hemi-Sync practitioners (Atwater 2004, p. 5). As Tart (1975) reflects, our perceptions of reality begin to change depending on the state of consciousness of the perceiver. Tart (1975) also states that certain states of consciousness induce a limited view of reality, while others induce an expanded awareness of reality.

2.4.1 Extended reticular-thalamic activation system: how a state of consciousness is regulated

Brainwaves and states of consciousness are regulated by the brains "reticular formation stimulating the thalamus and cortex" (Atwater 1997, p. 2). The extended reticular-thalamic activation system is involved in a variety of functions associated with consciousness. It is necessary to provide certain information to the reticular activating system in order to alter arousal states, attentional focus, and levels of awareness (Atwater 2004). According to Empson (1986), and Tice and Steinberg (1989), the reticular activating system decodes and reacts to information from internal stimuli such as "feelings, attitudes, and beliefs as well as external sensory stimuli" (Atwater 1997, p. 3), by regulating states of arousal, levels of awareness, and attentional focus which all vital elements of consciousness. Empson (1986) suggests that we interpret, respond, and react to this information by the brain's reticular formation stimulating the thalamus and cortex and controlling our attentional focus and levels of arousal.

However, Hunt (1995) argues that there is no way to objectively measure the human mind or human consciousness with a scientific instrument. According to Atwater (2004, p. 5) the human mind and human consciousness appear to be a phenomenon that "interferes with the body and the neurological structures of the brain." Atwater (2004, p. 5) maintains that this phenomenon

cannot be measured with scientific instruments, as "EEG patterns measured on the cortex are the result of electroneurological activity of the brain, but the brain's electroneurological activity is not mind-consciousness." These EEG patterns have been a reliable way for researchers to estimate states of consciousness based on the EEG frequencies. This is due to certain EEG patterns being "historically associated with specific states of consciousness" by assuming that specific EEG patterns emerge in accordance with a particular state of consciousness (Atwater 2004, p. 5). Although there appears to be no way to measure the human mind or human consciousness, Swann et al. (1982), Foster (1990), and Hiew (1995) maintain that EEG-based research does present evidence of the Hemi-Sync's influence on individuals' arousal states, attentional focus, and levels of awareness.

Swann et al. (1982) suggest that since the reticular activating system regulates cortical EEG frequencies, studying these EEG frequencies does present evidence for the performance of the reticular activating system during exposure to monaural beats. This strongly supports the theory that different states of consciousness can be induced through the vibrational frequencies of monaural beats. Chaieb et al. (2017) maintain that it will be interesting to observe whether future research on monaural beats, and successful applications thereof, will influence the degree to which Western Medicine views holistic healing.

2.5 Flow

In 1975, Csikszentmihalyi (1990) coined the term Flow after studying autotelic and self-motivating activities. Flow is a psychological state in which someone experiences a heightened state of consciousness characterised by complete absorption in a task, enjoyment, and intense concentration. It results from a perfect balance between a person's skill and the challenge of specific task. Csikszentmihalyi (1990) maintains that these moments of optimal experience and functioning only occur when a person invests themselves completely in an activity that they wish to succeed and achieve in with regards to their end goal. Csikszentmihalyi (1990) describes eight characteristics of the results of Flow: complete concentration on the task; clarity of goals and reward in mind and immediate feedback; transformation of time (speeding up/slowing down); the feeling that the experience is intrinsically rewarding; with effortlessness and ease; balance between challenge and skills; actions and awareness are merged; self-conscious rumination is lost and there is a feeling of control over the task.

According to Csikszentmihalyi & Nakamura (2002), Flow experiences are highly self-rewarding and satisfying and enjoyment is the main feature for the continuation and desire for

an activity. Csikszentmihalyi (1990) asserts that the conditions in which the state of Flow is induced must portray an important challenge that is perceived as being able to expand upon the person's already developed skills and abilities. This enables the participant to feel a sense of growth in the activity in which they are participating due to the desired demands being achieved adequately through their existing skills. Csikszentmihalyi and Nakamura (2002) suggest that a person may achieve states of Flow when they are striving towards a goal that demands total dedication and awareness of conscious efforts. This might result in the person becoming completely absorbed by the activity and momentarily blocking out all other elements that are not related to that activity such as awareness of time.

Once a person is experiencing Flow, they are functioning at a heightened level of concentration and awareness with regards to the activity in the given moment (Csikszentmihalyi & Nakamura 2002). There is a loss of self-control and the activity almost seems to be progressing at an automatic pace (Csikszentmihalyi & Nakamura 2002). This is due to the person having complete faith in their abilities to address the next task that is presented, as they are confident that they are skilled enough to deal with the activity. While in the state of Flow, there is a loss of time as the concentration upon the activity is so great, that any element that is not related to the activity is not considered (Csikszentmihalyi & Nakamura 2002). Csikszentmihalyi (1990) states that optimal experiences are achieved when a person has to use their skill according to certain rules to successfully complete a difficult and meaningful activity that results in a greater sense of achievement and fulfilment than if it were achieved through talent.

Csikszentmihalyi (1990) further maintains that overcoming an activity's challenge provides a deep sense of enjoyment and enhances the person's sense of accomplishment and self-concept. Relationships between athletic self-concept and psychological skills are positively related to Flow (Jackson, Thomas, Marsh, and Smethurst 2001). Jackson et al. (2001, p. 132) suggest that "athletic self-concept was expected to be positively related to Flow based on the positive associations that have been found between perceived ability and Flow". Positive perceptions of one's athletic prowess were expected to positively influence the challenge-skill balance equation critical to Flow as well as to enable the performer to focus on the task and not have the concerns of returning to pre-Flow states of consciousness. Jackson et al. (2001) suggest that the strategic use of psychological skills is important to get into a state of Flow, which can be difficult to attain. The more competent athletes become through practising psychological skills in their sport, the more they will experience Flow due to the development of greater control over their thoughts and emotions during their performance (Jackson et al. 2001).

2.6 Music performance anxiety

Performance anxiety is a disorder that affects individuals in various contexts, from test taking, mathematics performance, public speaking, sport, performing arts in dance, acting, and music (Kenny 2016). Performance anxiety was not included in the American Psychiatric Associations DSM-IV classificatory systems of psychological or psychiatric disorders before 1994. According to Kenny (2016, p. 47):

> Performance anxiety, stage fright, and shyness in social situations that involve unfamiliar people (a potentially hostile audience) are common and should not be diagnosed as Social Phobia unless the anxiety or avoidance leads to clinically significant impairment or marked distress.

Salmon (1990) has suggested a different term relating to performance anxiety, titled 'music performance anxiety'. Music performance anxiety is related to the experience of persistent, distressful apprehensions 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 (Salmon 1990). Performance anxiety extends to individuals in a wide range of specialised skills and capabilities and has been documented in areas such as public speaking, sexual functioning and musical performance (Salmon 1990). Music performance anxiety is a complex phenomenon caused by the interaction of many factors, including genetics, environmental stimuli and the individual's experience, emotions, cognitions and behaviours (Kenny 2011).

The terms 'stage fright', 'performance anxiety', and 'music performance anxiety' have been used interchangeably and there is not always agreement as to the meaning of these terms (Kenny 2016). Brodsky (1996), for example, places 'stage fright' at the extreme end of his proposed continuum of severity of music performance anxiety, while Patston (2013) argues that stage fright signifies a less severe level of stress than performance anxiety. To reduce confusion surrounding the use of the term 'stage fright,' Salmon (1990) maintains that all terms other than 'music performance anxiety' should be discarded.

Therefore, the term 'music performance anxiety proposed' by Salmon (1990) seems a more appropriate term when compared to 'performance anxiety' to characterise the generalised psychological distress reported by musicians well in advance as well as during performances.

Altenmuller and Ioannou (2016) support this by suggesting that music performance anxiety emphasises a unique state of arousal, which only happens when musicians perform before an audience in a performance context. Music performance anxiety is experienced through various physiological symptoms as well as through motor and cognitive functioning arising from sympathetic activation of the autonomic nervous system (ANS). Altenmuller and Ioannou (2016) further suggest that a musical performance requires the unique integration of a multi-sensory and motor information process and precise planning and monitoring of the performance via auditory feedback. They add that in the context of a musical performance, musicians must reproduce highly controlled physical movements perfectly and reliably in the context of an unyielding societal punishment–reward mechanism. Individuals vary in their capacity to cope with such stressful working conditions.

Numerous ways of coping with the impairing condition of music performance anxiety exist, the most popular being the use of medication or pharmaceutical drugs (Fishbein, Middlestadt, Ottati, Straus & Ellis 1988). Fishbein et al. (1988) maintain that the use of medication or pharmaceutical drugs was reported as the most common strategy to cope by 40% of those with severe stage fright. Beta adrenoceptor blocking drugs are frequently used, often without medical prescription. However, other studies investigating student samples report rates of medication or pharmaceutical drug usage of below 4% (Wesner, Noyes & Davis 1990). Interestingly, Wesner et al. (1990) maintain that nearly half of the performers affected by music performance anxiety would take prescription medication or pharmaceutical drugs to cope with performance anxiety. Some performers rely on a range of additional coping strategies such as hypnosis, massage, yoga and positive self-instruction (Fehm & Schmidt 2004).

An additional method of coping with performance anxiety is the use of gaming technology for distraction. While cell phones can be a negative distraction from the physical world, the use of cell phones for distraction has the capacity for positive uses (Ward 2017). A distraction technique is any activity used to redirect intense or uncontrollable thoughts (Ward 2017). When an individual distracts him- or herself, they are limiting negative thoughts and emotions by deliberately shifting their attention. Distraction techniques such as playing cell phone games are used and encouraged in many forms of Cognitive Behavioral Therapy (CBT) (Ward 2017). However, distraction is not particularly effective for long-term anxiety control and is best used as an occasional method in dealing with anxiety (Ward 2017).

The placebo effect can be described as a phenomenon where individuals who consume a "dummy" pill, or placebo, experience an improvement in their symptoms (Newton 2020). Placebo effects have been described for a wide variety of diseases with some experts estimating that up to 90% of medical disorders benefit from a placebo effect. In some controversial cases, such as selective serotonin reuptake inhibitor (SSRI) anti-depressants, placebo effects are thought to account for a major proportion of the positive effects of the drug. Research (Furmark et al. 2008) furthermore maintains that an individual's genetics may determine whether they experience a placebo effect and that there is a genetic basis for the placebo effect in sufferers of social anxiety disorder.

However, Kenny (2016) argues that not all musicians suffer or report the same level of anxiety and that individual differences occur in a range of psychological characteristics and responses to the performance situation. For example, varied coping mechanisms may be adapted for those who experience differing levels of anxiety, who are naturally anxious, lack confidence in their abilities or resort to coping mechanisms such as alcohol and legal pharmaceutical drugs (beta-blockers) or other drugs (marijuana).

Cox and Kenardy (1993) suggest that the size of the presenting group influences the level of anxiety, with solo settings eliciting the highest degree of anxiety, followed by smaller ensembles, orchestras, and teaching settings. Sternbach (1995) even compares musicians to the likes of elite athletes by suggesting that musicians must maintain their skills at peak form, endure many hours of solitary, repetitive practice, constantly self-evaluate their performances and subject their public performances to scrutiny. Kenny (2016) maintains that musicians are exposed to a variety of stressful factors in the physical, social, and psychological domains that must be dealt with if their musical careers are to be rewarding and sustainable. Ironically, Kenny (2016) further suggests that while musicians simultaneously report the highest levels of job satisfaction, they also suffer the highest levels of exhaustion as well as psychosomatic complaints such as stomach aches, headaches and sleep disturbance.

Larger audiences whose members are respected by the performer for their status in the field and expert knowledge of their repertoire will elicit more music performance anxiety than audiences without these characteristics (Craske and Craig 1984). Other situational factors influencing the occurrence and experience of music performance anxiety can be related to the mere presence of an audience, its size, status, as well as the size of the performance ensemble

influences the level of anxiety, with solo performances eliciting the highest anxiety, followed by small ensembles, orchestras, and teaching settings.

Brotons (1994) suggests that musicians' perception of the audience is 'real' and performers are usually correct in their assessment that people are watching and judging them. The reality of audience scrutiny should be taken seriously, as anxious musicians project their own perceptions about the nature of the audience. He further states that aspects of the feared stimulus, the music performance, must form an integral part of the theoretical formulation and treatment of music performance anxiety. However, Kenny (2016) maintains that people with music performance anxiety are more likely to be more concerned about their performance competency and the task at hand rather than others' perceptions of their performance. Particularly with regard to adolescents, Kenny (2016) describes four cognitive qualities that could be responsible for the individual's sense of perception:

1) Adolescent egocentrism:

The tendency to focus on oneself to the exclusion of others and the belief that no one can understand what they are thinking, feeling, or experiencing because these are unique and not previously experienced by others, especially parents. There is a heightened sensitivity to actual or perceived criticism, self-criticism, and self-doubt.

2) Invincibility fable:

The belief that one is not subject to the negative consequences of common behaviours, such as unprotected sex, substance abuse, reckless driving, and thrill-seeking activities.

3) Personal fable:

The belief that one is destined to achieve greatness through outstanding accomplishments in one's chosen field; it is sometimes accompanied by the fantasy that one's parents are inadequate and inferior, and possibly not one's biological parents.

4) Imaginary audience:

The belief that others are constantly thinking or talking about one, or if present, scrutinising one, leading adolescents to pay exaggerated attention to their appearance. Anxious individuals, through social avoidance, do not resolve their imaginary audience perception, which appear to be one mechanism through which their social anxiety is maintained.

While some musicians give up music performance due to anxiety (the ultimate social avoidance), many musicians persist (Kenny 2016). These musicians do not engage in social avoidance but continue to suffer music performance anxiety by developing a better sense of self-esteem. Musicians who can cope better might have derived a greater sense of self-esteem that allows them to effectively cope with anxiety-arousing objects, events, or people (Bandura & Locke 2003). Self-esteem is affected through experiences that are acquired either directly through repeated success or failure at specific tasks, or through an individual's experience to that arousal, through encounters with people who they highly value (Bandura & Locke 2003). This aligns with the process model of motivation developed by Austin et al. (2006) where self-theories are central to theoretical models of educational and musical motivation. There are four components, which have a reciprocal causal relationship with each other, including: Self-system (perceptions, beliefs, thoughts, emotions), Social system (teachers, peers, siblings), Actions (motivated behaviour including learning and self-regulation) and Outcomes (learning, achievements) (Austin et al. 2006).

2.7 A theoretical overview of research in music and emotions

Emotions in response to music are an important factor to consider when determining how certain psychological mechanisms are able to express and measured emotions. Juslin (2009) proposes a theoretical framework consisting of six mechanisms through which music is able to induce emotions. The term 'mechanism' in this context refers to distinct brain functions that allow for unique processes such as the mind's ability to retrieve a memory to occur. The framework presented by Juslin (2009) refers to the following six mechanisms:

1) Brainstem Reflex

An emotion is induced due to the perceptual system identifying events that meet certain criteria that will impact the central nervous system through auditory processing. This process can involve sounds that are sudden or loud, inducing emotions of excitement or surprise.

2) Evaluative conditioning

An emotion is induced due to certain positive or negative stimuli/event being associated with a piece of music.

3) Emotional contagion

An emotion is induced due to the listener perceiving an emotional expression in the music causing the listener to experience the perceived emotion.

4) Visual imagery

An emotion is induced due to the listener internally visualising images in relation to the music according to the listener's associations between the music and his/her experiences.

5) Episodic memory

An emotion is induced due to the listener relating a memory of a certain event in response to the music.

6) Musical expectancy

An emotion is induced due to a certain characteristic in the music occurring that either confirms or disagrees with the listener's own expectation of his/her perceived musical outcome.

Juslin (2016) expands on his theoretical framework by providing an additional two mechanisms:

7) Aesthetic judgement

An emotion is induced due to the listener's own evaluation of the musical aesthetics such as beauty.

8) Rhythmic entrainment

An emotion is induced due to the listener's own internal bodily rhythm being influenced by an external rhythm in the music. This results in the listener matching their breathing or synchronising their heartbeat with the music.

Individual, social and situational factors might play an important role in the experience of anxiety during musical performances (Castiglione, Rampullo, and Cardulloa 2018). Musical performance requires a high level of skill in a variety of areas (Castiglione et al. 2018). Musicians need years of practicing to develop the required sensorial, cognitive, and behavioural skills. Furthermore, musicians place great importance on the level and quality of their performances because they recognise them as an important aspect relating to their personal identity. The quality of their performances therefore affects their self-esteem and their willingness to perform in the future. However, practice and experience do not play a role in

reducing anxiety before or during musical performance, and practice and experience cannot guarantee that musicians will not experience feelings of anxiety and stress (Castiglione et al. 2018).

The term 'self-representation' is an individual's perception about his or her own self (Castiglione et al. 2018). When individuals describe, or think about, themselves, they will use knowledge about their own experiences and characteristics (Markus and Nurius 1986). The individuals will project this perceived knowledge about themselves into the future, which might positively or negatively affect their self-esteem, emotions, and behaviours. Poor judgement in their self-representation can lead to negative emotional states like depression, sadness, stress and anxiety (Castiglione et al. 2018)

2.8 Summary

This chapter has presented an overview of the existing literature in psychology and music psychology that is relevant to this study. The theories of brain responses to frequencies, brainwave entrainment, altered states of consciousness, Flow and music performance anxiety provide theoretical assumptions that provide support for this empirical study and will be discussed in relation to this study's findings in Chapter 5.

Chapter 3

Methodology

3.1 Introduction

This Chapter outlines the research design and method used in this empirical study. I present my reasons for selecting Interpretative Phenomenological Analysis for the study. I provide a brief discussion outlining the selection process for the research participants, the construction of the questionnaire and interview schedules. The data collection strategy, pilot study and data analysis are discussed in detail. I present an outline of the ethical considerations for the research as well as a brief discussion relating to the reliability and validity of the study. The Chapter will be concluded with a short summary.

3.2 Research design

This research project set out to investigate learners' subjective experiences of the effects of monaural beat vibrational frequencies on their experiences of music performance anxiety. Experiences cannot be identical from one person to the next and meaning is culturally determined and subject to evolutionary change (Denzin and Lincoln 1998). In order to capture the insider perceptions of the research participants' experiences of monaural beats (MB), this research project selected a qualitative methodology based on a phenomenological research paradigm, which fundamentally aims to explore an experience in its own terms (Smith, Flowers and Larkin 2009).

There are two aspects of phenomenological research, namely: descriptive and interpretative. Descriptive phenomenology calls for a detailed description of lived experience without interpretation (Charlick, Pincombe, McKellar & Fielder 2016). By contrast, interpretative phenomenology does not separate the description and interpretation of a phenomenon (Wojnar & Swanson 2007). Therefore, in order to elicit in-depth and intimate reflection of the research participants' interpretation and description of their lived experiences, an Interpretative Phenomenological Analysis (IPA) methodology was selected for this research. According to Smith et al. (2009), this research method is concerned with exploring the human experiences in the world around us and provides many theoretical steps about how to examine and understand lived experiences in a way that it may be expressed in its own terms. Smith et al. (2009) maintain that IPA researchers are interested in what happens when people's everyday

flow of lived experiences takes on a particular significance for them especially when something important has happened.

IPA is an approach to qualitative, experiential research with roots in psychology that recognises the researcher as playing a central role in understanding the experience of participants and interpreting how they make sense of their experiences (Pringle, Drummond, McLafferty and Hendry 2010). Biggerstaff and Thompson (2008) similarly maintain that IPA is a hermeneutic method through which careful interpretative methodology allows for possible access to an individual's cognitive inner world. IPA is a qualitative method originally developed for studies in health psychology (Benner 1994; Giorgi 1985, 1992, 1994; Kvale 1983; Smith 1996, 2004). Its methodology is rooted in three cornerstones of the philosophy of knowledge: phenomenology, hermeneutics, and idiography (Smith et al. 2009).

The term 'phenomenology' is widely referred to in the disciplinary fields of both philosophy and a range of other research approaches (Finlay 2009). Philosopher Edmund Husserl (1859-1838) was the pioneer of this phenomenological movement in an attempt to understand that the "body is not an extended physical substance in contrast to a non-extended mind, but a lived 'here' from which all 'there's' are 'there'; a locus of distinctive sorts of sensations that can only be felt first-hand by the embodied experiencer concerned" (Behnke 1995). For Husserl, phenomenology was about identifying the essential core structures of a given experience (through a process of methodological 'reductions') as well as identifying and suspending our assumptions (bracketing off culture, context, and history) in order to get at the universal essence of the phenomenon as it presents itself to consciousness (Larkin & Thompson 2011).

Theorists such as Martin Heidegger (1889-1976) have expanded upon the phenomenological paradigm from a philosophical discipline that mainly focuses on the descriptive elements regarding the consciousness of phenomena towards a more hermeneutic and interpretive paradigm (Giorgi 2007). Finlay (2009) maintains that when this paradigm is related to research, phenomenology studies the nature and meanings of certain phenomena, with a focus on the way phenomena express themselves through our own experiences.

The term 'hermeneutics' refers to the theory of interpretation and how a phenomenon presents itself (Smith et al. 2009). IPA emphasises the importance of the process of engaging with the participant and making sense of the participant who is making sense of the phenomenon, which illustrates the dual role of the researcher as both like and unlike the participant (Smith et al. 2009). The IPA researcher is in this way involved in a double hermeneutic, trying to make

sense of the participant, who is in turn trying to make sense of what he or she is experiencing (Smith et al. 2009). Wilding & Whiteford (2005) claim that IPA acknowledges that it is not possible to have direct access into someone's life, as this is influenced by the researcher's own experiences. Due to this process of a double hermeneutic, the emphasis moves away from simply describing the individual's experience, towards an understanding of the phenomenon that is context-specific and inclusive of both the individual and the researcher (Smith & Osborn 2008).

The term 'idiography' focuses on a particular rather than a group perspective such as "nomothetic" psychology (Smith et al. 2009). IPA's focus on the particular is understood through a detailed analysis which provides an understanding of how the phenomena are perceived by the participant (Smith et al. 2009).

A qualitative methodology in psychology collects data through in-depth, semi-structured interview questions (McLeod 2008). The semi-structured interview schedule consists of a list of open-ended questions covering certain topics that the researcher aims to investigate (Bryman 2012). However, the research participant has an opportunity to freely answer the questions in any manner they decide. This approach to the data collection was idiographic in nature, as the participants were encouraged to give in-depth explanations of how their music performance anxiety affected their performances, as well as how they felt while listening to the monaural beats.

3.3 Participants

A small group of four learners was purposefully selected to participate in the research study. Each research participant is a music learner at St Andrew's College (SAC) and The Diocesan School for Girls (DSG). The research participants were purposefully selected according to the following three criteria.

First, the participants should all experience significant levels of music performance anxiety when performing in public.

Second, the participants should all be subject pupils who are required to perform two graded practical examinations.

Third, the research context is a live practical examination.

3.4 Construction of the interview schedule

The research data was collected in two phases: each phase consisted of in-depth, semi-structured interviews conducted with each research participant after their performances.

(See Addendum A: Interview agenda.)

The semi-structured interviews

An in-depth, semi-structured interview was conducted with participants after they had completed their examinations. An interview agenda (Addendum A) consisted of three open-ended questions as well as three prompt questions. Prompt questions were included to assist the research participants if they did not fully understand or answer the questions properly. The interview questions that I included in the interview schedule were designed to encourage the research participants to freely expand upon different factors regarding their experiences related to their practical examinations and experiences of the effects of monaural beats, while simultaneously remaining relevant to the study.

The purpose of using open-ended questions was to encourage the research participant to ramble or go off on tangents as "it gives insight into what the interviewee sees as relevant and important" (Bryman 2012, p. 470). The questions in the interview schedule do not have to be followed strictly in the order they appear in the schedule, and questions that are not mentioned may be included at will by the researcher, to expand and further investigate aspects of what the research participant is describing (Bryman 2012). I found this method of interviewing relevant to the study, as it provides a framework in which certain topics are covered, but in a way that promotes the kind of flexible, qualitative and interpretative environment which the study requires. By following this method, the research project was able to explore the observations and subjective perceptions of the research participants.

The semi-structured interview included four kinds of IPA-specific questions: descriptive, evaluative, contrasting and structural (Smith et al. 2009):

1) Descriptive questions, for example, "What factors contribute to your anxiety when you are performing in public?"

2) Evaluative questions, for example, "What happens during your performance that does not normally happen?"

3) Contrasting questions, for example, “How would you describe your music performance anxiety after this examination when compared with your first examination?”

4) Structural questions, for example, “What noticeable changes did you experience after listening to monaural beats?”

This assisted me in phrasing particular questions in a way that is open and does not make too many assumptions about the participants’ experiences or concerns, or lead them to a certain answer (Smith et al. 2009). Instead, these IPA-specific questions invite the participants to feel more comfortable with the interview process, which would allow them to be more analytical and provide a thorough account of the experience under investigation. All interviews were conducted following the completion of the practical examination of each participant. While the research participants were informed that one of their two practical examinations would have monaural beats playing in the background, they were not informed which exam this would be.

3.5 Procedures and data collection strategy

In order to achieve a greater understanding of the experience of music performance anxiety and the experience of listening to monaural beats in relation to whether or not they reduce music performance anxiety, it was decided to interview the participants upon completion of their practical examination. This was to allow for an honest and accurate reflection of their “lived experience” as it was occurring.

3.5.1 Contacting the participants, letter of consent

Due to the research participants being in school, there was a rigorous and lengthy process (two years) that had to be adhered to before I could contact my research participants. Ethical consent for the project had to be obtained by the Rhodes University Higher Degrees Committee as well as acceptance of Ethical Clearance from Rhodes University Ethical Standards Committee (RUESC). Upon a thorough review of my research proposal, including interview questions and data collection strategies, my proposal was accepted, and permission was granted to continue with the research.

The next step was to obtain permission from the Director of the DR Wynne Music School (See Addendum B: Permission letter to Director of DR Wynne Music School), Headmistress of DSG (See Addendum C: Request for permission to conduct research at DSG) and Headmaster of SAC (See Addendum D: Request for permission to conduct research at SAC). This was to

allow school pupils to be used as research participants. Once this permission was obtained, each potential research participant and their guardian/parent was presented with an invitation to participate in the research study (See Addendum E: Invitation to participants and parents or guardians). The invitation clearly outlined the purpose of the study, explained their role in the study, and outlined the data collection strategy that would be used. If the participant accepted the invitation to be a research participant, they were required to read and sign a letter of informed consent (See Addendum F: Letter of informed consent) before participating in the research study. The consent letter also clearly outlined that their participation in the research study was completely voluntary and anonymous and that they could at any time before or during the interview decline to continue as a research participant.

3.5.2 Conducting the interviews

Once all the signed consent forms were received, the interviews were organised, conducted and audio recorded. The interviews including the preceding examination, lasted for approximately 5-8 minutes. The learners involved in the practical examinations proceeded into the venue to complete their examination after the learner before them had exited the venue to ensure that no time was wasted. Upon completion of each practical examination, the interview questions were asked. I followed the interview schedule carefully and made sure to ask all questions clearly and slowly for me to not have to repeat myself in case the research participant did not hear the question the first time. I often asked additional questions in order to delve further into detail and to ensure they recounted their experiences to the best of their abilities. The additional questions did not distract me from my interview schedule, or pre-answer any upcoming questions already structured in my interview schedule. The interviews took place over two phases:

Phase 1: This took place during the participants' half-term practical examinations. The research participants entered the examination venue and performed their practical examination. After their examination, I conducted the first interview consisting of three open-ended questions.

Phase 2: This took place during the participants' end-of-term practical examinations. Each research participant entered the examination venue while monaural beats were playing through speakers in the auditorium. The research participants performed another practical examination. After the completion of the second examination, I conducted the second interview with the participants.

The research participants knew that one of their practical examinations would have monaural beats playing in the background, but they did not know which exam would have the monaural beats. This was to eliminate any placebo effect that might compromise the results. Also, the repertoire performed at the two practical examinations was different, with a similar preparation time of a few weeks scheduled for each exam. Thus, the research variable of the amount of preparation time permitted for new repertoire per examination remained consistent for both examinations. This prevented factors such as familiarity with the repertoire or additional preparation time for an examination from affecting the participants' MPA. Special permission was granted by Mr Johan Pretorius (Head of Music at DR Wynne Music School) to allow for the research participants to have additional practical examinations should it be found that the learners were disturbed during these exams.

3.6 Pilot Study

I conducted a pilot study before proceeding with the interviews used in this study. The purpose of this was to help me learn to adhere to my interview schedule and questions, as well as to make any additional changes to my interview schedule depending on how my questions were phrased or asked. An additional subject music pupil took part in the pilot study in the same environment as the research participants. The pilot study also took place over two phases to allow each phase of my interview process to be tested.

The pilot study helped me to conduct my interviews in a professional manner and to gather all the relevant information I was looking for, but no changes were made to my schedule. However, the participant in the pilot study was not particularly talkative, which resulted in my asking him the prompt questions. I then decided to ask the prompt questions in each interview to elicit as many insights as possible from my participants. Due to the participants being anxious and in an examination setting, their answers tended to be short and sometimes not relevant to the question being asked, as they were still thinking about the examination that had just occurred. Therefore, the decision to include the prompt questions in the interview schedule was useful and I was able to obtain more information from each research participant.

3.7 Data Analysis

Each recording from the interview data for both phases was transcribed and analysed using a strict content data analysis based on the IPA framework presented by Smith et al. (2009). One of the main issues of interpretative phenomenological analyses highlighted by Clarke (2009)

is the length of time it takes to analyse data in the depth that is required. She considers it a lengthy and detailed process that requires a significant amount of time and commitment from the researcher.

Transcription Process

Semi-structured interviews are designed to gain access to the experiential understanding and elaboration of certain experiences through words, bodily gestures, and phenomenological interpretation in order to understand the subjective process and meaning-making of this experience (Larkin, Watts & Clifton 2006). Phenomenological studies seek to uncover the immediacy of lived experiences through not only the analysis of a second-order language, such as narrative descriptions or reports, but through a method of attending to how the ideas are communicated in the dialogue (Murray & Holmes 2013). For this, Murray and Holmes (2013) suggest that the researcher draw upon interpretative strategies from the human sciences: the significance of gestures, lacunae, hesitations, word choices, and figures of speech such as metaphors, metonymy, and catachresis. The subject's body language, tone, and gesture are therefore equally important, and they should be noted where possible.

For authenticity of interpretation, the interview should be "transcribed with meticulous accuracy, often including, for example, indications of pauses, mis-hearings, apparent mistakes, and even speech dynamics where these are in any way remarkable" (Biggerstaff & Thompson 2008, p. 217). They further mention that these, too, must be subject to analysis in order to arrive at a more complete understanding.

I transcribed each interview the week after the interviews were conducted. This was an extremely tiresome task, and each transcription took a lengthy amount of time. I followed a strict content data analysis, rather than a conversational analysis with regards to my transcription process,

> "because analysis in IPA aims primarily to interpret the meaning of the context of the participant's account, it does not require a particularly detailed transcription of the prosodic aspects of the recordings. That is, it does not require a record of exact length of pauses, or of all non-verbal utterance as favoured by conversation analysis" (Smith et al. 2009, p. 74).

The seven emergent themes were categorised into subordinate themes falling under two superordinate themes. These identified themes were written up and discussed in Chapter 4.

Reading and Re-reading

I began the analysis of each interview immediately after the completion of my transcription process so that each interview remained fresh in my mind and it was simple for me to be able to recall and visualise each interview. This benefitted me, as listening to the audio-recording again for each interview was unnecessary and saved me a lot of time as I could work at my own speed and not at the speed of the audio-recording. This further benefited the analysis process as I remained familiar with each interview, became deeply emerged in each interview and was able to identify important preliminary findings and emergent themes from the beginning of my analysis.

Initial Noting

Once each interview was accurately transcribed, I began the process of analysing each transcription, according to the guideline presenting by Smith et al. (2009). The text can be analysed using three different methods namely: descriptive, linguistic, and conceptual.

1. Descriptive comments according to Smith et al. (2009, p. 84) are used to understand and describe the "key words, phrases or explanations" that were expressed by the research participant through their thoughts and experiences related to the question.

2. Linguistic comments are concerned with the research participant's use of language throughout his or her explanations. The use of language relating to "pronoun use, pauses, laughter, functional aspects of language, repetition, tone, or degree of fluency (Articulate or hesitant)" may be interrelated with the context of the text (Smith et al. 2009, p. 88).

3. Conceptual Comments focus on a more interpretative method of analysing the text (Smith et al. 2009). "The interpretations which you develop at this stage will inevitably draw on your own experiential and/or professional knowledge" (Smith et al. 2009, p. 89).

Developing Emergent Themes

Through a further analysis of the transcript as well as the exploratory comments, I began the process of identifying the emergent themes. This involved the organising and grouping of the data while "simultaneously attempting to reduce the volume of detail (the transcript and the initial notes) whilst maintaining complexity, in terms of mapping the interrelationships, connections and patterns between exploratory notes" (Smith et al. 2009, p. 91). Due to my thorough engagement and familiarity with the transcriptions of each interview from an early

stage, I was able to identify the emergent themes accurately and with ease without the process becoming a lengthy task.

Superordinate and Subordinate Themes

Smith et al. (2009, p. 166) define superordinate themes as being "a construct which usually applies to each participant in a corpus but which can be manifest in different ways in the cases." To identify the study's superordinate and subordinate themes I followed the guideline presented by Smith et al. (2009, p. 96-98) termed abstraction and numeration. During the abstraction phase, I created a Microsoft Word document in which I placed all my emergent themes that I had identified from each research participant. These emergent themes were placed according to their relation to each other into three columns and were classified into three main themes which became superordinate themes. I followed this process for each research participant and grouped all the emergent themes I had identified from their transcript together under each superordinate theme. This allowed me to be able to trace each emergent theme back to the transcript and research participant from which it was identified. I was able to accurately place each theme in the context from which it emerged and support the themes with relevant quotes from the transcript.

During the numeration phase, I printed out this Microsoft Word document and under each superordinate theme for each of my research participants, began to group the emergent themes in even more detail according to how they related to each other. I followed this process for each research participant and eventually had identified all my subordinate themes which were now already grouped under the relevant superordinate theme. I created a table in which I compiled all my subordinate themes under the heading of "subordinate theme" in the first column. In the second column titled "Raw Data", I included two of the best quotes supporting each subordinate theme.

Due to my previous planning of placing each theme under the research participant's name from where it emerged, I could refer to my first printed Microsoft Word document and trace all my subordinate themes back to their emergent themes, which all were numbered according to which subordinate theme they related to. This made finding the most detailed and context rich quotes to support each subordinate theme a less time-consuming task. In the third column titled "Keywords", I mentioned the words from each quote that best explained the subordinate theme.

3. 8 Ethical Considerations

This research complied with the ethical protocol as outlined in the Rhodes University Ethics Standards Committee (RUESC) Handbook (v1.01, 21 Nov 2014). Ethical consent for this project was obtained by the Rhodes University Higher Degrees Committee as well as from RUESC.

Reliability and Validity

According to Bryman (2012, p. 46) "reliability is concerned with the question of whether the results of a study are repeatable. Reliability is particularly at issue in connection with quantitative research." Due to the nature of my research being qualitative and focussed on interpretative phenomenological experiences of my research participants, duplicating the process of this study might produce differing results, as every person has different explanations regarding their experiences.

The research participants' perspectives differed to some degree. This provided a richer and more complex set of data.

According to Bryman (2012, p. 47) "validity is concerned with the integrity of the conclusions that are generated from a piece of research." The validity of an IPA study can be expressed through the four main principles of: sensitivity to context, commitment and rigour, transparency and coherence, and impact and importance as noted by a guideline presented by Yardley (in Smith et al. 2009). I shall expand upon each of these principles and explain how my research study was able to meet these standards.

Sensitivity to Context

This principle was met, as I have participated in my own music practical examinations and have experienced my own music performance anxiety which I was able to draw upon when creating the research questions. While being able to relate to each of my research participants' experiences, I placed great emphasis on attempting to not have interpretative biases when analysing the data. Each interview was analysed strictly from each research participant's perspective.

Commitment and Rigour

This principle was achieved by explaining the study through my informed letter of consent, and allowing questions to be asked at the beginning of the interview. Each research participant was presented with a copy of the research proposal to further illustrate the purpose, methods, and requirements concerning the study as well as the nature of interviewing in an IPA study.

Transparency and Coherence

Through the close referencing and adherence to the guidelines presented by Smith et al. (2009) I was able to meet this standard by strictly following the methodologies and processes required in an IPA study.

Impact and Importance

It appears that this study is the first to investigate the use of monaural beats in reducing musicians' music performance anxiety during their practical examinations. Through this study, I hope to inspire and encourage further research into the importance and inclusion of Monaural beat technology in schools. I also hope to introduce more people to the phenomenon and benefits of using monaural beats and to prevent resorting to pharmaceutical drugs to reduce levels of anxiety. I also hope to encourage a general increase of individuals using Monaural beat technology outside of the practical examination environment.

3.9 Summary

Throughout this Chapter, I have presented a detailed description and discussion regarding my choice of research design and methodology that I followed during this study. I have provided explanations regarding my choice of participants, procedure and data collection strategy, pilot study, data analysis procedure, the ethical considerations, and the reliability and validity relating to my research study.

Chapter 4

Analysis

4.1 Introduction

This chapter presents an IPA analysis of the transcribed interview data collected from the research participants. The data analysis resulted in the emergence of two superordinate themes and eight subordinate themes. The chapter is divided into two sections. Each section discusses one overarching superordinate theme, the related subordinate themes, as well as verbatim quotes which support the themes. Each superordinate theme has been written up according to the first and second round of interviews: Superordinate theme 1 focuses on the first round of interviews, while Superordinate theme 2 focuses on the second round of interviews. Table 1 presents an overview of the superordinate themes, subordinate themes and the supporting verbatim quotes. Addendum A provides a more detailed representation of this table.

Table 4.1 Superordinate and subordinate themes, raw data and keywords

Superordinate theme 1: Factors contributing to music performance anxiety		
Subordinate theme	**Raw data**	**Keywords**
1. Performance-related factors a) Performers' perception of audience reaction	Participant C: Because it gives an excuse for you, for those, for your enemies to laugh at you, and it also gives, it also gives a sense that you don't know what you're doing. Participant D: The, uh, the pressure of having, like, a lot of people watching you, and having to play for them and knowing that if you mess up, there'll be quite a few people that will pick up on the mistake	Laugh Pressure
b) Performance Context	Participant C: Well, prac exams for me, it's that it's for marks. Even though I'm not doing an awfully hard piece, and I'm not doing incredibly hard scales and incredibly hard stuff, it's for marks, so, and it counts for my	Marks

	term order and it counts for, for, um my music mark, so it's, it's quite important for me, Participant D: So, when I am practising, I am a lot more comfortable there, like going through the piece that I am doing, at speed, and knowing that there will be no consequences when I mess up. When, playing in public, knowing that there is only one chance to do the piece, and if you mess up, well, there is the impression they got.	Comfortable
2. Self-Esteem Music performance anxiety related to fragile self-worth.	Participant A: Maybe it's the possibility of embarrassing yourself in front of people, if, should you do something wrong. Participant B: When I make a mistake in a music prac exam, I feel like I am letting people down if I play the wrong note. Like, letting you and myself down.	Embarrassing Letting people down
3. Music performance anxiety (MPA) Coping Methods a) Medication	Participant D: Before some concerts, my mother used to give me um, rescue remedy, and that helped to calm me down, and I would feel a lot more comfortable. But I do not take them anymore because I don't have access to them anymore as my dad would bring them from the States when he flew. Participant C: Well I am on chronic mood stabiliser medication, so taking a beta blocker does not really do anything for me.	Rescue Remedy Beta blocker

b) Games for the purpose of distraction	Participant B: That is why I was playing that game before I came in, because I was like, this will calm me down. It takes my mind off the fact that I have got an exam soon. But it is still in the back of my mind.	Calm me down
c) Performance Experience	Participant A: Yes, I think it does, I, obviously if you are performing for the first time ever, you are going to be nervous because you do not know what to expect. Participant A: Um, well, when I was less experienced, the anxiety showed as squeaks, either because my mouth went dry and then obviously that makes it difficult.	Expect Less experienced
Superordinate theme 2: Effects of monaural beats		
Subordinate theme	**Raw data**	**Keywords**
1. Sense of calm Monaural beats reduce listeners' level of anxiety.	Participant B: It calmed me down. I got calmer for everything and I was not overthinking so much. Participant D: I generally felt more calm during this exam. But I only noticed that the beats were playing after my first piece.	Calm Not overthinking
2. Improved Confidence Monaural beats boost listeners' confidence.	Participant A: I think I was more nervous for the last one. I am not entirely sure why, but I was more nervous going into it. This time I was more relaxed, a bit more confident about it. My previous exam I was more nervous. Today I was more confident which I think really helps. Participant C: I definitely felt more confident in this exam. And I feel that once people get	Relaxed Confident

	that confidence boost and that sense of relaxation, it is a lot harder for them to get stressed in it any more.	
3. Focus Monaural beats enable listener to focus on the task at hand.	Participant C: I felt a lot of strain relief off of me and a lot of stress relief. Strain regarding to thinking and trying too hard to work everything out and overthinking things. I think having the monaural beats in the background, helped me to slow down my mental thought and to help me focus on it, because if I stress too much, I am not going to get it right. Participant B: I was not overthinking things too much. It felt easier for me to focus on what I had to do and not get distracted by other things.	Stress relief Not overthinking

The first superordinate theme focuses on the factors contributing to music performance anxiety and explores three subordinate themes. The second superordinate theme focuses on the effects of monaural beat technology and explores four subordinate themes. Each section concludes with a short summary.

4.2 Superordinate theme 1: Factors contributing to music performance anxiety

The analysis suggests that there are a variety of factors that influence and contribute towards a young musician's experience of music performance anxiety. These factors are presented as three subordinate themes: performance related factors, self-esteem and coping methods.

4.2.1 Subordinate theme 1: Performance-related factors

The factors which influence music performance anxiety are discussed in two subsections, a) Performer's perception of audience reaction and b) Performance context.

a) Performer's perception of audience reaction.

This theme explores the performer's perception of the audience's reaction and the role that this perception plays in response to a participant's music performance anxiety. As a performance essentially provides the performer with an opportunity to present a musical interpretation that has developed over months (or years) of preparation, the audience's reaction and opinions is valued by the performer. Performers generally desire audience appreciation and enjoyment, which is viewed as a sign of a successful performance. This innate desire for audience appreciation induces anxiety in the performer. The anxiety can be induced due to irrational thoughts or expecting the worst possible reaction from the audience, such as the audience laughing or being teased by audience members after the concert.

> Participant C: Because it gives an excuse for you, for those, for your enemies to laugh at you, and it also gives, it also gives a sense that you don't know what you're doing, and other people might insult you for that, so, and most people want to get it right, because that means they they've done a good job, and they feel good at the end of it; if not, then they don't.

> Participant A: Well, the nightmare is that the, the nightmare is that they … they start laughing at you, I guess. Ja, it's, it is an illogical thing. I mean, I know a hundred percent that the audience is not going to break out laughing. But the thought is always in my head.

The thought that the audience is critically evaluating or judging the performer as if the performer were in an examination is also a factor that contributes to the performer's anxiety. The confidence needed to walk on stage is thus directly connected with how the participant imagines – (or fears) what the audience's reaction might be.

> Participant D: The, uh, the pressure of having, like, a lot of people watching you, and having to play for them and knowing that if you mess up, there'll be quite a few people that will pick up on the mistake. And… just the fact that I think that they're always silently judging me, judging as I play.

The fear of failure or making a mistake that will completely derail a performance in front of the audience is a daunting emotion experienced by performers. As Participant B states:

> Participant B: Mostly in a performance, it's knowing that I could fail; that's what really scares me. And it's because there's lots of people watching, I don't know what to do – I don't even know where to look, because I don't know who to look at. And um, I'm scared of being judged.

The participant has a sense of motivation to step out on stage and exhibit the hard work and preparation that has been developing throughout the practice routine leading up to the

performance or examination. This is acquired through various factors that each participant draws on for motivation to continue the process, with the final goal being to step out on stage and deliver a performance that is recognised by the audience to be equivalent to the effort that went into the preparation. These factors relate to the motivation to practice hard every day, to be dedicated towards practicing and the decision to enter oneself into the concert and put oneself into a high-anxiety situation willingly. The audience response could directly affect the confidence and motivation of the participant for future performances.

b) Performance context

The context of a performance contributes significantly to the level of music performance anxiety experienced by the performer. All the participants considered a public performance, e.g. a school concert, as less daunting than a practical examination as they did not have the added pressure of being marked by an examiner. The fact that the examination performance 'counts for marks' is the primary contributor to the music performance anxiety experienced by the participants prior to, and during, an examination. The participants observed that an examiner's ability to identify performance errors when following the score while the participants are performing contributes considerably to music performance anxiety.

> Participant C: Well, prac exams for me, it's that it's for marks. Even though I'm not doing an awfully hard piece, and I'm not doing incredibly hard scales and incredibly hard stuff, it's for marks, so, and it counts for my term order and it counts for, for, um my music mark, so it's, it's quite important for me, and especially this year, there's no messing around; there's no time for, for, um nonsense, um. This year, these marks, they all go through and they all count.

> Participant B: Well, I don't really get as nervous as I do when I go into an exam, because, I don't know, it's just examiners scare me so much because they know everything, and they know all the notes, and then if you make a mistake, you know they know. Because when, if you're just in a concert, no one knows when you've made a mistake – only you know. But in an exam, they have, like, all the papers.

Participants did not find that they could develop constructive methods dealing with music performance anxiety when practising, as the more relaxed environment of a practice room did not compare with the stressful performance or examination context.

> Participant A: Not really, it's a different environment. I'm more relaxed so I don't get as worked up when I make a mistake. You have no pressure to get it right because that's the point of

> practising. To Make mistakes and learn from them. But if you make mistakes in a performance, it means you haven't practised.
>
> Participant D: So, when I am practising, I am a lot more comfortable there, like going through the piece that I am doing, at speed, and knowing that there will be no consequences when I mess up. When, playing in public, knowing that there is only one chance to do the piece, and if you mess up, well, there is the impression they got.
>
> Participant C: Um, in the practise room, I do, there are times where, um, I do stumble a bit, but not as much. I find it much easier to focus on what I am doing and concentrate on getting back on track, because if, there's, there's a lot less pressure in a practise room than there is in an exam. Someone that's marking you on what you're doing. Um, and um, depending on what it is, if I'm confident in, that what I'm doing is right, I feel less, less nervous about it, but I still do feel nervous because I don't know if, if, for a Trinity exam, I don't know what, um, I don't know what the examiner is like; I don't know what he, he or she is going to react to how I'm going to play, or what he's going to say, so, it's kind of difficult.

Even the context of performing a solo item when compared to performing in a group or ensemble item elicits its own related anxiety according to the situation. Participants feel less anxious when performing in a group or ensemble as the possibility of the audience identifying a single individuals mistake is rare. It is easy for a performer to hide their mistake among the group of performers.

> Participant C: No, because when you play a solo, all the attention's on you, not much, even with the piano that's accompanying you; they don't really watch that; they watch the soloist playing, and when you are, when you are doing a solo, you have, it's, there's more expectation from others of you, compared to if you're in a band, um, they expect, they expect more of certain people, than yourself, and, um, in a, in a group, for instance in a choir, if you make a mistake, it's sort of shadowed by the rest, and if you're in wind orchestra, um, if you make a slight mistake in a note, it's covered by everyone else.

The performance related factors that contribute to music performance anxiety are therefore the performer's perception of audience reactions and the desire of the performer to receive a positive audience reaction, which is viewed as a sign of a successful performance. The performance context, such as practical examinations and concerts, also influences music performance anxiety. However, all participants agree that their music performance anxiety is greater during practical examinations due to the examiner's ability to identify performance errors when following the score while the participants are performing. All participants further

agree that performing in groups allows levels of music performance anxiety to be reduced when compared to a solo performance, as the possibility of the audience identifying a single individual's mistake is rare.

4.2.2 Subordinate theme 2: Self-esteem

A performer's self-esteem or confidence plays an important role in enabling him or her to step on stage and not be overwhelmed by the audience or situation. Furthermore, the performer's self-esteem or confidence on stage is clearly evident to the listener (audience or examiner) and might contribute to emotions the listener experiences in response to the performance. A strong sense of self-worth is required to build performers' confidence and belief in their performing abilities. In other words, doubting one's own ability or having a fragile self-worth will invariably lead to music performance anxiety. If a performer then projects a fragile sense of self-worth onto the audience or examiner, their self-perception can be emotionally contagious, causing the listener to share the performer's negative self-perception of themselves.

> Participant C: If I'm confident in, that what I'm doing is right, I feel less nervous about it, but I still do feel nervous because I don't know if, for a Trinity exam, I don't know what the examiner is like; I don't know what he or she is going to react to how I'm going to play, or what he's going to say, so, it's kind of difficult and that makes me nervous.

A performer's negative self-perception can manifest through a constant striving to please others and a goal to impress others in hopes that the audience or examiner will believe in his or her capabilities or offer a sense of confirmation that he or she did a good job.

> Participant A: Oh that's what scares me. Maybe it's the possibility of embarrassing yourself in front of people, if, should you do something wrong. Or… I think people watching you, and that's in everything we do, I think sport, performing, speaking, people are watching you. And that's, and we feel that as pressure. We don't know why but, but that makes you want to do better. Maybe it's got something to do with ego. You want to prove something, make someone proud, and all of those can make you kind of nervous.

This fear of failure by letting the listener down is irrational, as the repercussions of a good or bad performance only directly affect the performer. The listener is merely a medium in the situation and will not be directly affected by the performer's outcome. The possible "fear of failure" experienced by the performer could possibly be better described as their own fear of embarrassing themselves in front of an audience.

> Participant B: When I make a mistake in a music prac exam, I feel like I am letting people down if I play the wrong note. Like, letting you and myself down.

Self-esteem is therefore influenced by the development of a strong sense of confidence which is required in order to build one's own belief in the performer's capabilities. Self-esteem appears to be diminished through participants who doubt their ability or have a fragile self-worth.

4.2.3 Subordinate theme 3: MPA Coping Methods

Subordinate theme 3 explores ways in which performers cope with music performance anxiety methods in three subsections: medication, games for the purpose of distraction, and performance experience.

4.2.3.1 Medication

Previously, in an attempt to address their music performance anxiety before a practical examination, many of the participants had resorted to the use of natural (herbal) and pharmaceutical medication to alleviate symptoms of musical performance. One participant claimed that her use of a natural medication to relieve anxiety was unreliable, saying that the unpredictable results of taking the medication could be due to a placebo effect. However, the term "placebo" has been misused in the interview as the placebo effect refers to a benign substance (vitamin or sugar tablet) which functions well, as the participant believes in the medication's efficacy. The participant appears to have little confidence in the reliability or efficacy of whether natural medication works.

> Participant A: I have, I don't know, I have tried a natural kind of, or rescue remedy – it's kind of a natural supposed calming agent. It is called tissue salts or something, so it is a tablet, or it comes as drops. And it is, it is hard to tell, because it could just be the placebo effect, um, I have felt that sometimes it works, sometimes it doesn't, which would be placebo.

Another participant also used rescue remedy in an attempt to reduce his levels of anxiety before a performance. This participant claimed that it did work for him; however, he did not use it at the time of the interview.

> Participant D: Before some concerts, my mother used to give me um, rescue remedy, and that helped to calm me down, and I would feel a lot more comfortable. But I do not take them

anymore because I don't have access to them anymore as my dad would bring them from the States.

Another participant explains that while she is aware that other people are using herbal or pharmaceutical treatments, the participant cannot afford to resort to medication each time she experiences anxiety for financial reasons.

> Participant B: I honestly don't know what to do about it. Like, other people are using them, it is just I do not really have money to buy them every time I get nervous as I get nervous a lot.

Another participant who takes chronic mood stabiliser medication claims that taking beta blockers for music performance anxiety has no effect on the participant and he therefore does not use it. However, the participant does not mention whether his current mood stabiliser medication has an effect on his music performance anxiety.

> Participant C: Well I am on chronic mood stabiliser medication, so taking a beta blocker does not really do anything for me.

In summary, the analysis suggests that the use of medication, both herbal and pharmaceutical, may be used to treat music performance anxiety, but it is not a sustainable option due to the effects being unreliable, the medication being inaccessible or expensive.

4.2.3.2 Games for the purpose of distraction

One research participant who does not take any form of medication to treat anxiety before a performance, mentions that she plays games on her cell phone before a practical examination to reduce her anxiety. The participant claims that when she does this, she can distract herself from the fact that she is about to go into a practical examination. This appeared to reduce her levels of anxiety minimally and for a limited time prior to a performance. However, when the participant stops playing the game on her cell phone, the anxiety immediately returns once she is faced with the reality of having to perform a practical examination.

> Participant B: That is why I was playing that game before I came in, because I was like... this will calm me down. It takes my mind off the fact that I have got an exam soon. But it is still in the back of my mind.

Thus, the analyses suggest that gaming appears to be an unsuitable method of dealing with music performance anxiety as the participant was unsuccessful in sustaining her reduced anxiety once the actual performance began. However, she was able to reduce her anxiety temporarily in a pre-performance environment which possibly affected the overall anxiety that she would experience from performing.

4.2.3.3 Performance experience

Performance experience plays an important role in the levels of anxiety experienced by the participants. Every concert or examination provides an opportunity for the participant to learn something new and to better prepare for future concerts or examinations. One research participant refers to performance experience as being an important factor in allowing her to better deal with her MPA.

> Participant A: Yes, I think it does, I, obviously if you are performing for the first time ever, you are going to be nervous because you do not know what to expect. If you are doing it for your hundredth time, you are going to be a bit more confident. You know what is coming, you are ready. You know what you do, you know what works for you. You know what will… what to do, what not to do.

This implies that performing frequently at concerts or examinations provides performers with a means of negotiating performance scenarios (positive and negative) through experience. The value of this experience is that the nerve-wracking sense of a performance's 'unknown' diminishes somewhat, which contributes to reduced music performance anxiety.

Two research participants compared performance anxiety experienced through competitive individual sport (squash), and their musical practical examinations. Both research participants claimed that they generally experience less performance anxiety during competitive individual sports than a music practical examination. They attributed this to the level of experience they had acquired in the sports arena.

> Participant A: Maybe if it is a big match that I really want to win, or someone that I really want to beat, to do well in a tournament or something, there is that nervousness. When I was slightly less experienced, I would get really nervous if there were lots of people watching. But at this point, I have learned to focus on the game as opposed to anyone who is spectating.
>
> Participant B: I have played more squash matches, so I am more used to it (performance anxiety) than music exams.

However, both solo performances and solo competitive sports are comparable in that they do not include teamwork (individual pressure etc), do include spectators, require training/preparation etc. So, provided that the participant applies the same preparation for music and sport performance, performance experience in the different domains must then logically play a role in the levels of anxiety experienced.

Performance experience also appears to play a role in the extent to which participants are able to manage physiological symptoms of music performance anxiety. Physiological symptoms such as shortness of breath, unsteady fingers and dry mouth can prevent a participant from playing with the level of skill of which they capable.

> Participant A: Um, well, when I was less experienced, the anxiety showed as squeaks, either because my mouth went dry and then obviously that makes it difficult, or, um, the nerves make your, um, I think it's … your jaw gets tight, and then obviously that doesn't help when your mouth is controlling your playing, so then that showed as squeaking. Um, (pause) and it's quite funny that (laugh) I'm anxious about making mistakes, while my anxiety comes out as making mistakes in pieces.

Performance experience is therefore an important factor in allowing participants to better deal with their MPA through learning to better prepare and deal with managing their symptoms (both mental and physiological) resulting from music performance anxiety.

Summary of Superordinate theme 1

The factors contributing to music performance anxiety as identified through the analysis of the participants' transcripts include performance-related factors, such as the performer's perception of audience reactions as well as the context of the participant's performance. Self - esteem and the performer's fragile sense of self-worth and self-confidence being related to their MPA. Music performance anxiety coping methods that the participants have attempted to lower symptoms of anxiety such as medication, games for distraction and the experience of performing in front of an examiner/audience.

4.3 Superordinate theme 2: Effects of monaural beats

The data analysis of the second set of interviews which were conducted after the exams which included background monaural beats elicited several interesting insights into the effects of monaural beats on music performance anxiety. The immediate effects when listening to monaural beats appeared to be positive and therapeutic. This section discusses five main effects

of monaural beats which the research participants identified as contributing to their performance experience in a meaningful way: sense of calm, improved confidence, passive awareness and focus.

4.3.1 Subordinate theme 1: Sense of calm

Three of the research participants reported feeling calmer during their second practical examination while monaural beats were playing in the background when compared to how they felt during their first practical examination when monaural beats were absent. The three participants referred to the vibrational frequency of the monaural beat as being enjoyable to listen to and therefore induced a state of calmness.

> Participant B: It (monaural beats) calmed me down. I got calmer for everything and I was not overthinking so much.

> Participant D: I generally felt more calm during this exam. But I only noticed that the beats were playing after my first piece.

The participants' experiences of calmness resulted in less extreme physiological stress responses, which are typically linked to high emotional stressors or triggers e.g. unsteady hands, dry mouth, shortness of breath and loss of focus. These unpleasant physiological responses which result from MPA have a negative impact on levels of performance success as they cause performers to make errors that they would not normally make while in a practice room and not being exposed to the high anxiety context of the practical examination.

> Participant D: I felt it was a lot easier to play the piece as in flowing wise and I normally get quite nervous, and I do not blow as hard as I would while practicing. But during this exam, it felt a lot easier to blow.

> Participant B: I was not as twitchy, because I like to move a lot and my fingers get shaky. They were not shaky for this exam and I did not squeak.

> Participant A: Usually when I get nervous, I get sweaty hands and I get quite nervous. When I first started playing the saxophone, that came out as having a dry mouth, which really does not help you when you are playing an exam. And today when I was playing, they were fine.

In summary, the pleasing sound referred to by the three participants while listening to monaural beats during the practical examinations caused them to experience a state of calm. This in turn

resulted in the three participants being able to focus on the task at hand without overthinking and feeling relaxed.

4.3.2 Subordinate theme 2: Improved confidence

In the second round of interviews, two of the research participants expressed experiencing an unusual sense of confidence while performing when the monaural beats were playing in the background during their practical examination. When comparing these higher levels of confidence to their earlier experiences in their practical examinations when monaural beats were not playing, they observed considerable differences. During the first round of practical examinations, all research participants reported feeling nervous and anxious. This is the usual response regarding performers' levels of anxiety before and after a practical examination from the participants. Interestingly, the two participants could not explain why they felt this improved sense of confidence during the second round of their practical examinations during which the monaural beats were played.

> Participant A: It is quite calming. It is a nice sound which obviously makes one calmer. Quite possibly, I think that would be a quite likely explanation for me feeling more relaxed for this exam.

> Participant A: I think I was more nervous for the last one. I am not entirely sure why, but I was more nervous going into it. This time I was more relaxed, a bit more confident about it. My previous exam I was more nervous. Today I was more confident which I think really helps.

The potential of monaural beats to induce feelings of confidence in the participants, without the participants being able to identify the reason, suggests that the monaural beats were affecting the participants at a subconscious level. Although the participants were aware of the monaural beats at times during the examinations, they were consciously focusing on performing aspects of their exams, such as scales and pieces.

> Participant D: I felt quite confident in my piece, sir, also in the scales, a lot more confident than I would be.

> Participant C: I definitely felt more confident in this exam. And I feel that once people get that confidence boost and that sense of relaxation, it is a lot harder for them to get stressed in it any more.

The data analysis thus suggests that confidence is an important factor in enabling the participants to feel better about their practical examination. Participants related a better sense of confidence and preparedness to a reduced sense of MPA.

> Participant C: Um, for me, anxiety affects my performance in, um, confident playing. Um, playing with, playing my dynamics properly, if I'm nervous, I tend to play soft, or my dynamics aren't on point. Um, I tend to shake, so my notes go off; my fingers go off the holes, and sound doesn't come out. Um, anxiety makes me think too much about what I'm doing, and it makes me think about other things; what the examiner is thinking; what he's writing down, what, did I get a good mark; did I get a bad mark, and I'm not focusing on the actual task I'm supposed to be doing.

> Participant A: I think to some extent I'd still be nervous. It's the same scenario as every other time before, but there is that confidence thing that, you know what you're doing. Then, you, or you have a way of not being nervous. Or you, it's not the unknown. You can calm yourself down or know what doesn't make you nervous. Or know that once you start playing, you're fine, or whatever it is that works for you.

Therefore, monaural beats were able to improve participants' confidence in their practical examinations, allowing the participants to feel less anxious and to perform their examination requirements successfully.

4.3.3 Subordinate theme 3: Passive awareness

The research participants were not consciously aware that the monaural beats were playing in the background of the examination venue when they entered the venue. Two participants eventually picked up on the fact that monaural beats were playing, while the other two participants were still oblivious to the monaural beats until I brought it to their attention that there were monaural beats playing in the background. This suggests that monaural beats operate at a subliminal level and are not distracting to the listener.

> Participant B: I did not notice when I walked in. I only noticed after I had finished playing my first scale.

> Participant C: I could not hear any monaural beats playing.

Once again, due to the low vibrational frequency of the monaural beat, this vibrational frequency is not always consciously identified by the human ear, yet the vibrational frequency affects the body. This further suggests that monaural beats may be used in a venue without the

participants being distracted by the vibrational frequencies, while still benefiting from the effects.

4.3.4 Subordinate theme 4: Focus

Being able to focus on the task at hand is an important factor for any performer in preparing for a concert or an examination. According to several participants, avoiding distractions and committing one's mind fully to the goal is crucial to ensure an efficient practice session is achieved. Participant C describes how he is able to focus better while in a practice room due to fewer distractions around him. Possibly the context of the practice room for the sole purpose of practicing allows him to focus on the task at hand without encountering other distractions that would tempt him if he were trying to practice in his room. Monaural beats allow the participant to block out any external stimuli such as outside noise due to the brain becoming entrained on the monaural beat and focusing on the sound of the vibrational frequency.

> Participant C: Well, in the practice rooms, I remove myself from anything that distracts me, and then I can focus on one thing. Um, and I shut out the sound from outside, so that I can focus on that thing. But when I come into a prac exam and I'm nervous about a prac exam, all the sounds from outside come in and they sort of distract me. Even if I'm focusing on the music; even if it looks like I'm focusing on the music, I'm focusing on some other – I'm focusing on the sounds coming from outside

The research participants claimed to feel more focused during their second practical examination than when practising. Due to monaural beats playing in the background, even though it was during an examination which causes anxiety and stress, the participants reported that it was easier to concentrate on the task at hand without overthinking by being able to focus on the sound of the monaural beat.

> Participant C: I felt a lot of strain relief off of me and a lot of stress relief. Strain regarding to much thinking and trying too hard to work everything out and overthinking things. I think having the monaural beats in the background helped me to slow down my mental thought and to help me focus on it, because if I stress too much, I am not going to get it right.

> Participant B: I was not overthinking things too much. It felt easier for me to focus on what I had to do and not get distracted by other things.

The research participants' experience of the effects of monaural beats, despite being unaware of them, suggests that monaural beats function at a sub-conscious level. Even though the participants are not necessarily aurally conscious of the monaural beats, the vibrational frequencies appear nevertheless to be experienced at a sub-conscious physiological level.

> Participant B: It wasn't immediate, I didn't walk in and be like, oh there's monaural beats. But I did notice them after a little while.

This indicates that monaural beats do not distract one from performing the task at hand.

> Participant C: I would use monaural beats for anything: through studying, working in class, oral work, especially during my orals, because a lot of people tend to get nervous, and they tend to stutter, which is not good. My personal experience: having an intimidating teacher watching over you is very stressful and very nerve-wracking. So listening to monaural beats beforehand to calm myself down actually helps a lot. For my personal experience, it is very useful, because it helps me with my studying, helps me with my concentration.

Although not directly related to the main research question, monaural beats were reported by a participant to be useful in everyday non-musical contexts. This participant suffers from attention deficit disorder (ADD). The participant perceives everyday tasks as challenging, as he is easily distracted and can lose focus on the task at hand or the goal that he has set out to accomplish.

> Participant C: I am ADD and it helps a lot with concentration, working, more efficient working, quicker working, working faster, getting deadlines done. And it can be doing anything; even arbitrary tasks, like putting your laundry in the washing machine, making yourself breakfast, going for a run, doing some work outside, gardening work, whatever, it works.

In summary, the sound of monaural beats in the background during the practical examination helped the participants to concentrate better on their performances. Through focusing on the sound of the vibrational frequency, the participants were less distracted by non-musical factors such as external sounds, negative thoughts, or stress and were able to remain calm and focused on their music.

Summary of Superordinate theme 2

Listening to monaural beats during a performance has elicited the following effects: an improved sense of confidence in the listeners, a sense of calm that can reduce levels of music performance anxiety and the ability to focus better on the task at hand.

4.4 Summary

This chapter provided an analysis of the superordinate and subordinate themes that were identified through the data analysis over the two separate rounds of interviews. Two superordinate themes – factors contributing to music performance anxiety and the effects of monaural beat technology – emerged from the analysis. The findings of the analysis will be discussed in relation to the current literature in the next chapter.

Chapter 5

Discussion

5.1 Introduction

This research project set out to investigate learners' subjective experiences of the effects of monaural beat vibrational frequencies on their experiences of music performance anxiety. To date, very little research has focused on the effects of monaural beats on levels of music performance anxiety during a performance. This research specifically seeks to understand the performer's perspective on the effects of monaural beats. This chapter presents a discussion of the interview data with reference to the two superordinate themes: 1. Factors Contributing to music performance anxiety; 2. Effects of monaural beats. The findings will be discussed in relation to current literature on brain responses to frequencies, monaural beats, the effects of monaural beats and mood, anxiety and well-being, Flow, music performance anxiety and emotions in response to music. A summary concludes the chapter.

5.2 Superordinate theme 1: Factors contributing to MPA

MPA is a complex phenomenon caused by the interaction of many factors, including genetics, environmental stimuli and the individual's experience, emotions, cognitions and behaviours (Kenny 2011, p. 47). This theory aligns well with this research, which suggests that there are several factors that play a role in a young musician's experience of MPA.

The findings of the analysis suggest that learners' perceptions of audience responses to their performance is a root cause of their music performance anxiety, which occurs only in a performance environment. As Altenmuller and Ioannou (2016) maintain, MPA emphasises a unique state of arousal, which only happens when musicians perform before an audience in a performance context. As a performance essentially provides the performer with an opportunity to present a musical interpretation that has developed over a period of preparation, often revealing the performer's inner self, the audience's reaction and opinions is thus valued by the performer. The analysis suggests that performers generally desire audience appreciation and enjoyment, which they perceive as a measure of the success of their performances. This innate desire for audience appreciation however, can induce anxiety in the performer which is often simply caused by irrational or negative thoughts, for example an anticipation of the audience laughing at him or her.

> Participant A: The nightmare is that they start laughing at you. It is an illogical thing. I know a hundred percent that the audience is not going to break out laughing. But the thought is always in my head.

Brotons (1994) agrees that musicians' perceptions of the audience is 'real' and performers are usually correct in their assessment that people are watching and judging them. The reality of audience scrutiny should be taken seriously, as anxious musicians project their own perceptions about the nature of the audience's responses. He argues that aspects of the feared stimulus, the music performance, must form an integral part of the theoretical formulation and treatment of MPA.

However, not all researchers agree with this view. Kenny (2016) contends that people suffering from music performance anxiety are more likely to be concerned about their performance competency and the task at hand than others' perceptions of their performance. The findings of the analysis also align with this claim, suggesting that in addition to the fear of a critical audience, young musicians are also concerned about their competence while performing. This implies that both perceived audience reactions as well as performance competency contribute to performers' experiences of MPA.

> Participant D: So, when I am practising, I am a lot more comfortable there, like going through the piece that I am doing, at speed, and knowing that there will be no consequences when I mess up. When, playing in public, knowing that there is only one chance to do the piece, and if you mess up, well, there is the impression they got.

However, all the participants maintained that the thought of the audience critically evaluating or judging them is a greater contributing factor to their music performance anxiety than their musical competency and the thought of making a mistake. The analysis suggests that the fear of failure or making a mistake in front of the audience may be directly correlated to the participants' fear of audiences' perceptions. As Participant C states:

> Because it gives an excuse for your enemies to laugh at you and a sense that you don't know what you're doing and most people want to get it right, because that means they they've done a good job.

The analysis suggests that young musicians tend to associate their musical competency with the audience response, which may directly affect their self-confidence and motivation to perform. As discussed in Chapter 2, Kenny (2016) asserts that there are four cognitive qualities

that could be responsible for an individual's sense of perception- adolescent egocentrism, invincibility fable, personal fable and imaginary audience. While the audience at a performance is real, the performers' perception that audience members are scrutinising them during the performance is (for the most part) imagined, aligning with Kenny's (2016) notion of an "imaginary audience".

The findings of the analysis indicate that the context of a performance contributes significantly to the degree of music performance anxiety experienced by the performer. All the participants considered a public performance e.g. a school concert, as less stressful than a practical examination, as they did not have the added pressure of being marked by an examiner. While there is little research comparing music performance anxiety to the pressure of being marked by examiners, Castiglione et al. (2018) explore the effects of the performance setting (jury versus non-jury) on MPA in a sample of music students, covering a wide range of music disciplines. The students' levels of music performance anxiety were assessed through several physiological, behavioural and self-reported measures. The study found that the students who performed in a jury setting showed higher heart rates and anxiety levels than compared to the students' who performed in a nonjury setting. Similarly, Craske and Craig (1984) argue that audiences whose members are respected by the performer for their status in the field who possess expert knowledge of their repertoire, such as an examiner, will elicit more MPA than less accomplished audience members. The findings of the analysis correlate with these views, directly linking the performers' experiences of MPA with their awareness that an examiner is able to identify their performance errors when following the score.

> Participant B: I don't get as nervous as I do when I go into an exam, because examiners scare me. They know all the notes, and if you make a mistake, they know. When you're in a concert, no one knows when you've made a mistake – only you know.

The findings of the analysis further suggest that the context of performing a solo item when compared to performing an ensemble item plays a considerable role in the degree of music performance anxiety experienced by performers. This correlates with Cox and Kenardy's (1993) assertion that MPA increases when musicians perform as soloists, compared to practice and group sessions, and the mere presence of other individuals may alter their performance. The size of the presenting group influences the level of music performance anxiety, with solo settings eliciting the highest degree of anxiety, and then decreasing in other contexts such as smaller ensembles, orchestras, and teaching settings (Cox & Kenardy 1993). Situational factors

influencing the occurrence and experience of music performance anxiety can be related to the mere presence of an audience including its size and status (Craske and Craig 1984). The size of the performance ensemble itself influences the level of music performance anxiety experienced by performers, with solo performances eliciting the highest anxiety, followed by small ensembles, orchestras, and teaching settings (Craske and Craig 1984). Similarly, this research analysis proposes that participants feel less anxious when performing in a group or ensemble as there is a very small chance of the audience identifying an individual's mistake.

> Participant C: When you play a solo, all the attentions on you, and not the piano that's accompanying you. There's more expectation from others of you, compared to if you're in a band. If you're in a wind orchestra and make a slight mistake, it's covered by everyone else.

Thus, the findings of the analysis support the factors mentioned by the participants, including audience reactions and the performance context that contribute to music performance anxiety. Furthermore, the analysis reveals that a strong sense of self-worth is required in order to build performers' confidence and belief in their performing abilities. When performers doubt their own ability or have a fragile self-worth, this will invariably lead to music performance anxiety. As Castiglione et al. (2018) point out, musicians place great importance on the level and the quality of their performances because they recognise them as a fundamental element of their personal identity and the quality of their performances affects their self-esteem.

Additionally, performances, goals and careers are also affected by self-concept (Oyserman & Markus 1990). Self-images affect individuals' cognitions, emotions (including anxiety) and behaviours. Self-representations were shown to play an important motivational role among musicians, with the musical self positively affecting his or her performances, goals and careers (Oyserman & Markus 1990). The findings of the analysis suggest that a performer's negative self-image can manifest through a constant striving to please others in hopes that the audience or examiner will believe in his/her capabilities or offer a sense of confirmation that the performer did a good job.

> Participant C: If I'm confident that what I'm doing is right, I feel less nervous about it, but I still do feel nervous because for a Trinity exam because I don't know what the examiner is like or how they are going to react to how I'm going to play.

Juslin (2016) draws attention to the notion of emotional contagion, which he identifies as one of the mechanisms through which emotions are expressed and measured. This resonates strongly with the findings of the analysis, which suggest that if performers project a fragile

sense of self-worth onto the audience or examiner, self-perceptions can be emotionally contagious, causing the listener(s) to share the performers' negative self-perception of themselves. By the same token, a confident performer communicating a positive self-perception would induce a positive response from the listener(s).

The findings of the analysis suggest that some performers experienced a fear of failure which is linked to the listener(s) being disappointed in their performances. In the context of a performance which is not being examined, listeners are merely passive observers at the performance, and do not play a direct role in the actual success of the performance. This differs in examinations, where there is the additional 'fear factor' of achieving a good mark as well as performing well. Here the listener(s) do play a role in the graded outcome of the performance. The findings of the analysis suggest that the performers' fear of failure is their own fear of embarrassing themselves in front of an audience. As Castiglione et al. (2018) maintain, the discrepancies and incongruences between self-representations, such as embarrassing themselves or letting others down showed a negative effect on emotional states like depression, sadness, stress and anxiety. The findings of the analysis show that all performers agree that their levels of music performance anxiety are increasingly higher when performing for an examiner when compared to performing for an audience.

Individuals vary in their capacity to cope with stressful working conditions and numerous ways of coping with the impairing condition of performance anxiety exist, the most popular being the use of beta adrenoceptor blocking drugs (Fishbein et al. 1988). The findings of the analysis reflect a similar insight into the use of beta blockers, finding that not all participants made use of them due to varying levels of the medication's efficacy. Some of the participants had taken natural (herbal) and/or pharmaceutical medication to alleviate symptoms of musical performance. However, one participant stated that pharmaceutical beta blockers had no effect on her music performance anxiety as she was already taking prescribed chronic mood stabiliser medication, and experienced no positive effects from beta blockers.

Fishbein et al. (1988) maintain that the use of drugs was reported as the most common strategy to cope by 40% of those experiencing severe stage fright. However, the findings of the analysis differ in that not all participants are able to access these drugs due to certain drugs only being available outside of the country. The findings further suggest that while participants are aware that other people are using herbal and/or pharmaceutical treatments, the drugs are not affordable, especially if required each time the participants perform.

> Participant B: I honestly don't know what to do about it. Other people are using them, but I do not have money to buy them every time I get nervous as I get nervous a lot.

The findings of the analysis identified interesting perspectives on the efficacy of natural medication. One participant claimed that her use of a natural medication to relieve anxiety was unreliable, saying that the unpredictable results of taking the medication could be due to a placebo effect. Although this is a misunderstanding of the placebo effect as the research participant did not consume a placebo, the finding remains that the natural medication was not effective.

The analysis therefore proposes that gaming appears to be an unsuitable method of dealing with music performance anxiety as the participant was unsuccessful in sustaining her reduced anxiety once the actual performance began. However, in concurrence with the literature, the participant was able to reduce her anxiety temporarily in a pre-performance environment which possibly had an effect on the overall anxiety that was experienced.

The findings of the analysis indicate that performance experience plays an important role in the extent to which of performers experience music performance anxiety. Every concert or examination provides an opportunity for the participant to learn something new and to better prepare for future concerts or examinations. As Kubzansky and Stewart (1999) point out, anxiety is closely related with poor musical performance experiences and, as a consequence of poor performance experiences, comes the possibility of musicians prematurely ending their musical careers. According to Hazel Markus and Paula Nurius (1986) the term future self delineates a set of knowledge about what one might become. When individuals describe, or think about, themselves, they will use knowledge about characteristics that they believe they actually possess or they will likely acquire in the future. They will use self-knowledge about themselves in the present and project this into the future (Markus & Nurius, 1986). This implies that performing frequently at concerts or examinations provides performers with a means of negotiating performance scenarios (positive and negative) through experience. The value of this experience is that the nerve-wracking sense of a performance's "unknown" diminishes somewhat, which contributes to reduced music performance anxiety.

Even so, the analysis suggests that more experienced students might perform better than less experienced peers under anxiety conditions. One research participant refers to performance experience as being an important factor in allowing the participant to better deal with her music performance anxiety.

> Participant A: If you are performing for the first time ever, you are going to be nervous because you do not know what to expect. If you are doing it for your hundredth time, you are going to be a bit more confident.

However, Ana Barbara, José de Souza Crippa, Flávia de Lima Osório (2014) disagree, contending that music students who want to become professionals showed higher levels of music performance anxiety and that professional and amateur musicians had similar music performance anxiety, but professional ones showed higher levels of general and social anxiety. Castiglione et al. (2018) support this claim, arguing that despite the common belief that years of practice could protect musicians from anxiety before or during musical performance, research showed that practice and experience cannot guarantee that musical performances will be free of feelings of anxiety and stress.

Two research participants further elaborated on their belief that experience benefits anxiety by comparing performance anxiety experienced through competitive individual sport (squash), and their musical practical examinations. Both research participants claimed that they generally experience less performance anxiety during competitive individual sports than a music practical examination. They attributed this to the level of experience they had acquired in the sports arena.

> Participant B: I have played more squash matches, so I am more used to it [performance anxiety] than music exams.

The analysis further suggested that performance experience plays a role in the extent to which participants are able to manage physiological symptoms of music performance anxiety. A musical performance requires the unique integration of a multi-sensory and motor information process and precise planning and monitoring of the performance via auditory feedback (Altenmuller and Ioannou 2016). In the context of a musical performance, musicians have to reproduce highly controlled physical movements perfectly and reliably in the context of an unyielding societal punishment–reward mechanism.

These finding cannot be assumed for all musicians, as according to Kenny (2016) not all musicians suffer or report the same level of anxiety. Individual differences occur in a range of psychological and physiological characteristics and responses to the performance situation, performance experience can be an important factor. This allows participants to better deal with their music performance anxiety through learning to better prepare and deal with managing

their symptoms (both psychologically and physiological) resulting from music performance anxiety.

5.3 Superordinate theme 2: Effects of monaural beats

David Icke (2010, p. 3) asserts that the human brain converts sound vibrations into electrical signals which are later decoded to construct our physical reality. In other words, all incoming information is the same information in different forms, and the brain "decodes this information vibrationally, electrically, electromagnetically, and chemically." The findings of the analysis suggest that the background monaural beats had a noticeable impact on the performers' physiological and emotional realities when performing. This implies that the vibrational information of the monaural beats has the potential to alter the performers' states of consciousness.

The findings of the analysis suggest an unusual improvement in the performers' sense of confidence while performing with background monaural beats. This heightened sense of confidence was notably greater than their levels of confidence experienced when performing without background monaural beats. Additionally, the analysis found that the performers experienced less music performance anxiety when performing with background monaural beats. Interestingly, the research participants could not explain their improved confidence and reduced music performance anxiety.

> Participant A: I think I was more nervous for the last one. I am not entirely sure why, but I was more nervous going into it. This time I was more relaxed, a bit more confident about it.

The pleasing sound referred to by the three participants while listening to monaural beats during the practical examinations caused them to experience a state of calm. This in turn resulted in the three participants being able to focus on the task at hand without overthinking and feeling relaxed. The analysis proposes that the participants' inability to account for the reasons they felt less anxious implies that the calming effects of the monaural beats occurred at a deeply subconscious level. According to Kasprzak (2011), monaural beats influence brainwave frequencies associated with different levels of consciousness, including gamma waves (40 Hz), beta waves (12 Hz to 30 Hz), alpha waves (8 Hz to 12 Hz), theta waves (4 Hz to 8 Hz) and delta waves (1 to 4 Hz). The findings of the analysis, although not validated by quantifiable EEG readings, nevertheless resonate with Kasprzak's (2011) notion of subconscious brainwave entrainment, submitting that the monaural beats synchronised the

participants brainwaves to the specific frequency that alters the human consciousness to a mental state associated with reduced anxiety and confidence in the beta wave frequency (12 Hz to 30 Hz). Building on Kasprzak's (2011) theory, Engelbrecht et al. (2019) assert that through brainwave entrainment, monaural beats synchronises the brains neural activity to a specific auditory frequency that alters the human consciousness to a mental state associated with that specific auditory frequency.

The findings of the analysis suggest that monaural beats appear to block out or replace the distractions of external stimuli such as outside noise due to the brain becoming entrained with the monaural beat and passively responding to the vibrational frequency. Thus, the research participants feel more focussed on their performance.

> Participant C: But when I come into a prac exam and I'm nervous about a prac exam, all the sounds from outside come in and they sort of distract me. Even if I'm focusing on the music; even if it looks like I'm focusing on the music, I'm focusing on some other – I'm focusing on the sounds coming from outside

Bedgard and Georges (2000) refer to inaudible frequencies which vibrate below the audible human range of about 20 Hz to 20 000 Hz as infrasound. These inaudible infrasound frequencies, if played loud enough, are often perceived rather than heard by the human ear. Therefore, the findings suggest that while the extremely low vibrational frequencies of the background monaural beats (30 Hz) might not always be identifiable by the human ear, the listener will nevertheless perceive the vibrational frequencies and respond on an emotional and physiological level. This means that monaural beats may be useful in other contexts where there is an atmosphere of stress and tension such as written examinations, without causing distraction from the task at hand.

> Participant A: No, I did not realise that they were playing beforehand. And yet, when I was playing my piece, I had a few rest bars, and I thought about it and tried to hear it, and it was not there. So, it has no distracting effects.

Juslin (2016) asserts that human emotions might occur in response to the rhythmic elements of music. This emotional response is attributed to the listener's own internal bodily rhythm synchronising with the external rhythmic pulse in the music. As a result, listeners match their breathing, or synchronise their heartbeats subconsciously with the music. The findings of the analysis mirror Juslin's theory of rhythmic entrainment of the heartbeat, suggesting however that the performer's brainwaves – as opposed to heartbeats- were synchronised subconsciously

with the vibrational frequency of the Monaural beat. Furthermore, this rhythmic synchronisation, or brainwave entrainment, with the specific frequency of the background monaural beats appear to be associated with the participants' feelings of calm and confidence. The findings of the analysis propose that even though the participants are not necessarily conscious of hearing the monaural beats, the vibrational frequencies appear to be experienced at a sub-conscious, physiological level.

Chaieb et al. (2017) claim that monaural beats can affect the human mind or body leading to altered states of consciousness and healing, resulting in affected mood states e.g. different levels of anxiety and well-being. The findings of the analysis strongly suggest that the low vibrational frequency of the monaural beats affected the participants' altered state of consciousness, which in turn accounted for a reduction in the participants' experience of MPA-related unpleasant physiological responses. This aligns with Atwater's (2004) assertions that when brain waves respond to the low frequencies of monaural beats during a state of consciousness, an altered state of consciousness begins to emerge.

The findings of the analysis align somewhat with the psychological state referred to by Csikszentmihalyi (1990) as a "Flow state" where individuals described their optimal states of performance as instances when their work simply flowed out of them without much effort. One of the hallmarks of a Flow state is the ability to focus on, or become completely absorbed in a task. Their capacity to focus well when monaural beats were playing was emphasized by the participants as being personally welcome and beneficial to the outcome of their performances.

> Participant C: I think having the monaural beats in the background, helped me to slow down my mental thought and to help me focus on what I was doing.

Once a person is experiencing Flow, they are functioning at a heightened level of concentration and awareness with regards to the activity being performed (Csikszentmihalyi and Nakamura 2002). Flow results from a perfect balance between a person's skill and the challenge of specific task and leads to moments of optimal experience and functioning, which only occurs when a person is completely focused on an activity at which they wish to succeed (Csikszentmihali 1990). Thus the findings of the analysis align with particular aspects of Flow such as improved focus, feeling calm and confident.

However, while certain aspects of Flow emerged from the analysis, other important aspects of Flow, namely a profound state of bliss, transcendence of reality, loss of sense of time and self,

and peak performance, were not mentioned. While interviewing the research participants, the research questions were not designed for investigating whether the participants were experiencing aspects of Flow, but rather to explore the effects of monaural beats on their music performance anxiety. Therefore, aspects of Flow might have been experienced but were simply not divulged during the interviews. Alternatively, there were not enough contributing factors for a Flow experience to occur. As Foxcroft's (2019) research posits, there are a number of factors which predispose, inhibit, sustain or disturb Flow in optimal musical performance. Foxcroft (2019) identifies strong negative emotions, such as music performance anxiety, as an inhibitor of Flow, and the findings of this analysis suggest that the participants certainly experienced music performance anxiety during their examinations, albeit reduced due to the background monaural beats. However, it would be interesting to conduct future research which specifically investigates whether listening to monaural beats could counteract MPA to such a degree that a Flow experience might be more likely to occur.

Chaieb, et al. (2017) assert that future research on the applications of monaural beats, may provide additional contexts and uses for the applications of monaural beats on treating symptoms of anxiety disorders. The findings of the analysis propose monaural beats as beneficial in everyday non-musical contexts such as dealing with symptoms of attention deficit disorder (ADD). These benefits include reducing symptoms of ADD such as distraction and poor concentration, thereby facilitating the completion of ordinary tasks that are usually perceived as being challenging.

5.4 Summary

This chapter provides a discussion of the analysis in relation to the existing literature. The claims made by each participant relate to the supporting literature regarding factors contributing to music performance anxiety. The participants reported that their perceptions of audience responses to their performances, context of the performance such as a practical examination versus a public performance, as well as performance experiences contribute to MPA. The findings of the analysis further reveal that a strong sense of self-worth is required in order to build performer's confidence and belief in their performing abilities. When performers doubt their own ability or possess a fragile self-worth, this will invariably lead to music performance anxiety. This construction and maintenance of a healthy self-image invariably plays a further role in other aspects of life such as performances, goals, careers, cognitions, emotions (including anxiety) and behaviours.

The findings of the analysis were discussed in relation to current literature, which claims that monaural beats can induce many attributes of Flow such as reduced anxiety, increased levels of calm, the increased ability to focus on the task at hand and improved confidence. However, the findings of the analysis do not entirely align with the aspects of Flow, as there were no findings directly linked to the experiences of the performers to a profound state of bliss, transcendence of ego and peak performance. The findings of the analysis further identified that the frequency of the monaural beat is processed at a sub-conscious level, which performers do not necessarily hear, but of which they are passively aware.

Chapter 6

Summary and conclusion

6.1 Introduction

This research project set out to investigate learners' subjective experiences of the effects of Monaural beat vibrational frequencies on their experiences of music performance anxiety. Chapter 1 provided an introduction of the research, the background, aims, a brief overview of the methodology, definitions of the research's key concepts, and the research questions. Chapter 2 provided a review of the current theories relating to the uses of monaural beat technology in treating MPA in the field of music psychology. The theories included monaural beats, Flow psychology, performance anxiety and music performance anxiety. Chapter 3 outlined the methodological procedures used for this research and included the research design, research participants, the construction of the questionnaire and interview schedules, data collection strategy, pilot study, data analysis, ethical considerations as well as a brief discussion relating to the reliability and validity of the study. Chapter 4 provided an IPA analysis of the transcribed interview data collected from the research participants. Chapter 5 presented a discussion of the identified emergent themes in relation the current academic literature. Chapter 6 provides a conclusion and summary of the research. The main research question and the six sub-questions are discussed in this chapter.

6.2 Addressing the research questions

The main research question is: what are the effects of monaural beat technology on music performance anxiety on learners performing practical examinations? The six sub-questions of the main research question will be addressed before discussing the main research question.

6.2.1 What factors influence or contribute to learners' music performance anxiety?

The research suggests that there are a variety of factors that influence and contribute to a young musician's experience of MPA. These factors are presented in two sections: performance-related factors and self-esteem.

Performance-related factors are discussed in two sub-sections: performers' perceptions of audience reactions and performance contexts. As a performance provides the performer with an opportunity to present a unique musical interpretation that has developed over a period of

preparation, the audience's reaction and opinions is valued by the performer. Performers generally desire audience appreciation and enjoyment, which is viewed as a sign of a successful performance. Performers' innate desire for audience appreciation may induce MPA which is attributed to irrational fears that the audience might ridicule them during or after their performances. The research shows that participants are motivated to perform and exhibit their extensive performance preparation to the audience. This motivation is largely driven by a desire for recognition for the effort that went into their performance preparation. Audience recognition thus motivates performers to practise hard every day, to be committed to practising, and to the decision to volunteer for performance opportunities despite the inherent anxiety-invoking performance conditions. The audience's response to their performances could play a significant role in learners' confidence and motivation for future performances.

The context of a performance contributes significantly to the level of MPA experienced by the performer. For example, a school concert is considered less daunting than a practical examination, as the audience is considered less critical than an examiner. The pressure of being marked by an examiner is the primary contributor to the MPA experienced by the participants prior to, and during, an examination. This is due to the learners' awareness that examiners, unlike the general audience members, are able to identify performance errors, and mark accordingly.

The context of performing a solo item compared to a group performance also plays a role in the degree of MPA experienced by learners. Performing in a group or ensemble induces lower levels of MPA as the possibility of the audience identifying a single individual's mistake is rare. This means that performers feel less exposed if they were to make an error in a group performance, a comforting awareness which is linked to a lower level of music performance anxiety.

Self-esteem or confidence plays an important role in enabling a performer to perform without feeling overwhelmed by the audience or situation in which they are placed. Furthermore, the performer's self-esteem or confidence on stage is generally evident to the listener (audience or examiner) and appears to be contagious, often influencing the listener's critical or emotional response to the performance. In other words, if a performer projects a fragile sense of self-worth onto the audience or examiner, this will reflect in the performance delivery, causing the listener to share the performer's negative self-perception. A strong sense of self-worth is thus useful in developing performers' self-confidence in their performing abilities. Self-esteem is

influenced by the development of a strong sense of confidence, which is required in order to build one's own belief in one's capabilities.

6.2.2 How does MPA affect practical performance?

Learners' physiological symptoms triggered by music performance anxiety included unpleasant stress responses, e.g. unsteady hands, dry mouth, shortness of breath and loss of focus. This invariably caused uncommon performance errors as the learners had less physical control over their instruments, as well as less mental focus on the music they were performing. Thus, MPA negatively affects practical performance.

6.2.3 What kinds of methods do learners generally use to manage MPA?

The methods used by the learners to cope with their music performance anxiety include the use of medication, distracting online games and performance experience.

The learners' use of natural (herbal) and pharmaceutical medication to alleviate symptoms of music performance anxiety was common. However, using medication, both herbal and pharmaceutical, to treat music performance anxiety is not a sustainable option for the following reasons: 1) herbal medications do not yield consistent, reliable results; 2) certain medications (pharmaceutical and herbal) are inaccessible or too expensive; 3) the medications are ineffectual if participants are taking prescribed chronic mood stabilizer stabilisers.

Playing games on a cell phone before a practical examination was identified as being a fun method of reducing levels of music performance anxiety, as the focus on the game could override the anxiety-inducing thought of the imminent practical examination. However, this relief was only temporary as anxiety returns when the game ends. Therefore, this method is unsuitable, as it is unsuccessful in reducing MPA during the practical examination.

Performance experience in examinations or concerts can alleviate MPA, since each experience of performing despite anxiety could assist learners to manage the physiological symptoms of MPA. In other words, the learners know from experience what to do when unpleasant physiological symptoms of music performance anxiety arise. Competitive individual sport supposedly elicits less performance anxiety than music practical examinations. This was attributed to more experience in playing sport than music practical examinations, even though both activities require the participant to apply the same level of preparation. Therefore, it is suggested that experience does play a role in learners' ability to manage performance anxiety.

6.2.4 To what extent are learners consciously aware of Monaural beat technology when played simultaneously during a performance?

Monaural beats played softly in the background of a practical examination are audible but not distracting to the performer as they operate at a subliminal level. In other words, while the low frequencies of the monaural beats are not always identified by the listener, they do nevertheless appear to synchronise with performers' brainwaves at a subconscious level, known as brainwave entrainment, with the specific frequency of the background monaural beats triggering feelings of calm and confidence. Thus, even though the participants are not necessarily consciously aware of the monaural beats, they do respond to vibrational frequencies subconsciously.

6.2.5 How do learners' experiences of music performance anxiety compare when background monaural beats are present or absent?

The research participants' experiences of MPA were drastically decreased during their second practical examination. This was due to the presence of monaural beats playing in the background of the second practical examination as compared to their first practical examination when monaural beats were absent. Additionally, the learners experienced a sense of calm, increased levels of confidence, decreased distraction and the ability to focus on performing the task at hand. This resulted in a decrease of physiological symptoms which provided a better sense of physiological control over their performances as well as psychological wellbeing.

6.3 Answering the main research question: what are the effects of monaural beat technology on music performance anxiety in learners performing practical examinations?

Background monaural beats played softly during a musical performance are processed on a sub-conscious level by learners and are associated with noticeably reduced music performance anxiety. As a result of experiencing reduced music performance anxiety, the performer experiences an improved sense of confidence, calmness and the ability to focus better on the task at hand. This is beneficial to the performer's well-being and has a positive impact on the performance success.

6.4 Limitations of the study

The research elicited some novel insights into the effects of Monaural beat technology on music performance anxiety experienced by learners during their practical music examinations. However, a number of limitations became apparent while conducting the research study.

Firstly, the sample size only included four participants who are learners at the same school. Therefore, the results of the research are limited and do not allow for a wider account of the experiences of the effects of monaural beats on MPA. Future research is needed to explore the results in comparison to a greater participant size across different schools in order for a more accurate and general result.

Secondly, the interviews were conducted during two legitimate practical examinations to explore real feelings of anxiety under actual practical examination conditions. The second practical examination in which the second round of interviews were to be conducted was cancelled due to unforeseen circumstances. This put a hold on the research as the next round of practical examinations were only to be held the following Term in a few months. This was problematic as practical examinations take place twice a Term. Due to the extra time between the examinations, participants had extra time to practice pieces, which could have had a positive impact on their MPA. Additionally, the atmosphere of a "real" practical examination was not achieved due to the delay in examinations. This is not a common occurrence and therefore the participants were not interviewed under "real" examination conditions. Future research needs to be conducted over usual practical examination periods in order to measure accurate practical examination experiences.

Thirdly, due to the nature of the research participants being anxious school pupils, being interviewed after a practical examination, the quality of the answers during the interviews were not as comprehensive as expected. This made it difficult to create an environment in which the research participants were focused and able to provide detailed accounts of their experiences. It would be interesting to conduct future research on University students with greater experience in practical examinations to investigate whether the quality of answers during the interviews is related to age or music performance anxiety.

Fourthly, the research focused on specific genre(s) of music in a set syllabus (not typically what the performers might enjoy/chose to perform) in particular practical examination parameters required by the school. These parameters include pieces, scales, sight reading and aural. It would be interesting to conduct future research on how monaural beats might affect music performance anxieties experienced by performers during other performance genre(s) or

under different practical examination parameters where possibly only the performance of pieces is examined.

6.5 Recommendations for future research

Firstly, more extensive research which explores the effects of monaural beats on music performance anxiety would enhance future applications of monaural beats on treating symptoms of music performance anxiety and provide comparison of findings with this research's findings.

Secondly, it would be interesting to explore what the effects of monaural beats would be on professional or more experienced musicians and whether their experiences of music performance anxiety and the effects of monaural beats would be similar.

Thirdly, research could be conducted during a concert environment (rather than the context of an examination) and the findings could be compared with the research's findings.

Fourthly, it would be exciting to explore the effects of monaural beats on music performance anxiety in other fields such as written examinations or sports fixtures that would allow for monaural beats to be played in the background such as chess, pool or golf (with the use of headphones). Monaural beats could be effective in other school contexts such as studying or doing homework, because they appear to reduce distractions and thereby enable the listener to perform the task at hand. As they improve focused attention, monaural beats may be particularly useful for preventing distractions in listeners who suffer from attention deficit disorder (ADD) and therefore experience difficulty in completing the ordinary tasks.

Fifthly, to explore the use of monaural beats during practice and preparation leading up to an important performance.

Lastly, it would be interesting to investigate whether listening to monaural beats can elicit a state of Flow.

6.6 Conclusion

In conclusion, listening to monaural beats during a music practical examination can reduce music performance anxiety in a non-invasive, sub-conscious manner. This benefits the learner by allowing an experience of improved confidence, calm and focus. Monaural beats have also shown to be a useful method of dealing with music performance anxiety instead of resorting to

pharmaceutical drugs or other methods of coping, such as playing games for distraction. However, as to the best of my knowledge, this is the first empirical research study which explores the relationship between monaural beat technology and music performance anxiety and therefore the results are only applicable to the research participants involved in this research. Therefore, future research is needed to provide more empirical evidence before the results of this study can be generalised to other music performers.

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Addenda

(Addendum A: Interview Agenda)

The main research question for phase 1 is:
What factors induce Music performance anxiety amoung musicians?

The main research question can be subdivided into the following sub-questions:

1. What factors contribute to your Music performance anxiety when you are performing in public?

1b. Prompt question- Why do you get nervous when you perform in public?

2. How does Music performance anxiety effect your performance?

2b. Prompt question-What happens during your performance that does not normally happen?

3. Have you taken any precautions in the past to try and address your Music performance anxiety?

3b. Prompt question- Have you tried anything to avoid Music performance anxiety?

The main research question for phase 2 is:

Can Monaural beats decrease Music performance anxiety in musicians?

The main research question can be subdivided into the following sub-questions:

1. How would you describe your Music performance anxiety after this examination when compared with your first examination?

1b. Prompt question- Was there a difference relating to your levels of Music performance anxiety between the two examinations?

2. What noticeable changes did you experience after listening to Monaural beats?

2b. Prompt question- How do you think listeing to Monaural beats affected your examination?

~~3. What other context would you suggest using Monaural beats to reduce performance anxiety?~~

~~3b. Prompt question- What other situation do you experience performance anxiety in?~~

(Addendum B: Permission letter to Director of DR Wynne Music School)

PERMISSION LETTER TO DIRECTOR OF DR WYNNE MUSIC SCHOOL

20 Ilchester
2nd November 2018

REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT DR WYNNE MUSIC SCHOOL

To Mr Mike Skipper

I am currently completing my Master's Degree in Music at Rhodes University (RU) in Grahamstown, South Africa. The research I wish to conduct for my Master's full thesis requires me to observe and conduct interviews with four learners from the DR Wynne Music school during their Mid-term and End-of term practical examinations during Term 1. This research will be conducted under the supervision of my supervisor: Prof. Catherine Foxcroft.

This letter serves to seek formal consent to approach my music learners ~~(Noa Pitcher, Jacob Erasmus, Erin Powers and John Atkinson)~~ and the parents of the learners for this research. I attach a copy of my research proposal which includes copies of the invitation to participate and the assent forms to be used in the research process. I have received ethical clearance from the Rhodes University Higher Degrees Committee as well as the Rhodes University Ethical Standards Committee, on condition that I receive the school's permission. As part of this I undertake to ensure that all participants will be replaced with pseudonyms and that all the material I collect as part of the research will be accessible only to myself and my supervisor.

Upon completion of the study, I undertake to provide you, the teachers, and the learners of the DR Wynne Music School with access to the research findings. If you require any further information, please do not hesitate to contact me on my email address (J.Flanagan@dsgschool.com) or my supervisor (C.Foxcroft@ru.ac.za).

Thank you for your time and consideration in this matter.

Yours sincerely

Jayson Flanagan

(Addendum C: Request for permission to conduct research at DSG)

REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT THE DIOCESAN SCHOOL FOR GIRLS

To Mrs Shelley Frayne

I am currently completing my Master's Degree in Music at Rhodes University (RU) in Grahamstown, South Africa. The research I wish to conduct for my Master's full thesis requires me to observe and conduct interviews with three learners from St Andrews College during their Mid-term and End-of term practical examinations in the DR Wynne Music School. This research will be conducted under the supervision of my supervisor: Prof. Catherine Foxcroft.

This letter serves to seek formal consent to approach my music learners' ~~(Erin Powers and Robyn Tharrat)~~ and the parents of the learners' for this research. I attach a copy of my research proposal which includes copies of the invitation to participate and the assent forms to be used in the research process. I have received ethical clearance from the Rhodes University Higher Degrees Committee as well as the Rhodes University Ethical Standards Committee, on condition that I receive the school's permission. I have also received permission from Mike Skipper to conduct my research in the DR Wynne during the practical examinations of Term 1 2019. As part of this I undertake to ensure that all participants will be replaced with pseudonyms and that all the material I collect as part of the research will be accessible only to myself and my supervisors.

Upon completion of the study, I undertake to provide you, the teachers, and the learners of the DR Wynne Music School with access to the research findings. If you require any further information, please do not hesitate to contact me on my email address (J.Flanagan@dsgschool.com) or my supervisor (C.Foxcroft@ru.ac.za).

Thank you for your time and consideration in this matter.

Yours sincerely

Jayson Flanagan

(Addendum D: Request for permission to conduct research at SAC)

REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT ST ANDREW'S COLLEGE

To Mr Alan Thompson

I am currently completing my Master's Degree in Music at Rhodes University (RU) in Grahamstown, South Africa. The research I wish to conduct for my Master's full thesis requires me to observe and conduct interviews with three learners from St Andrews College during their Mid-term and End-of term practical examinations in the DR Wynne Music School. This research will be conducted under the supervision of my supervisor: Prof. Catherine Foxcroft.

This letter serves to seek formal consent to approach my music learners' (John Atkinson and Noa Pitcher) and the parents of the learners' for this research. I attach a copy of my research proposal which includes copies of the invitation to participate and the assent forms to be used in the research process. I have received ethical clearance from the Rhodes University Higher Degrees Committee as well as the Rhodes University Ethical Standards Committee, on condition that I receive the school's permission. I have also received permission from Mike Skipper to conduct my research in the DR Wynne during the practical examinations of Term 1 2019. As part of this I undertake to ensure that all participants will be replaced with pseudonyms and that all the material I collect as part of the research will be accessible only to myself and my supervisors.

Upon completion of the study, I undertake to provide you, the teachers, and the learners of the DR Wynne Music School with access to the research findings. If you require any further information, please do not hesitate to contact me on my email address (J.Flanagan@dsgschool.com) or my supervisor (C.Foxcroft@ru.ac.za).

Thank you for your time and consideration in this matter.

Yours sincerely

Jayson Flanagan

(Addendum E: Invitation to participants and parents or guardians)

INVITATION TO PARTICIPANTS and PARENTS OR GUARDIANS

(Participant's Name)

(DSG/SAC)

Grahamstown.

6139

Dear (XXX participant's name)

Re: Invitation to participate in a research study

You have volunteered to participate in a research study entitled "The Effects of Monaural Beat Technology on Learners' Experiences of Music performance anxiety". The aim of this research is to identify whether listening to Monaural beats can decrease levels of Music performance anxiety in musicians. Monaural beats manifest as a low pulsating tone which is the result of a

specific frequency omitted by stereo speakers. Your participation is important so as to allow for the necessary data to be collected that will allow for the research to be carried out

The research will be undertaken through your performance in two practical examinations. After each examination, you will be required to take part in an in-depth interview with Mr Flanagan. The collection of this data will require between 5-10 minutes of your time per each examination. All interviews will be audio recorded and will be kept on record. All research participants will remain anonymous and be assigned with a completely anonymised, non-identifiable title (research participant A, B, C etc.) throughout the research. Once the interviews have been transcribed, the initial data will be destroyed. Upon completion of my Master's Thesis, all information will be made available to all persons involved so they may be informed about the results of my thesis. I will further include my research in the public domain by participating in academic endeavours such as publication in academic journals, conference presentations and dissertations. You will remain anonymous for the duration of the research and during these endeavours after completion of the thesis.

If you agree to participate, I will explain in more detail what would be expected of you, and provide you with the information needed to understand the research at a later meeting. These guidelines would include potential benefits, and your rights as a participant. This research has received ethical clearance from the Rhodes University Higher Degrees Committee as well as the Rhodes University Ethical Standards Committee.

Participation in this research is voluntary and a positive response to this letter of invitation does not oblige you to take part in this research. To participate, you and your parents or guardian will be asked to sign a Consent form to confirm that you understand and agree to the conditions, prior to any examination and interview commencing. Please note that you have the right to withdraw at any given time during the study.

Thank you for your time and I hope that you will respond favourably to my request.

Yours sincerely,

Jayson Flanagan

(Addendum F: Letter of informed consent)

CONSENT FORM

Research Project Title:	"The Effects of Monaural Beat Technology on Learners' Experiences of Music performance anxiety"
Principal Investigator(s):	Jayson Flanagan

Participation Information
• I understand the purpose of the research study and my involvement in it • I understand the risks and benefits of participating in this research study • I understand that I may withdraw from the research study at any stage without any penalty • I understand that participation in this research study is done on a voluntary basis • I understand that while information gained during the study may be published, I will remain anonymous and no reference will be made to me by name or student number • I understand that XXX (other data collection requirements particular to this research, e.g. test results, personal information, video recording) may be used • I understand and agree that the interviews will be recorded electronically • I understand that I will be given the opportunity to read and comment on the transcribed interview notes • I confirm that I am not participating in this study for financial gain

Information Explanation
The above information was explained to me by: Jayson Flanagan
The above information was explained to me in English and I am in command of this language:

Voluntary Consent	
I, hereby voluntarily consent to participate in the above-mentioned research.	
Signature:	Date: / /

Investigator Declaration	
I, Jayson Flanagan, declare that I have explained all the participant information to the participant and have truthfully answered all questions ask me by the participant.	
Signature:	Date: / /