Designing Sound for Health and Wellbeing: Composing Electroacoustic Compositions for a Hospital Emergency Department

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School of Art.
RMIT University, Melbourne.
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Declaration

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; and; any editorial work, paid or unpaid, carried out by a third party is acknowledged; ethics procedures and guidelines have been followed.

David M. Brown
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I would like to acknowledge my supervisors at RMIT University, Dr Philip Samartzis for his keen ear, guidance and recording assistance both historically and for the duration of this project, and Dr Keely Macarow for her support and feedback during the compositional stages of the project. In addition Dr Macarow’s engagement with my written work and attention to detail was invaluable. I would also like to thank Dr Tracey Weiland at St Vincent’s Hospital for her assistance with data management and for easing my engagement with the Emergency Department. I am also grateful to Dr George Jelenik for his guidance in the Emergency Department and for his encouraging and evocative responses to my compositions. Thanks also to Tim Catlin for encouragement and technical assistance, Philip Brophy for fortifying my approach to writing, Adam and Vicki Simmons for emotional and practical support and John Billan for his generosity of time and excellent photographic contribution.

I am also indebted to my partner Leanne McLean for her continual loving support, which always ranges way beyond the call of duty.
Abstract.

*Designing Sound for Health and Wellbeing* is a three phase research project designed to firstly ascertain Emergency Department patients’ preferences for a range of purposely composed electroacoustic and soundscape compositions and secondly, to determine whether subsequent compositions developed from these preferred electroacoustic and soundscape components have the ability to effectively reduce emergency patient levels of stress and anxiety.

I was recruited for *Designing Sound for Health and Wellbeing* as a musician with a significant history in composition, improvisation, extended instrumental techniques and the use of recording technology. My role was to research, develop and produce electroacoustic compositions designed specifically for the project. The resultant sound compositions were delivered through headphones and iPods® to patients at the St Vincent’s Hospital Emergency Department. In addition the participating patients were provided with questionnaires employed to gauge their responses to the sound compositions.

For the *Designing Sound for Health and Wellbeing* project the research focused on a number of key areas where I investigated the sonic effects of hospital and Emergency Department architecture and infrastructure upon the working, clinical and listening environments of medical staff and patients. The research concentrated on the functions of the human brain in regard to music and, in particular how the brain deciphers sonic and musical information. I also investigated the use of extended instrumental techniques throughout various musical genres to determine how these techniques influenced the project historically and explicitly during the composing stages. The project also examined how literature, Sicilian culture and Asian instrumental sounds influenced the compositional contribution to the project.

The outcomes of *Designing Sound for Health and Wellbeing* illustrate the ability of electroacoustic compositions and soundscape compositions to significantly reduce the stress and anxiety levels of Emergency Department patients. In addition the composing process for this research project encouraged me to work outside my usual musical abilities and add new sonorities and instrumental techniques that broadened my musical
palette. These outcomes demonstrate that rigorously composed and refined musical and sound compositions can be used in public forums to encourage engagement between areas of community life not traditionally seen as intertwined.
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CHAPTER ONE: Introduction.

1.1 Preface.

Designing Sound for Health and Wellbeing is a three phase research project designed to firstly ascertain Emergency Department patients’ preferences for a range of purposely composed electroacoustic and soundscape compositions and secondly, to determine whether subsequent compositions developed from these preferred electroacoustic and soundscape components have the ability to effectively reduce emergency patient levels of stress and anxiety.

For the Designing Sound for Health and Wellbeing project, a team of researchers from the School of Art, RMIT University and St Vincent’s Hospital, Melbourne researched the effects of musical and soundscape compositions in the St Vincent’s Hospital Emergency Department (ED). The research team consisted of Professor Elizabeth Grierson, Professor of Art and Philosophy, School of Art, RMIT, Dr Keely Macarow, Acting Deputy Head, Research and Innovation, School of Art, RMIT, Dr Philip Samartzis, Lecturer in Sculpture, Sound and Spatial Practice, School of Art, RMIT, Professor George Jelenik, St Vincent’s Hospital, Dr Tracey Weiland, Research Development Officer, St Vincent’s Hospital and Dr Craig Winter, Director of St Vincent’s Hospital Emergency Department. During the early stages of the project the previous Director of the Emergency Department, Clinical Associate Professor Andrew Dent was also a member of the research team and played a driving role in instigating the project. The project was funded by an Australian Research Council Linkage grant and research was undertaken for the project between 2008 and 2010. As a composer for this interdisciplinary team, I composed electroacoustic compositions and my colleague Dr Philip Samartzis composed soundscape compositions based on environmental field recordings for Phase One of the project. These purposely-designed sound compositions were tested in Phase Two of the project on a cohort of patients in order to ascertain what genres and styles of compositions patients prefer. Phase Three of the project investigated what and how specific electroacoustic and soundscape compositions affect levels of stress, anxiety and satisfaction of Emergency Department patients.

All members of the research team contributed to publications, conference presentations and papers and in addition, attended listening sessions that resulted in critical
suggestions and feedback that strongly contributed to the shape and content of the electroacoustic and soundscape compositions. Dr Keely Macarow managed and contributed to the design and development of the methodology for the research project. Dr Philip Samartzis, as co-composer for the project, developed soundscape compositions based on field recordings and made ambient recordings of the Emergency Department environment. At St Vincent’s Hospital Professor George Jelinek, Dr Tracey Weiland and Dr Craig Winter liaised with hospital staff to keep them informed about the instigation and progress of the research study. Dr Weiland also created and managed the research database for the project.

As a musician with a significant history in composition, improvisation, extended instrumental techniques and the use of recording technology I was recruited to the Designing Sound for Health and Wellbeing project in order to bring my specific expertise to the compositional stages of the project. My role was to research, develop and produce electroacoustic compositions designed specifically for the project. It was also my role to deliver all the sound compositions through headphones and iPods® to patients at the St Vincent’s Hospital Emergency Department in both the Phase Two and Phase Three testing stages. In addition I provided the participating patients with questionnaires employed to gauge their responses to the sound compositions.

For Designing Sound for Health and Wellbeing my research focused on a number of key areas where I investigated the sonic effects of hospital and Emergency Department architecture and infrastructure upon the working, clinical and listening environments of medical staff and patients. In addition I examined how the circumstances in the Emergency Department would impact on my composing for the project. I researched the functions of the human brain in regard to music and, in particular how the brain deciphers sonic and musical information. This in turn led me to examine how the activities of my own brain interact with the music I produce live and in the recording studio. I researched the use of extended instrumental techniques in classical music, improvised music and electroacoustic composition to determine how these techniques by key composers and instrumentalists influenced me historically and explicitly during composing for Designing Sound for Health and Wellbeing. I also examined how literary cutups, Sicilian literature, the history and social structure of the Sicilian city of Palermo and the evocative qualities of Asian instrumental sounds influenced my compositional
contribution to the project. Across the duration of the project these interactive areas of research, influence and discovery became the focus of my investigation and mirrored my approach of gathering disparate influences for composing and improvising for the project. The diversity and uniqueness of my research focus mirrored the unique methodologies and location the study as a whole occupied, both as an arts based project using team decision making and as a clinical research project embedding music practice in an unfamiliar and ground breaking environment.

Since the project’s inception I have found that when I explained the premise and methodology of the project to fellow scholars, friends and acquaintances, people frequently assumed that Designing Sound for Health and Wellbeing was an art therapy/music therapy project. However, what separates the project from music therapy is the intrinsic methodology whereby music and sound were purposely developed for the project through a consultation process with the research team and through the patients preferences for a range of electroacoustic and soundscape compositions. I found it an unusual, unfamiliar and rewarding procedure as a composer to have experienced this type of focus group situation for the development of musical and sound compositions which ultimately broadened my understanding of compositional structures, components and their expanding functions.

1.2 Outline of the exegesis.

The title of this exegesis, Designing Sound for Health and Wellbeing: Composing Electroacoustic Compositions for a Hospital Emergency Department denotes my specific contribution to the project. However, references to Designing Sound for Health and Wellbeing throughout the exegesis will sometimes refer to the broader project in addition to my specific contribution.

After an introductory first chapter that outlines the background, methodology and aims of the project, Chapter Two explains key research texts that informed my approach to composing for Designing Sound for Health and Wellbeing. In particular this chapter describes the regions of the human brain involved in the analysis of sound and musical phenomena along with the adaptability of the brain’s regions to exchange roles in cases where unexpected neural stimuli affect brain function or when damage to the brain has
occurred. Chapter Two explains how research involving music and the brain focused my attention on my own brain activity while composing and recording during *Designing Sound for Health and Wellbeing*.

Chapter Two also examines how ambient noise in the Emergency Department affects staff and patients located in the Emergency Department and discusses parallels between these residual sounds in the hospital and extraneous sonic phenomena in urban locations where field recordings for the project were undertaken. In addition, Chapter Two discusses instances of the use of sounds and music to mask or distract from residual sounds and noises in urban environments and thus, whether the purposely composed electroacoustic and soundscape compositions would act similarly to distract emergency patients.

Chapter Three outlines my development of a range of extended instrumental techniques designed for acoustic stringed instruments and electric guitar and how they provided an initial basis for my electroacoustic compositions for *Designing Sound for Health and Wellbeing*. This chapter also outlines the historical development of extended instrumental techniques for both the classical and jazz musical genres along with the composers and musicians influential to this project who were responsible for their development and utilization. In addition, Chapter Three details how the appropriation of literature for the purpose of titling musical compositions mirrors my compositional methodology for *Designing Sound for Health and Wellbeing*. The chapter also describes the poignant influence of Sicily’s history, literature and social structure on atmospheric and structural elements of my electroacoustic compositions for the project.

Chapter Four describes my efforts to situate myself within a pre-existing research project and recounts in detail my development and refinement of 28 one-minute electroacoustic compositions during Phase One of the project. It details the integration into the one-minute compositions of my pre-existing compositional and performance techniques and how these were expanded, and augmented by new techniques through the guidance and reflections of the research team along with my own intuitive musical pursuits. Chapter Four also details the development of surround sound recordings of the sonic environment of the St Vincent’s Hospital Emergency Department and the specific influences these recordings brought upon my compositional process. It also gives a
rundown of verbal and written patient responses to the project compositions and elucidates the testing tools and procedures designed to gauge patient preferences for the one-minute electroacoustic and soundscape compositions.

Chapter Five discusses the third and final phase of the research and explains my development of the final twenty-minute composition. It describes my compositional processes in a step-by-step fashion along with Dr Samartzis’ development of the final twenty-minute soundscape composition. Chapter Five also relates details of the testing methods and tools employed for this phase including the impact for patients of medical procedures and other interruptions throughout the trial. My explanation of the methodology outlines the roles of the five patient groups incorporated into Phase Three testing. The impact of the aural environment on patient participation is also explained.

Chapter Six discusses the collation and interpretation of data obtained from Phase Three and the clinical outcomes this illustrates. The chapter also includes an in depth description of the influence of the city of Palermo (Sicily, Italy) and specific Sicilian literature upon the structural makeup of my twenty-minute electroacoustic composition. I examine how these societal and literary elements influenced the twenty-minute composition I composed for Designing Sound for Health and Wellbeing. I also explore how the works of key composers and the evocative nature of Asian instrumental phenomena shape the sonic atmosphere and the filmic and narrative structure of my composition.

Chapter Seven explains the conclusions of the research including the project’s significant influence upon my compositional and performance vocabularies and how this influence has expanded my musical frame of reference and solidified latent performance techniques.

This chapter also discusses the negative verbal responses I received from patients while they listened to the electroacoustic and soundscape compositions and how these responses differed from the clinical outcomes achieved. I also discuss how negative feedback affected me as a composer and strategies I developed to deal with patient criticism of the compositions along with how I redirected patient focus towards concentration and listening. Another outcome of Designing Sound for Health and
Wellbeing that I discuss in Chapter Seven is the discovery that rarified arts practices need not be confined to the expectations and venues they traditionally occupy.

Chapter Seven concludes by recommending some improvements to Emergency Department research procedures and also recommending ways in which the results and outcomes of Designing Sound for Health and Wellbeing could be further developed and implemented in the future.

1.3 Aims of the research.

The aim of this research project was to compose purposely-designed electroacoustic and soundscape compositions to reduce Emergency Department patients' levels of stress and anxiety and to affect the emotional wellbeing of participating patients in a positive way by relaxing them, distracting them from their ailments and reducing their anxiety levels. As a result, an ancillary aim of the project was to reduce medical and nursing staff workloads by decreasing patient agitation and unnecessary demands for ministration from staff by focusing patient attention on the musical and sound compositions. These purposely designed electroacoustic and soundscape compositions were arrived at and consolidated through a consultation process that incorporated ideas, contributions and reflection from all members of the research team.

A further aim was to investigate and test Emergency Department patients' preferences for a broad range of short (one-minute) compositions and to use these preferences to develop twenty-minute electroacoustic and soundscape compositions for Phase Three of the study. The stylistic inclinations and performance histories of the contributing composers were influential upon the compositional process and outcomes. Testing during Phase Two of the project tracked patient choices and preferences for specific musical styles and specific sounds.

In addition I aimed to determine whether short, one-minute compositional vignettes can be successfully redeveloped as the compositional building-blocks of twenty-minute electroacoustic and soundscape compositions and whether Emergency Department patients' self-rated levels of anxiety, stress and treatment satisfaction can be positively
influenced by exposure to purposely composed twenty-minute electroacoustic and soundscape compositions.

1.4 History of the research partnership.

Historically St Vincent’s Hospital, Melbourne has installed 2D and 3D artworks to enhance the personal experiences of patients, staff, carers and the friends and relatives of patients while they are engaged in activities within the hospital’s various departments. Artworks have been installed to enrich the work environment and improve the ambience of the Emergency Department, hospital corridors, clinical spaces, and waiting rooms. St Vincent’s Hospital’s engagement with art includes a collection of over 1000 visual art works that are on display and rotated within sites in St Vincent’s Hospital. The hospital operates across 17 sites in total including three primary campuses: St Vincent’s Hospital, Melbourne in Victoria Street, Fitzroy which provides a wide range of medical, surgical and outpatient services including the Emergency Department where this research took place, St George’s Health Service located in Kew where services include residential aged care, inpatient care and acute psychiatry and the Caritas Christi Hospice, also located in Kew, which is a palliative care facility. The other 14 campuses are spread over a wide area of Melbourne and include a range of specialized services including rehabilitation, mental health care and correctional health services.

Figures 1 and 2. Artworks displayed both internally and externally at the St Vincent’s Hospital, Fitzroy campus. Photos: John Billan, 8 November 2011.
In addition, the St Vincent’s Hospital Art Gallery is a fully functioning public art gallery located in the Daly Wing of the hospital’s primary Victoria Parade, Fitzroy campus. The gallery holds monthly exhibitions of 2D art that reflects the values of the hospital: compassion, justice, human dignity, excellence and unity. St Vincent’s Hospital also runs an artist in residence program based at their Caritas Christi campus in Kew where nine studios are available to practicing artists on a rent-free basis for a period of twelve months. At the completion of their tenure each participating artist contributes works of art into the St Vincent’s Hospital art collection in recognition of the opportunities provided through the utilization of the studio space.

The Designing Sound for Health and Wellbeing project gestated out of associations already developing between St Vincent’s Hospital and the School of Art at RMIT University. In 2006, Dr Andrew Dent, the Emergency Department Director at the time, along with Dr Tracey Weiland (St Vincent’s Hospital) and Dr Keely Macarow (RMIT University) collaborated on a video based project titled Keith in which Dr Macarow worked with her undergraduate students in the School of Art, RMIT University to produce a video that was subsequently made available to patients within Emergency Department cubicles. Patients watched the DVD via television screens purchased by the ED specifically for the Keith project. A strong impetus behind both the Keith project and the gestation of the Designing Sound for Heath and Wellbeing project was Dr
Dent’s forward-looking endeavours to develop more holistic approaches to healthcare within the Emergency Department.

In an endeavour to improve the hospital experiences of patients, carers, family members, medical and nursing staff a number of hospitals have integrated the use of visual and performing arts into their medical settings and research projects have been undertaken to measure the efficacy of these interventions.

“British hospitals such as the Chelsea and Westminster Hospital (London) and the Royal Brompton Hospital (London) have developed major international profiles for their extensive art collections, art commissions, and research of the relationship of art to human health and well-being. In Australia, Westmead Hospital (Sydney) has run extensive art prizes and art programmes, and commissioned new artworks to display throughout the Hospital since it opened in 1978 (Macarow. et al, 2011).

A research project undertaken at the Chelsea and Westminster Hospital (1999-2002) to test the effects and benefits of visual and performing arts in health care settings produced positive results for patients in a variety of clinical areas and for hospital staff, who concluded that,

The Integration of the Visual and Performing Arts in Healthcare, Induces significant differences in clinical outcomes; Reduces amount of drug consumption; Shortens length of stay in hospital; Improves patient management; Contributes towards increased job satisfaction; Enhances the quality of service. (Lelchuk Staricoff et al. 2004, p. 5).

The research team for Designing Sound for Health and Wellbeing aimed to gain similarly beneficial results for patients, their relatives, carers and hospital staff and the desired results were to be attained through the use of electroacoustic and soundscape compositions developed specifically for patients within an Emergency Department. The uniqueness of this research approach lay in both the fact that it entailed the specific development of the compositions and also the fact that an Emergency Department was
the focus of the research, a medical setting not included in the Chelsea and Westminster Hospital project.

In his book *Arts Development In Community Health; A Social Tonic* (2009), author and arts and health researcher, Mike White discusses the therapeutic benefits sought from artistic interventions in community health settings and explains the efficacy of these interventions in contributing to the evolution of a holistic and unified approach to arts programmes in both hospitals and other community arts settings. He introduces his book by stating,

In the last decade health has become a recurrent topic in discussion of the role of the arts in society, fuelled by a growing body of research into connections between culture and wellbeing (White, 2009, p. 1).

A three-year study by arts in health researcher Clive Parkinson entitled *Invest to save: Arts in Health – Reflections on a 3-year period of research and development in the North West of England*, concluded in 2007 and explored the impact of creativity, culture and the arts on public health. The study examined the effects of six contrasting arts intervention projects employing arts practices that included creative writing and visual arts. The resulting data gathered across all six projects clearly illustrates “that people engaging in the arts had significant reductions in symptoms of stress, depression and anxiety; moreover those meaningfully engaged in the arts had increased feelings of wellbeing” (Parkinson, 2009).

Since 2008 lighting and stage designer Efterpi Soropos has created immersive environments in her *Disambiguation Room* at Monash Medical Centre’s palliative care unit (Melbourne). This pain management room has variable architectural, visual and sonic elements which gravely ill patients can choose from to assist with relaxation and in reduction of their pain levels. Staff at the palliative care unit have reported that the room allows patients to feel a sense of safety and peace (Power, 2009).

Another study, by researcher Melissa Smith, entitled *The Effects of a Single Music Relaxation Session on State Anxiety Levels of Adults in a Workplace Environment* was conducted in Queensland and investigated the use of music relaxation sessions in
stressful working environments and found that improvised acoustic guitar music used for one-off, live listening sessions in a busy telephone call centre had an immediate effect by substantially reducing workers’ anxiety levels (Smith, 2008). These examples of recent arts interventions in health and workplace settings illustrate some of the positive therapeutic benefits that are attainable through the integration of arts practices in health and workplace environments.

In *Arts Development In Community Health; A Social Tonic*, Mike White also refers to the therapeutic benefits of arts programmes in a variety of health settings including hospitals and other community environments. He states that,

> Whether the work is located in a hospital entrance, primary care clinic, hospice or sink estate, there is frequently a common purpose to enhance the physical and social environment with arts that provide positive messaging in support of health improvement. A common concern of arts programmes in both hospitals and community settings is to help provide orientation and connection through a supportive sense of place. (White. 2009, p. 75).

In the context of *Designing Sound for Heath and Wellbeing* I hoped that listening to the electroacoustic and soundscape compositions would assist patients to feel secure and less anxious within the environment.

Although the research undertaken for *Designing Sound for Heath and Wellbeing* was designed to reduce levels of stress and anxiety in Emergency Department patients, as the project moved forward, my focus progressively shifted to also provide a distraction for patients from the volatility, noise and overwhelming atmosphere of the Emergency Department while also developing and enhancing, for participating patients, a comforting sense of belonging, involvement and engagement with the Emergency Department while they were undergoing consultation and treatment. As far as the research team were aware from the initiation of the project through to the time of writing this was something that had not been undertaken before on a significant scale in an Emergency Department. However, the study *Evaluation of a systematic development process: Relaxing music for the emergency department* (2009) was undertaken by music therapy researchers Alison Short and Nicole Ahern in the Emergency Department.
of a busy Sydney hospital and offered a small cohort of fifteen patients the opportunity to select from four genres of prerecorded music. The music, which was chosen by the researchers with the aim of relaxing Emergency Department patients, fell within the genres classical, ambient, world and modern music (pop). No compositions were developed specifically for inclusion in the study. For this study patients listened through headphones with audio playback generated from mp3 players. This method of audio delivery was similar to that used for Designing Sound for Health and Wellbeing but the methodology of employing pre-existing music rather than purposely designed compositions was completely different, as was the scale of the study. Although patients trialled during Short’s study reported that all four genres of music made them “feel better” (Short. et al, 2009, p.19) therapeutic outcomes of the study are no more expansive than this brief statement. One outcome of the study that bears direct relevance to my research, due to the similar setting, was the discovery that the hectic and noisy Emergency Department environment “did not preclude using music effectively for stress reduction” (Short. et al, 2009, p.19). This particular outcome appeared to be an ideal precursor to the reduction of patient anxiety, which was a desired outcome of Designing Sound for Health and Wellbeing.
CHAPTER TWO: INFLUENCES AND CONTEXT.
2.1 Music and the brain.

In the early stages of the *Designing Sound for Health and Wellbeing* project I was interested in how listeners to all types of music absorb and perceive sound, and music in general.

I questioned how, as an improviser and composer, my own thought processes would affect my responses and input into an empirical, clinical research project. In conjunction with these questions I embraced the challenge of discovering how conventional ideas of harmony and rhythm would be imposed upon my compositions for *Designing Sound for Health and Wellbeing*. I questioned how these impositions would impact long-term on my continuing compositional and performance sensibilities and vocabularies, and how I would balance these new musical phenomena with my current techniques of instrumental performance and composition.

As an improvising musician and electroacoustic composer I approached the question of how musical activity is absorbed and processed by the human brain from a scientifically naïve point of view, with little knowledge of research in this area of study. The functioning of the brain in general, and in regard to music in particular, had never been a specific fascination of mine because my intuitive inclinations as an exploratory musician were in deference to an analytical, highly formal and theoretical approach to music.

However, the human brain’s functioning, in regard to music, is intriguingly outlined in the book *This Is Your Brain On Music, The Science Of A Human Obsession* (2006) by musician, sound engineer and neuroscientist Daniel J. Levitin. His background as a rock musician and recording engineer across multiple musical genres brought an openness to and acceptance of rock, exploratory and adventurous music and its role in his neuroscientific study to discover how music is processed and understood by the brain. In *This Is Your Brain On Music* Levitin explains that:

Musical activity involves nearly every region of the brain that we know about, and nearly every neural subsystem. Different aspects of the music are handled by different neural regions – the brain uses functional segregation for music
processing, and employs a system of feature detectors whose job it is to analyse specific aspects of the musical signal, such as pitch, tempo, timbre, and so on (Levitin, 2006, pp. 85-86).

Levitin’s enlightening study of contrasting components of sound and music and their detection in different regions of the brain led me to reflect upon my own musical predispositions and inclinations, particularly my propensity for atonality and textural density. As a result I questioned whether my musical predispositions could be the result of particular regions of my brain being more predominately involved in musical analysis than other regions of my brain and whether these predominant inclinations towards music could vary for a range of listeners to music and sound dependent on their own neurological tendencies.

Levitin describes how the analysis of music progresses from one region of the brain to another and explains the subtleties of how different regions of the brain deal with different musical phenomena:

Listening to music starts with subcortical (below the cortex) structures—the cochlear nuclei, the brain stem, the cerebellum—and then moves up to auditory cortices on both sides of the brain. Trying to follow along with music that you know—or at least music in a style you’re familiar with, such as baroque or blues—recruits additional regions of the brain, including the hippocampus—our memory center—and subsections of the frontal lobe, particularly a region called inferior frontal cortex.

At a deeper level, the emotions we experience in response to music involve structures deep in the primitive, reptilian regions of the cerebellar vermis, and the amygdala—the heart of emotional processing in the cortex (Levitin, 2006, pp. 86-87).

Levitin also relates that a newly discovered property of the human brains functioning, *neuroplasticity*, suggests that the processing centres of the brain have the flexibility to move functions to other regions of the brain if trauma or brain damage is experienced. Levitin states that this is particularly true of the different regions of the brain involved in musical analysis.
The functions of the brain that underpin the analysis of music and particularly the flexibility and regional interchange of functions that Levitin describes are further chronicled and elucidated throughout the book *Musicophilia, Tales of Music and the Brain* (2007) by neurophysician and author Oliver Sacks. This is a book of anecdotal stories and case studies describing the power of music relayed through the experiences of patients and musicians that focus on anomalous and extraordinary musical occurrences or episodes that the subjects have undergone. Sacks relates examples of these extraordinary musical phenomena which include the case of a surgeon, with little previous musical experience, who after being struck by lightning develops an obsession with the piano music of Chopin, to which he listened in an all-consuming manner. As a result of this, he purchased the sheet-music versions of Chopin and taught himself to play the pieces (Sacks, 2007, pp. 3-8). In another example, a musicologist had developed amnesia so severe that his memory span stretched only a few seconds, making every moment a new awakening. Despite this he could perform keyboard pieces that were favourites from his past that he could not recall any knowledge of either before playing them nor immediately afterward (Sacks, 2007, pp. 187-198). These stories and case studies are used by Sacks to explain the complexities of function and interaction between areas of the brain where music is processed.

A number of these anecdotes chronicle cases of patients who suffer from musical hallucinations. One in particular describes the case of a young boy who is unable to turn his musical hallucinations down, or off. These hallucinations entailed music playing in his head incessantly from morning to night, becoming louder and distorted if he was stressed. An extraordinary aside to this patient’s musical problem is the highly focused ability of musical recall he possessed. Sacks conveys the child’s mother’s update on his health where she describes how when the child:

…hears music, his brain automatically records it and he can recall or play a piece even years later as if he just heard it. He loves to compose his own music, and he has perfect pitch (Sacks, 2007, p. 69).

While researching and considering normal and extraordinary musical phenomena and experiences I began to dissect and reflect upon my own procedures and inclinations
while performing and composing music. I questioned whether the functions of the brain become something I am cognizant of while engaged in compositional procedures and whether I am aware of the progression of musical phenomena from reception at the ears, through neural regions and passages and toward final analysis and cognition while I’m engaged in the act of improvisation. I also questioned whether, as an experienced musician and composer entrenched in the mid-stages of my career, I would have the ability to absorb and integrate unfamiliar musical styles and techniques that may be required for the Designing Sound for Health and Wellbeing research project. I feared the ability to absorb unfamiliar techniques might be compromised by my lack of youthful openness. Thus, I questioned whether I would be habitually reliant on musical techniques that were second nature and lay in my own musical comfort zone. The youthful ability to easily absorb new musical phenomena, which I thought I might lack, is described by Daniel Levitin:

Our brains are maximally receptive – almost spongelike – when we're young, hungrily soaking up any and all sounds they can and incorporating them into the very structure of out neural wiring. As we age, these neural circuits are somewhat less pliable, and so it becomes more difficult to incorporate, at a deep neural level, new musical systems, or even new linguistic systems (Levitin, 2006, p. 41).

I do not evaluate the minutiae of my brain function occurring while I play or compose music. The functioning of the brain while engaged in real-time, musical activity is intriguing, but is not my intellectual focus while involved in musical activity. Instead, my core, essential approach to performing and composing follows an intuitive path where a mixture of chance processes, organic responses and an innate sense of what is the correct musical procedure in any given instance, all coalesce. In essence, I am an improviser who thinks laterally while performing and who, when composing, organizes fragments and blocks of sound along with musical elements through the use of intuitive processes and responses. In the final analysis, while I’m actually involved in performance and compositional procedures, I’m not simultaneously engaged in reflection upon what is happening with activity in my brain. A forthright illustration of musicians lack of awareness of their real-time musical/brain interactions during musical activities is the otherworldly state they often pursue, and sometimes arrive at, when
performing where they have the impression that the musical outcomes are somehow being channeled through them as if these outcomes are out of their control. In order to illustrate this as a known and semi-common phenomena among performing musicians and composers, Daniel Levitin explains in his book, *The World In Six Songs; How the Musical Brain Created Human Nature* (2008):

> This ineffable power of music shows up not just in listeners but also in creators of music. The great songwriters and improvisers talk about not so much creating music, but having it written *through* them, as though the music comes from outside their bodies and their heads, and they are merely the conduit for it. Many great musicians, particularly in Third World cultures, reach a state of total ecstasy, a trance state, while playing music, in which their minds and bodies seem to be possessed by otherworldly forces (Levitin, 2008, p. 93).

This *otherworldly* state of experiencing musical phenomena is something I personally achieve on occasion during my own performances. In a way this *otherworldly* state separates me from the immediate circumstances of the performance environment through the feeling of exhilaration induced by the act of channeling musical phenomena.

While the research focused on music and the brain didn’t bear a direct relevance to my compositional methodologies or the musical components I composed for *Designing Sound For Health and Wellbeing* this research did assist me to reflect upon and understand the role of my cerebral impulses as a performer along with my desire to attain an ecstatic, trance-like state as a performer and recording artist. As a result, over the course of the research project it became apparent that the fundamental qualities of the compositional components and methodology of the project were embedded within a music and sound art trajectory and obeyed a more trial and error approach than that of an empirical, clinical research project. This is reflected through the consultation process I engaged in with my research partners to arrive at compositional decisions and also through my ability to obey my own intuitive impulses and decision-making. These impulses, decisions and realisations about brain activity helped to shape my compositional forms and the sonic makeup of my electroacoustic compositions for *Designing Sound For Health and Wellbeing*.
2.2 Music and environments.

For this project it was important to consider what impact listening to electroacoustic music and soundscapes within the St Vincent’s Emergency Department (a clinical environment) would have upon the listener’s perceptions of the compositions I created. How much would residual noise (the sounds of Emergency Department machinery and infrastructure along with activities and sounds generated by all of it’s occupants) distract patients from listening to the project compositions? Would interruptions for consultation, diagnosis and treatment have a detrimental effect on the patient’s ability to engage with the compositions? And would the compositions effectiveness in reducing patient stress and anxiety be compromised by sonic phenomena, interruptions and activities that distract? These questions were not answered decisively throughout either stage (Phase Two or Phase Three) of the study but I did observe a wide range of responses from emergency patients while they listened to the compositions during the trial. The responses ranged from concentrated engagement through to distraction and severe disengagement with the compositions and seemed to be wholly dependent on individual patients’ sensibilities, personalities, listening skills, level of discomfort and commitment to listening.

My interest in the social uses of music and sound were triggered by my initial field visits to the Emergency Department at St Vincent’s Hospital and by field trips with my research colleague Dr Philip Samartzis to capture urban recordings to be used as source material for his soundscape compositions. The field trips took place in the early stages (Phase One) of Designing Sound for Health and Wellbeing.

In the case of the Emergency environment, what impressed me so strongly was the wall of environmental noises that staff and patients endured on a continual basis. The noises varied in intensity in different regions of the Emergency Department but there were some constants predominately tones created by the air-conditioning systems, medical machinery alarms, beeps and noises and intermittent public address announcements piped throughout the Emergency Department.

In the case of the urban field recording experiences, the aural environment of the shopping mall at Melbourne Central which is tiered over several stories and open and
cacophonous illustrated for me how all the incidental sounds and noises present were amalgamated by the architectural space into a shifting amorphous sound world. The shopping mall is enveloped by a multitude of pedestrian and conversational sounds as well as those of amplified sales pitches (a piano salesperson demonstrating his electric instruments in the open on one level), and has incidental piped music plus intermittent clock chimes and tunes. In both the hospital and urban environments such the shopping mall, coffee shops, pedestrian laneways and streetscapes I engaged in concentrated listening to examine the density and volume of the extraneous aural phenomena each produced. In the emergency department and the urban environments where Dr Samartzis and I recorded I engaged in concentrated listening by either sitting or standing in situ and focusing my listening on the aural world that encapsulated me. This concentrated listening assisted me to understand how noise, music and cacophonous sound interact at differing levels in divergent environments and as a result informed my approach to composing for the sonic environment of the St Vincent’s Hospital Emergency Department. In addition, I subsequently listened to the recordings Dr Samartzis and I had made concentrating my listening on the extraneous sonic elements the recordings had captured. It was evident that within the Emergency Department environment there were no overtly musical aspects to the aural onslaught, whereas within the shopping mall environment and other similar urban areas where Dr Samartzis and I had engaged in recording (a coffee shop in a busy laneway, a tram and pedestrian laden street mall) the sonic wash featured a heavy component of conspicuously musical elements (piped pop music, radio transmissions and musicians busking) interspersed with the regular urban sounds of conversation, vehicular and pedestrian traffic, crockery, cutlery and coffee machines. The lack of musical elements within the Emergency Department sonic environment struck me as at odds with the urban soundscapes I had experienced and as a perfect environment into which I could inject the musical aspects of my purpose composed electroacoustic compositions.

The compositions I was to compose for Designing Sound for Health and Wellbeing were composed with the specific objective to reduce levels of Emergency patient anxiety and stress and for the specific environment of the Emergency Department. As a result, Muzak® and it’s use in specific environments such as shopping malls, department stores, office and industrial environments informed my electroacoustic compositions for the project. Author, film critic and music analyst Joseph Lanza's, Elevator Music, A
Surreal History of Muzak, Easy-Listening, and Other Moodsong® (2004) chronicles the origins, history and spread of Muzak and its descendant’s tentacles which reach into contemporary uses of music to control and manipulate public behavior in urban and working spaces. One example of this mode of manipulation that Lanza cites is the early introduction of Muzak which was used to quell the fears of the first travelers in multi-storey elevators. He states:

Next to rollercoasters and airplanes, elevators were perceived by many as floating domiciles of disequilibrium, inciting thoughts of motion sickness and snapping cables. Building proprietors and the rapidly growing lift industry dedicated part of their public relations campaign to allaying elevator jockey fears. Riders felt a little more assured when uniformed attendants were on hand to greet and guide them through their uncertain vertical passage. But following the first appearance of Otis’ electric elevator in 1889, the flesh-and-blood attendant was eventually superseded by soft, comforting, angelic music luring and lulling the squeamish on board. By injecting ether and eliminating dross, elevator music became a style whose notes and harmonies sounded as if they were whipped up with air (Lanza, 2004, p.39).

Lanza’s research into the very specific use of music to influence the moods and productiveness of workers and the public informed my approach to composing for Designing Sound for Health and Wellbeing. It led me to consider the extent to which my compositions would mask and/or alleviate the ever-present, overwhelming aural environment that Emergency patients are continually subject to. I anticipated that the electroacoustic compositions introduced into the Emergency Department environment might play a similar role to the musical components I had heard in urban environments which blanketed and distracted from other environmental sounds. I expected that to some degree my electroacoustic compositions and Dr Samartzis’ soundscape compositions would be able to distract patients from the all encompassing effects of Emergency Department environmental noise and distract them from the symptoms of their ailments and the stresses of being situated in an Emergency Department. In Elevator Music, Lanza quotes evidence of some early attempts to use sound and music
to interfere with environmental sounds, one of these being composer Karlheinz Stockhausen’s (Germany)\(^1\) suggestion to use:

\[
\text{....computer programmed "sound swallowers" to neutralize every unwanted noise in a public place with its opposite vibration (Lanza, 2004, p.12).}
\]

Elsewhere in *Elevator Music*, while explaining early uses of music and sound as mood regulators Lanza mentions several instances of the practice. For example:

Edison had initiated several background music “mood tests” in the early 1900s. Aided by a “Dr. Bingham,” he compiled charts depicting the mood changes of people as they listened to his phonographs. In 1915, Edison used a programmed selection of phonographic music for factories to determine the extent to which it would mask hazardous drones and boost morale. But the infant loudspeaker and transmission technology were still too weak. There were also cigar factories in the United States and Cuba that hired “readers” to recite the contents of books and newspapers aloud while workers rolled tobacco. Sometimes records or radios were used in their place (Lanza, 2004, p.13).

Mood regulators may appear like a severe descriptive title for musical compositions designed to be used within an Emergency Department. However, in essence the electroacoustic compositions were designed through a consultative process with the research team to perform a similar task to Edison’s morale boosters to both reduce patient anxiety levels and act as an aural distracter from Emergency Department noise and activity.

### 2.3 The effect of constituent musical elements on composition.

The research conducted to inform my early compositional forays for the project, led me to consider the listening procedures, musical responses and methods of compositional construction that I undertake while improvising, performing and composing music. There

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\(^1\) Stockhausen was born in 1928 in Mödrath near Cologne he died in 2007. He composed over 300 works covering a broad stylistic spectrum. Early in his career he studied phonetics and acoustics and evolved the theory of ‘parameters’ or dimensions of sound. He is seen as one of the forefathers of electronic music (Kennedy, 1994: pp.845-846).
is one constant factor throughout all these facets of my musical practice and outputs. This unchanging element was the fact that all my performance and compositional processes and vocabularies utilized an element of play as a means of arriving at final musical and compositional forms. This playful element involves experimentation with sonic materials and processes that, through long-term employment, are no longer experimentation or trials but are now harnessed as legitimate and integral compositional tools. The tools include the intentional juggling of random and unusual sonic elements in an effort to determine what odd juxtapositions these sonic allegiances can produce. This process has become a compositional raison d'être for me, and has a regularly high precedence within my compositional vocabularies. I questioned how I could retain the importance and integrity of these compositional processes and whether they could be melded with the requirements of the research project. I also considered how my music may affect both the listener and myself during performance and at the moment of listening. It is not specifically the effects of the melodic contents and tonalities of my musical outputs that I am concerned with, but rather, the manner in which the sonic timbres and textures penetrate the listener’s sensibilities. My concern is the effect and resonance of, what I term, an atmosphere or feeling generated by or inherent in the juxtapositions of my sonic elements, whether they be conventionally harmonious and melodic musical elements or textural and abstract sounds. Interestingly, my personal penchant when recording and performing is for employing unconventional, extended instrumental techniques along with the utilization of non-musical utensils to conjure sonic phenomena from stringed instruments.\(^2\) There is an inherent beauty in non-tonal sounds, which renders them naturally evocative. This evocative character is obtained through their striking difference from conventional, tonal, instrumental sounds: they grab the listener’s attention by complimenting the tonal sounds they accompany. Simultaneously the tonal and non-tonal sounds focus scrutiny on each other’s characteristics, timbres and textures. The resultant interplay and exchange of effect in fact renders the non-tonal sounds highly musical even if they do not inherently hold this quality all along. Two definitive examples of the use of non-tonal, unconventional instrumental sounds embedded in compositions that also utilize conventional musical instrumentation are composer Erik Satie’s (France, 1866-1925) score for the ballet *Parade* (Satie, 1967) premiered in 1917 in Paris, where Satie employed typewriters,

\(^2\) My development of these instrumental and compositional techniques is explained fully in Chapter 3.
revolvers, sirens and lottery wheels to provide untuned percussive accompaniment for conventional orchestral instrumentation. The typewriters in particular provided textural and percussive accompaniment to the melodic, string-driven orchestral passages within the ballet score. The second example is composer Edgard Varèse’s (France, 1883-1965) use of sirens to provide continuously sweeping tonal glissandos within his large scale (approximately 113 instrumentalists plus a huge battery of percussion) orchestral work *Amériques* (Varèse, 1998) that is a musical interpretation of the urban landscape of early 20th Century New York. Varèse’s wife, Louise Varèse in her biography of her composer husband quotes Edgard Varèse:

> I began to resent the arbitrary limitations of the tempered system, especially after reading at about the same time, Helmholtz’s description of his experiments with sirens in his *Physiology of Sound*. Wanting to experiment myself, I went to the *Marché aux Puces*, where for next to nothing you could find just about anything, and picked up two small ones. With these I made my first experiments in what I later called spatial music. The beautiful parabolas and hyperbolas of sound the sirens gave me and the haunting quality of the tones made me aware for the first time of the wealth of music outside the narrow limits imposed by keyboard instruments (Varèse, 1972, p. 42).

This quote illustrates Varèse’s frustrations with conventional tonality and his search for alternatives where he discovers the evocative abilities of sirens to awaken new musical phenomena.

Joseph Lanza discusses another illustration of the ability of dissonance and non-conventional tonalities to compliment the effects of conventional instrumentation and generate interest between these two sound worlds when he cites the composer of exotica and easy-listening music, Martin Denny (US, 1911-2005):

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3 A glissando is the passage through the span from one tonal point to another. Instead of representing the fixed tones and semitones of a scale the tones of a glissando are infinite in number (Kennedy, 1994, P. 346).

4 Both exotica and easy-listening are interchangeable monikers for the musical genre ‘Exotica’ named after the 1957 Martin Denny album of the same name. Most exotica attempts to amalgamate the musical culture of Polynesia and South America with rhythmic jazz elements. For more information on the history of exotica see: [http://oldies.about.com/od/easylistening/g/exotica.htm](http://oldies.about.com/od/easylistening/g/exotica.htm) accessed 7 April 2012.
Associates who worked with airlines would bring Denny strange instruments from around the world. He believed that all sounds represented colors and once reconstructed a xylophone for a perfect glissando. He once stated that dissonance, not harmony, makes the most interesting music. Just listen to his koto version of “My Funny Valentine” to hear how he loved sounds grating against each other and thrown into improbable contexts (Lanza, 2004, p. 123).

The playful use in my musical practice of unconventional instrumentation, atonality and dissonance led me to a realisation that my own performances and compositions communicate an evocative atmosphere through source sounds whose instrumental basis is ambiguous and mysterious. During the compositional process for Designing Sound for Health and Wellbeing my use of unusual instrumentation led me to believe that the range of responses I would gather from listeners (both my research partners and Emergency patients) would differ widely. I came to this conclusion due to the listener’s varied musical backgrounds and experiences. This range of interpretations was later borne out by the variation in responses to the electroacoustic compositions I composed for the Designing Sound for Health and Wellbeing project. In the case of my research partners, some found both my one-minute and twenty-minute compositions highly evocative of imaginary scenarios whereas others had a more deadpan response where the purity of the listening experience and intrinsic sonic phenomena was what impressed. The Emergency patient’s verbal and written responses during both phases of testing within the Emergency Department also consolidated the breadth of responses to my compositions across all phases of the study. In some cases, patient reactions conveyed a complete dissatisfaction with my electroacoustic compositions while others genuinely embraced them and were immersed in them emotionally. These broad differences in responses are chronicled in more detail in chapters four and five.
3.1 Development of my Instrumental and Compositional Techniques.

Since 1998 I have developed a broad range of extended instrumental techniques to enhance my approach to guitar playing in performance, compositional and recording situations. These developments have led to the serial abandonment of any references to conventional guitar techniques and follow two concurrent streams. One methodology I have pursued is applied to electric guitar, which is processed with stomp boxes and other electronic manipulation. The second methodology I have developed and pursued, again for performance, compositional and recording situations, is applied to the semi-acoustic guitar and other acoustic stringed instruments: in particular the fretless tenor banjo, eukolin (a mail-order folk/zither instrument designed to be bowed or plucked), bandura (a Ukrainian zither-like instrument), ukulele and acoustic guitar.

Figure 4 illustrates the Ukrainian Bandura a member of the zither family. The Bandura is an example of the acoustic stringed instruments used for the Designing Sound for Health and Wellbeing electroacoustic compositions. Photo: David Brown, 15 April 2012.

5 Stomp boxes are electronic effects pedals primarily developed for processing electric guitar signals in various ways. For instance, fuzz and overdrive pedals distort the guitar's output signals while wah-wah and equalization pedals filter out or emphasize chosen frequency bands of the guitar's output signals altering their timbre.

6 Zithers are a family of stringed instruments with histories in America, Europe and elsewhere. Members of the zither family include: fretless zither, concert zither (with fretboard added), bowed zither, bowed psaltery, autoharp and eukolin. For more information, see the fretless zithers website at: http://www.fretlesszithers.com/index.html accessed 14 April 2012.
My development of these extended instrumental techniques for the electric guitar has centred on the use of the guitar strings and pickups\(^7\) as tone generators, rather than as producers of melodies or chordal structures. These tones are then processed with an array of electronic effects pedals, colloquially known as stomp boxes. Sometimes the action of fingerling strings upon the fretboard is utilized to create allusions to melodic content. However, generally what develops are textural beds which pulse, ebb, flow, and reference rock music through distortion and volume. However these textural beds also reference electroacoustic composition and concrete music through the use of silences, space, shapes, texture, stereophonic travel and other formal concerns. My primary objective in composing and performing is the transformation of sounds derived from electric guitar and electronic processing devices into far removed, unrecognisable, new aural, sonic, textural information. Here my musical research and practice could be perceived as a sonic Frankenstein, which resembles a runaway train barely clinging to the rails and where the resultant sounds and energies are scarcely constrained.

\(^7\) Guitar pickups are the onboard microphones situated underneath the guitar strings that electronically transfer the tones generated by the guitar strings for amplification.
Figure 6 illustrates a range of stomp boxes used to transform the sounds derived from the electric guitar. Photo: David Brown, 27 February 2005, Horti Hall, Melbourne.

My development of techniques for the semi-acoustic guitar and other acoustic stringed instruments germinated from my initial fascination with the peripheral sounds that are a by-product of playing the electric guitar *unplugged*. For instance, sounds like the slapping and hammering of my fingers and the strings on a fretboard and the overtones and other harmonic information produced either side of my finger’s actions upon the strings and resonant body of the guitar were instrumental in leading to the development and refinement of more sophisticated extended instrumental techniques. At *acoustic* volume these peripheral sounds are able to augment, compete and merge with the tonalities conventional fretting and plucking produce. My early fascination with *extra* sonic and tonal information flowed into a process of experimentation where I would alter the intonation of the strings by attaching objects to them and also by placing utensils onto the body of the semi-acoustic guitar and through the strings, essentially preparing the instrument to produce an array of unconventional sounds, both tonal, textural and percussive. Because the semi-acoustic guitar is in essence a large, hollow, resonant body\(^8\), the resonance and inherent reverberant qualities of the guitar can be used to further enhance and multiply peripheral sonic phenomena. To bring these extra phenomena to the forefront during live performance and recording I have placed contact

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\(^8\) A semi-acoustic guitar is a type of electric guitar with both a hollow sound box and one or more electronic pickups (microphones).
microphones on the body and headstock⁹ of the instrument in conjunction with utilizing the semi-acoustic guitar’s onboard electric pickups. These contact microphones amplify the extraneous sounds that are generated specifically from the guitar body and headstock.

Figures 7 and 8 illustrate a range of utensils used to extract and coax unconventional sounds from the strings, headstock and body of the semi-acoustic guitar and other acoustic instruments. Photos: David Brown, 21 November 2008, and 15 November 2008.

The central focus of these and other personally developed techniques (percussive, textural and drone-like) has led to the establishment of a musical vocabulary of tiny acoustic sounds that are enlarged outside their normal context and volume. As such, other surfaces of the guitar (the headstock, neck and hollow body), have equaled and to some degree outweighed the importance of the strings as sonic generators.

Extended instrumental techniques have developed and evolved through their use in contemporary Classical music along with Jazz and Improvisation. Composers who have utilized extended instrumental techniques within their compositions include: John Cage (US, 1912-1992), George Crumb (US, b.1929), Iannis Xenakis (Greece, 1922-2001), Mauricio Kagel, (Argentina 1931-2008), Helmet Lachenmann (Germany, b. 1935), Luigi Nono, (Italy, 1924-1990) and Edgard Varèse, (France, 1883-1965). Xenakis worked as a mathematician and in the field of architecture as well as composition. He developed the theory of stochastic composition where mathematics, the laws of probability and aleatoric processes contributed to his compositional process. Lachenmann is particularly notorious for his use of conventional orchestral instrumentation to produce

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⁹ A guitar headstock is at the opposite end of the neck to the guitar body and its purpose is to hold the strings, which are generally tuned from geared machine heads, adhered to the headstock.
unfamiliar tones and timbres, largely abandoning the paradigms that had previously dictated a romantic and lyrical output from the instruments of the nineteenth century orchestra. In explaining Lachenmann’s outsider status as a composer, music scholar Jürg Stenzl explains:

The resistance to Lachenmann’s music is understandable. Even listeners well versed in the music of the post-1950 avant-garde and the new sonic universes of electronic music considered his works a wholly alien world that did away with “normal” tones and even half-familiar progressions. Instead, Lachenmann made conventional instruments emit noises that seemed to offer nothing to cling to (Lachenmann, 2002).\(^\text{10}\)

In addition to the Classical composers listed above, improvising musicians who pioneered the use of extended instrumental techniques include saxophonists Anthony Braxton (US, b. 1945), Steve Lacy (US, 1935-2004), Evan Parker (UK, b. 1944), guitarist Keith Rowe, (UK, b. 1940), and percussionist Paul Lovens (Germany, b. 1949). Braxton is a saxophonist who bridges the gap between Jazz and composition, especially through his use of graphics-based scores that he brings to both small and large ensembles. A personal quote from his website illustrates his immersion in multiple genres:

I know I’m an African-American, and I know I play the saxophone, but I’m not a jazz musician. I’m not a classical musician, either. My music is like my life: It’s in between these areas (Braxton, 2008).\(^\text{11}\)

Keith Rowe is a guitarist who was a founding member of the English improvising group AMM. After imitating American Jazz guitarists he famously turned his guitar horizontal (on a tabletop) and abandoned tuning the guitar while allowing it to fall progressively further and further out of tune. He applied radios, screwdrivers, electric drills and other utensils to the guitar strings and pickups in order to develop a personal sonic vocabulary

\(^{10}\) This quote has been cited from CD booklet liner notes without page numbers. Throughout this exegesis there are some citations from CD liner notes and websites that do not have page numbers. Please check the bibliography for bibliographic details of these citations where page numbers do not appear.

\(^{11}\) For more information about Braxton’s broad range of musical activities see his biographical details at: [http://tricentricfoundation.org/foundation/bio](http://tricentricfoundation.org/foundation/bio), accessed 13/11/2011.
from his guitar (Warburton, 2001).\textsuperscript{12}

As a result, Rowe’s guitar playing has a lightly industrial, almost mechanical quality with repetitive motives that imitate machinery and produce electrical hums and tones. While, simultaneously it seems that there is something \textit{not quite right} about the machines being mimicked, they may be running backwards or in a state of disrepair.

Of particular influence upon me, was the multi-instrumentalist and composer Fred Frith (UK, b.1949) whose use of extended instrumental techniques for the semi-acoustic guitar created listening and performance epiphanies that triggered the groundwork for my own development of unconventional instrumental techniques. Improvising musicians who have subsequently adopted and further refined extended instrumental techniques include trombonist Johannes Bauer (Germany, b.1954), percussionist Sean Baxter (Australia, b.1970), saxophonist Jim Denley (Australia, b.1957), trumpeter Axel Dörner (Germany, b.1964), bassist Barry Guy (UK, b.1947), cellists Tristan Honsinger (USA, b.1949) and Fred Lonberg-Holm (USA, b.1962), guitarist Kim Myhr (Norway, b.1981) and violinist Jon Rose (UK, 1951). Baxter is a Melbourne based percussionist who, over a ten year period, has developed a completely obtuse performance approach to the traditional drumkit. He performs and records on the drums with an array of utensils other than drumsticks (bamboo whisks, chopsticks, enamel plates, windchimes and wok lids). These radical approaches to the drumkit are reflected in the descriptive titles he has given tracks from his solo vinyl release, \textit{Solo Drumkit Improvisations}. These titles include: \textit{Plates}, \textit{Windchimes}, \textit{Junk}, \textit{Hands} and \textit{Brushes}. Baxter’s one-take acoustic improvisations on this recording frequently take on the sonic qualities of electronic music while transmuting the functionality of the drumkit to convey sonic impressions of electronic percussion, dense insect choruses, junkyard clatter and gamelan orchestras.

Alaskan academic, composer and sound artist Matthew Burtner has written, for the web magazine \textit{newmusicbox}:

\begin{quote}
As tonality expanded and exploded in the early decades of the 20\textsuperscript{th} century,
\end{quote}

\textsuperscript{12} For more information about Rowe’s abandonment of conventional guitar technique see Dan Warburton’s interview with Rowe at: \url{http://www.paristransatlantic.com/magazine/interviews/rowe.html}, accessed 13/11/2011.
performers were confronted with increasingly varied harmonic systems, systems that embraced consonance and dissonance and questioned the nature of order in radical new ways (Burtner, 2005).\textsuperscript{13}

Burtner has chronicled how these new sonic vocabularies led to the development of extended instrumental techniques for classical musicians and has written of extended bowing and percussive techniques for stringed instruments, extended blowing and muting for wind instruments and extended vocalization that included singing extra tonalities in addition to the root note, hissing, sucking and screaming as well as vocalizing into other resonant objects such as the hands, drums or glasses. Burtner has also provided an explanation of the role of extended techniques and their difference in regard to more conventional instrumental techniques:

Extended techniques require the performer to use an instrument in a manner outside of traditionally established norms (Burtner, 2005).

This use of the instrument outside traditional norms is something that has perennially appealed to me. Even in my youth while listening to Pop and Rock music it was the subtle or not so subtle departures from the norm that caught my attention and acted evocatively upon me to an extra degree. This is where the desire to expand my instruments vocabularies historically and throughout composing for the Designing Sound for Health and Wellbeing project was rooted.

American journalist Everett Bradman has articulated a number of the extended instrumental techniques used by Classical musicians:

Extended techniques for piano include whistling, singing or talking into the piano; percussive use of different parts of the piano, such as the outer rim; and using palms, fists or other body parts or external devices to strike the keys to create tone clusters. Extended technique for woodwind and brass instruments includes

\textsuperscript{13} For more information about the history of extended instrumental techniques and the amalgamation of noise and non-musical sonic phenomena into musical performances see Burtner’s article in the online magazine \textit{New Music Box} at: http://www.newmusicbox.org/articles/Making-Noise-Extended-Techniques-after-Experimentalism/ accessed 01/12/2010.
flutter-tonguing, continuous breathing or circular breathing and humming while blowing. Extended technique for stringed instruments includes exaggerated vibrato, using altered tunings, playing prepared guitar and tapping on the fingerboard (Bradman, 2010).

These techniques illustrate the breadth and history of unconventional approaches taken to various instruments, and in particular, the techniques Bradman lists for stringed instruments, exemplify the foundations upon which my own stringed instrument techniques have been shaped and consolidated.

The extended instrumental techniques that I have developed since 1998 involve preparation of the instruments surfaces and strings with an array of utensils employed to pluck, bow, scrape, agitate, hammer, deaden, alter intonation, produce a percussive effect and coax unconventional sounds from acoustic stringed instruments. The preparatory objects and sonic agitators I use include: rubber super-balls, alligator clips, metal street-sweeper blades, an animal flea comb, a basting brush, a makeup brush, a bottle brush, bamboo skewers, a motorized milk frother, a motorized personal fans, music boxes, a toothbrush, crochet needles, tuning forks, hair combs, plectrums, icy-pole sticks, earrings, a necklace chain, Ebows, al-foil cake patties, bamboo whisks, toy motors and bicycle bells.

Figures 9 and 10 illustrate instrument preparations and utensils used for extended instrumental techniques. Photos: David Brown, 23 May 2008.

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14 A motorized milk frother is a battery-operated device for changing the consistency of milk before adding it to coffee.
15 The Ebow is a handheld device that applies electromagnetic force to the guitar string, vibrating it continually, resulting in a sustained tone.
This development of a range of extended instrumental techniques has organically flowed into my compositional practice and is evidenced throughout my CD recordings.\(^{16}\) Alongside this I have transformed, recorded and borrowed sounds through electroacoustic processes. As a result, the sounds I have constructed through the use of extended instrumental techniques and electroacoustic processes provide me with a sonic vocabulary whereupon I have arrived at a new musical identity based on the inclusion of these extended instrumental and recording techniques as transformative agents which complement and influence more conventional instrumental techniques. French electroacoustic composer Bernard Parmegiani elucidates this process of transformation by saying:

> An instrument should go beyond the conventional limits of instrumental performance. All in all, the electro acoustic machine stretches the sounds of other instruments (Parmegiani, 2008).

All the extended instrumental techniques and electroacoustic processes I have discussed and developed since 1998 were an ideal basis, a group of building blocks, upon which I could forge the nucleus of my early compositions for Designing Sound for Health and Wellbeing.


\(^{16}\) For example my solo CDs Apsomeophone (2005), Wakool (2007) and Mimosa (2009) released under the moniker ‘candlesnuffer’.
3.2 Fragmentary borrowing and titling.

From the mid-1970s onwards I have engaged in a practice of extracting fragmentary excerpts of words, phrases and paragraphs, from literature and other reading material based on a refined and highly personal poetic attachment to these fragments. This poetic attachment arises from a conjunction of words striking an empathetic chord with me, often focusing attention and an alternative definition upon the words outside their literary context. Often these have an odd, unusual or Surrealist connotation. At times these extracted fragments (newly written but absent from their original context) form semi-coherent poems or mini-narratives and these collections of disparate words and phrases coalesce to form aleatoric associations. As a result, the words bear new relationships to each other. Even though fragmentary, they form mini-narratives glued together by the associations and peculiarities that first attracted me to them. The literal meanings of the selected words and phrases assist in the cementing of these mini-narratives.

My accretion of literary fragments bears kinship with the collages and perpetually evolving assemblages of the Dadaist and Constructivist artist Kurt Schwitters (Germany, 1887-1948) whose collages, montages and sculptural constructions are comprised of media including detritus, building materials, trash and everyday objects like advertising and newspaper clippings which unite to form visual and sculptural wholes, but where the individual elements retain an essence of their original incarnation.

Individual elements of Schwitters assemblages such as advertising, scraps of timber and metal and found objects impart a narrative through their new associations, and while they have been transformed also engender enquiry and thought around their original purpose and history. Schwitters statement, “I am a painter and I nail my pictures together” (Richter, 1965, p.137) illustrates the use of aleatoric process in the construction of his artworks along with the disdain he felt for conventional aesthetic considerations. These sensibilities led to random conjunctions of pictorial and sculptural elements that mirror the aleatoric associations between my own collected literary fragments.

The purpose behind my bower-bird-like collection of literary fragments was to create a trove of words and short phrases to be used as titles for musical compositions and other artistic creations. The allotting of these titles to a composition is almost always a process that happens retrospectively. Accordingly, while listening to a musical composition I find associations between the quality of the sound and the quality of the words. It is as if a musical composition chooses a title and explains itself, its purpose and heritage through the newfound title. As a result, the displaced word or phrase and a musical form are bound together through a convoluted practice of endearment and empathy.

Not surprisingly, literature and in particular Sicilian literature, has informed the compositions that have been instrumental in the development of my final twenty-minute composition for the Designing Sound for Health and Wellbeing project. Relationships between literature and my compositional processes are based on empathetic and poetic connections.

17 My assemblage of literary fragments owes a debt to the literary cut-up method of author, essayist and poet William S. Burroughs (US, 1914-1997) who is credited with co-authoring the cut-up method with painter and writer Brion Gysin (UK, 1916-1986). They discovered and adopted the method after accidentally slicing up sections of newspaper and rearranging them to make random phrases. Burroughs’ novel The Ticket That Exploded (Burroughs, 1992) for example employs this method. Though it is a literary precursor to my own fragmentary borrowing, Burroughs’ use of the cut-up method did not directly influence my contribution to Designing Sound for Health and Wellbeing (Morgan, 1991, pp.321-323).
3.3 Palermo.

During a performance tour of Europe in late 2008 I visited Palermo, Italy on two occasions. These were short but epiphany like visits. After my departure from the city the effects of Palermo’s serial invasions and colonisations, its earthquakes, wartime destruction and subsequent redevelopment influenced and even mirrored my compositional process through the amalgamation of disparate elements. Since foundation in the 8th Century B.C. Palermo, and Sicily as a whole have been subjected to a long series of social, architectural and cultural impositions through serial colonisation beginning with the Greeks (800B.C.) and subsequently the Romans (263B.C.), the Byzantines (527), the Saracens (878), the Normans (1072), the Hohenstaufens (1190), the Spanish/Spanish Viceroyos (1479), the Bourbons (1734) and Garibaldi (1860) (Benjamin, 2006). Prior to the Second World War, the spread of Northern Italian fascism into Southern Italy led to the abolition of all other political parties and a wave of emigration over the period 1921-26 (25,000-30,000 annually) to escape the fascist dictatorship of Mussolini’s regime who ordered peasant lands and other assets to be forcibly seized (Benjamin, 2006). The Southern advance of Northern Italian fascism also eroded the power of the Mafia in Sicily which contributed to the wave of emigration with the mafia seeking to exercise it’s power elsewhere (Benjamin, 2006, pp.364-377). During this period from 1921-26 over one million Sicilians emigrated predominately to North and South America in order to benefit from better economic and social situations there (Privitera, 2002, p.127).

Physically and socially Palermo is a melting pot of influences, and it is the architectural additions and contrasts in the city arising from serial colonisation that are most notable. The Second World War bombing of Palermo in early July 1943, as a preparatory action to the Allied invasion of Sicily, destroyed large sections of the city (Benjamin, 2006. p.378). Ruined buildings however, still exist in contemporary Palermo. It is difficult to differentiate which architectural damage is due to this bombardment and which is due to earthquake destruction. A seismic history of the Palermo region in the last five hundred years reveals that the city has never been completely destroyed, but has instead suffered devastating effects from earthquakes in 1693, 1726, 1751, 1823, 1940, 1968 and 2002 (Azzaro, et al, 2004, pp.525-543). War and earthquake damaged architecture stand alongside gentrified retail development and ruined buildings stand in close
proximity with domestic and commercial architecture. Since the Second World War the re-building of Palermo has been a long drawn out process and is still underway. The prevalence of artisans lining the streets and marketplaces hand-making artefacts such as brushes, brooms, plumbing fittings, steel bowls, woodwork and carpentry in Palermo is striking. Many artisan premises have the dual function of workshop and domestic quarters, where during the day a previously hidden market life emerges and the sale of fresh foodstuffs meshes with and accompanies these hardwares that are available for observation and sale. Somehow all these disparate elements interact, bounce off each other and compliment each other in a functional whole with vitality and purposefulness. As a result all these interlinked elements are interlaced, adapt and coexist. Ramshackle, crumbling and decrepit buildings are situated next to new architecture and pristine retail outlets and domestic quarters. Chaotic and dangerous city regions coincide with secure, well-lit and safe areas and traditional artisan cottage industries coexist alongside corporate franchises.

Figure 14. Photo showing earthquake affected or war-torn architecture alongside domestic residences. Photo: David Brown, Palermo, Italy, 20 November 2008.

The striking effect of Palermo’s complexity and diversity may stem from centuries of adaptation to the numerous colonists mentioned previously and absorption of varied social, cultural and architectural influences these colonists imposed on Sicily. For
instance, over the course of Palermo’s serial colonisation new architectural elements have often been added as attachments to pre-existing architectural features. Architecture reflecting one colonial style is often adjacent to those from another colonial era. One notable example of these architectural differences is the small Church of San Cataldo (circa 1154) that demonstrates a Muslim influence with its three red cupolas. Nearby, at its base are the remains of a wall dating from the Roman era. Another building that illustrates these colonial architectural differences is the Abbey Church of St John of the Hermits, Palermo. It’s origins date to the 6th Century, but it’s current structure, which shows a Muslim influence, was built upon a mosque in the 12th Century while its belltower dates from the earlier Norman occupation and is Gothic in character (Benjamin, 2006: p.165).

Figures 15 and 16. Left to right, the Church of San Cataldo and the Abbey Church of St John of the Hermits (Palermo, Italy) that illustrate the influence of Muslim based architecture on their architectural precursors. Photographs from: http://www.seepalermo.com/churches.htm accessed 10 July 2010.

Interestingly, the complex juxtapositions of disparate elements that contribute to Palermo as a whole are a parallel to my own compositional methods of shaping disparate sonic events, diverse influences and musical elements into a formal whole. In my compositions I meld together elements from different musical genres, opposing streams and genres traditionally at cross-purposes. For example, my practice has combined rock music with folk; acoustic instrumentation with electric instrumentation; busy, dynamic, instrumental activity with static, drone-like, inactive segments; analogue with digital processes; miniscule, barely audible musical gestures with dense, complex,

broadband instrumental activity; lo-fidelity with hi-fidelity; appropriated material with personally constructed musical sequences; mathematical and binary processes with free improvisation; conventional instrumental techniques with unconventional techniques and extreme volume with silence. Through initial compositional recording and construction, re-working and electronic processing of the constituent elements of compositions, the additions to, augmentations of and subtractions from all these sonic elements gel into a formal whole as if they were meant to be in allegiance.

3.4 Musical influences on my instrumental and compositional techniques.

A historical focus of my compositional process has been the direct referencing of other composer’s sounds in an ode-like, reverential sense. The prime example of this type of appropriation is my extensive use of sound-quotes from the works of French composer Pierre Henry (b. 1927) throughout my CD apsomeophone, which was released in 2005. For this CD I extracted the first and final ten seconds of sonic information from every track included in the five CDs in the box-set MIX PIERRE HENRY 01.1, released in 1999. I then edited, shaped and processed all these ten second sonic heads and tails, sometimes reconstituting them multiple times over, using them as starting points and bookends around which to shape my own compositions. In most cases these original sonic references to Pierre Henry’s work are rendered unrecognizable from their original form and tenor through the various electroacoustic processes I applied to them and through their fragmentary nature and isolation from their original context. Other composers whose work I referenced for apsomeophone were: Toru Takemitsu (Japan, 1930-1996), John Cage (USA, 1912-1992), Béla Bártok (Hungary, 1881-1945) and György Ligeti (Hungary, 1923-2006). From each of these last four composers various compositions I extracted sonic fragments of a primarily percussive nature, although these were not necessarily sounds generated from percussion instruments. In the case of Takemitsu I extracted and isolated individual notes of Japanese stringed instruments, drum sounds and sustained Shakuhachi tones. These taken predominately from his soundtrack composed for the Akira Kurosawa film Ran (1985). In addition I sourced fragments of dialogue and incidental sound effects from this and other Kurosawa films. All these appropriated elements were utilized in conjunction with my own prepared guitar techniques on the tracks Satan Wash and Bad Snake Laugh from

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19 The Shakuhachi is a Japanese flute traditionally made from bamboo.
Apsomeophone. In the case of Cage I extracted fragmentary prepared piano sounds from several of his prepared piano compositions as well as fragmentary tuned percussion sounds from his percussion quintet *Imaginary Landscape No. 2* (1942) and I coupled these appropriated elements with similarly isolated fragments from Béla Bartók’s *String Quartets No’s 5 and 6* (1934 and 1939). I particularly chose elements from the string quartets derived from string plucks and percussive slaps of the strings against fretboard. These elements I subsequently combined with my own electric and prepared guitar sounds to create peculiar sonic conjunctures throughout my compositions *Money’s Dark Night* and *Were Holes Mended*, also from *Apsomeophone*. I used small selections of Ligeti’s opera, *Le Grand Macabre* (1997 version) to create ethereal, sustained, string tones and dramatic punctuation-like musical gestures that form the basis of my composition *Voices of the Air Shaft* 2 where I responded to this basic structure I’d created from borrowed and transformed fragments by adding electric guitar improvisations. The appropriated musical fragments I chose from all these composers reflect my interest in extended instrumental techniques. The sounds were also selected because of their staccato nature and isolation from other instrumental sounds so as to facilitate their use as punctuation points and triggers for other sonic activity. These percussive fragments were also subject to multifarious electronic processing and reconstitution. In addition, I generated my own instrumental sounds, which mimicked the percussive sounds I referenced, and these were utilized to perform formal functions within my compositions for *Apsomeophone*.

This approach to using reconstituted sound bites as punctuating sonic activators (either appropriated or personally composed) is one facet of another compositional preoccupation I have experimented with as a composer. I employed these techniques for my recording *Apsomeophone* and also for my first self-titled *candlesnuffer* CD (2001). This involves the use of random, mathematical and chronological formal impositions and templates as compositional frameworks. I have also imposed form on my compositions by placing appropriated or personally composed sound bites at random points then adding further sonic and musical information as bridges between these points. The aleatoric implementation of these components contributes to the development of unexpected sonic relationships between diverse, random elements.

Another manner of imposing a formal template on my compositions is by recording
singular textures or motifs for a given duration then repeating this process chronologically employing similar, opposing or contrasting textures and durations. Over these initial recordings, I superimpose further textures or motifs that mimic or defy these chronological models, by overlaying subsequent recordings. This sonic layering process is repeated several times creating expanded shifting textural beds where spacious sounds such as intermittent notes accompany constant sounds or drones and drawn out musical gestures accompany fast, busy instrumental actions. In addition, individual textures and durations are re-processed repeatedly, electronically transforming them into new sonic entities unrecognisable from their source, yet retaining some perceivable essence of the original. As a result, this layering technique causes shifts in density, space, intensity and moments of silence analogous to the ocean’s tidal movements or daily shifts in urban vehicular traffic.

Historically there are two streams of musical influence upon my work as an improviser and electroacoustic composer and these influences have informed my compositions for *Designing Sound for Health and Wellbeing*. During both the Phase One and Phase Three stages of composition for the project I revisited the recordings of influential musicians and composers who I discuss below. I did this with the express purpose of immersing myself in the spirit and atmosphere of their musical works in an endeavour to have their methods and techniques infiltrate the compositions for *Designing Sound for Health and Wellbeing*.

The first of these influential streams stems from complex, high density, Free Improvisation. Artists from this Improvisation stream whose work has added to the distillation of my performing and composing vocabularies include Peter Brötzmann (Germany, b.1941), Ornette Coleman (USA, b.1930), Fred Frith (UK, b.1949), Paul Lovens (Germany, b.1949), Evan Parker (UK, b.1944), Sun Ra (USA, 1914-1993) and James Blood Ulmer (USA, b.1942). Ornette Coleman has pioneered the ‘Harmolodic’ sub-genre of Jazz where harmony, melody, intonation and pulse blend into a whole with none in particular playing a leading role. Coleman is also credited with coining the term ‘Free Jazz’ through the release of his double quartet recording simply titled “Free Jazz” (1961). James Blood Ulmer who shared an interest in Harmolodics since joining Coleman’s groups in the 1970s has been devoted to the use of divergent and open
tuning systems for the semi-acoustic guitar. In all these instances I drew direct influence from listening to the artists’ recorded material. In addition to this there were some instances of exposure to the artists’ performance techniques in a live setting which provided for me a sudden intuitive leap of understanding as to the evocative possibilities of the performers extended instrumental techniques. What these performances also crystallized for me was that I could personally absorb and expand on these instrumental techniques. In particular, during the mid-1980s I experienced workshop performances at the Victorian College of the Arts by the ‘Schlippenbach Trio’ and ‘Brötzmann/Kowald’ duo. The ‘Schlippenbach Trio’ is comprised of pianist Alexander Von Schlippenbach (Germany, b.1938), saxophonist Evan Parker and percussionist Paul Lovens. What I specifically responded to from this trio was Parker’s use of circular breathing techniques and his simultaneous utilization of atonal, percussive sounds which seemed to exist between the notes, while Lovens surrounded the floor adjacent to his drum kit with percussive detritus and accessories (bells, saw-blades, Chinese hand drums, gongs and bowed saw) that became effortlessly integrated into an extended drum kit while providing an armory of extraneous percussive sounds. I also observed a fluency and speed in their musical interactions. The intensity, deftness and ease of these improvisatory phenomena I had not experienced before. The second of these influential Victorian College of the Arts performances was by the ‘Brötzmann/Kowald’ duo comprised of saxophonist Peter Brötzmann and bassist Peter Kowald (Germany, 1944-2002). This was a passionate, loud and bombastic performance where the sheer acoustic volume and intensity of Brötzmann’s performance was bewildering. He seemed to be attacking his saxophones with gusts of visible saliva and breath. This gutsy, intense performance along with his use of circular breathing, flutter-tonguing and multiphonic techniques made a deep impression on me and inspired me to incorporate peripheral, noisy and percussive sonic phenomena into my guitar playing vocabularies.

The second stream of major musical influence upon my work as an improver and acoustic composer grew from concrete music, mid to late twentieth century classical music and electroacoustic composition. Examples of artists and composers from these genres whose works and techniques have also contributed to my musical vocabularies include Béla Bátok, François Bayle (France, b.1932), John Cage, Michel Chion (France, b.1947), Luc Ferrari (France, 1929-2005), Pierre Henry, György Ligeti, Ennio Morricone (Italy, b.1928), Bernard Parmegiani (France, b.1927), Toru Takemitsu,
Edgard Varèse and Iannis Xenakis.

In particular I experienced two listening events that included the compositions of Bernard Parmegiani. His compositions illustrated the possibilities that the utilization of acoustic processes could provide within recorded material along with their subsequent use in a performance context. What I specifically responded to was his use of silence and the movement of sonic phenomena through space. The first of these listening experiences was during the ‘Immersion’ festival in Melbourne, June 1999, curated by Philip Samartzis. This festival presented surround sound compositions where the compositions were heard in a darkened cinema and the optimal listening situation, for the movement of sounds within the cinema space, was to be seated in the central area of the cinema. What struck me about Parmegiani’s composition *Immer/sound* was the depth and subtlety of the movements of individual sonic events within the cinema listening space and the sense of expectation, spatial awareness and sense of timing these sonic phenomena engendered. The second of these influential listening experiences involving Parmegiani’s compositions occurred during the July 2003 *Liquid Architecture Sound Art Festival* at RMIT University’s Storey Hall in Melbourne. Parmegiani performed live and spatialised diffusions of selected works from his oeuvre through a sixteen speaker sound system. On this occasion the subtleties of movement of compositional sonic phenomena around the much larger performance space were amplified both by the size of the space but also through the use of diffusion techniques utilizing all sixteen speakers. Along with this Parmegiani’s performance included periods of sonic density where the complexities and subtleties of aural depth and motion led to feelings of anticipation as to the individual elements impending sonic trajectories. At both *Immersion* and *Liquid Architecture* Parmegiani’s compositional and performance techniques engendered a mood of openness and susceptibility to where the aural experience led me, along with relaxed absorption and concentrated listening. This was an intense level of immersion in listening that I had rarely experienced previously in any situation. My own acoustic processes have been inspired by Parmegiani’s compositional and performance techniques (especially those techniques that give consideration to the aural space surrounding individual sonic events and the panning and movement of

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20 The Immersion festival took place at Cinemedia@Treasury Theatre Melbourne with works composed specifically for the festival from composers including: Philip Brophy (Australia), Alan Lamb (Australia), Rasmus Lunding (Denmark), Bernard Parmigiani (France), Arno Peeters (Netherlands), Hildegarde Westerkamp (Canada) and Christian Zanési (France).
individual sounds).

In addition to these primary Free Jazz and acoustic influences, I have also derived inspiration from my early listening experiences and the effects of this have been embedded in my compositions and performance techniques. These influences have been absorbed from a plethora of 1960s popular song, which I experienced in my pre-teens and as a teenager growing up with the family gramophone and a transistor radio glued to my ear. The recordings of some specific 1960s and 1970s musicians such as rock iconoclasts Captain Beefheart (USA, b.1941) and Frank Zappa (USA 1940-1993), Krautrock21 groups Can, Cluster and Harmonia, musician, producer, theorist Brian Eno (UK, b.1948), English group King Crimson (Progr)ock who melded formal Rock Music with musical passages and techniques drawn from Improvisation, English Glam Rock group Roxy Music, Australian Psychedelic Rock group McKenzie Theory (Melbourne, 1971-1974) who amalgamated Progrock with extended Raga-like jams, Folk guitarist and experimenter John Fahey (USA 1939-2001) whose steel-string acoustic guitar playing included elements of traditional Blues, Folk and church hymns which coalesced into a personal guitar style, plus artists from the mid-1970s New York No Wave movement such as DNA and Mars who abandoned regular tuning and tempo while loosely retaining some elements of song form.

Of all these influences, one of the most seminal has been the multi-instrumentalist, composer, Fred Frith. This influence is drawn from his solo recordings and solo live performances along with his involvement in the groups Henry Cow and Art Bears in which he played electric bass, electric guitar, prepared guitar, violin and had a compositional role. His first solo recording simply titled ‘Guitar Solos’ (1974) documented the first concentrated iteration of ‘prepared guitar’ I had experienced, and as such engendered a feeling of mystery and wonder at the expanded sonic possibilities of the guitar as evidenced within the record. His use of unusual utensils and objects to coax sounds from and alter the sonic vocabulary of the guitar, in combination with his use of secondary pickups, was a revelation from first hearing. Additionally the final Henry Cow recording, Western Culture (1979) was comprised of two sidelong suites that

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21 The musical genre popularly nicknamed ‘Krautrock’ developed in Germany from 1968 – mid 1970s, with the amalgamation of progressive rock and Anglo-American influences where musical innovators attempted to reject conventional music forms and create a new, German, rock music (Freeman, and Freeman, 1996, p. 5).
stylistically oscillate between notated sections and improvisation. This recording illustrated the possibilities of a previously unheard conjunction of elements with abstract, open, improvised components distilling in a new genre of formal composition. Along with these two recordings, the second Art Bears release Winter Songs (1979) amalgamates a compositional structure which incorporates a cabaret-like song-cycle with melodies from European folk music alongside dense percussive textures, freeform guitar soloing and studio techniques such as multi-tracking, tape-looping, reverse tape playback and electrification of acoustic instruments. The lyrical content of Winter Songs contains poetic, succinct, descriptive scenes of everyday happenings and religious inspiration drawn directly from friezes, stone carvings and sculptures observed by musicians from Henry Cow in ancient, European architecture. This fascination with narrative, sculptural elements of the architecture bring a Gothic atmosphere to the songs.\(^{22}\) It is the disparities in these source materials (modern recording techniques, traditional song-form, abstract and dexterous musicianship along with poetic, Gothic lyrical content) that see them simultaneously coalesce into a whole that suggests industrialisation, modernity, allegory and medieval existence. Fred Frith’s musical groups and projects have inspired the recording, performance and compositional techniques that have informed my artistic practice and have played an inspirational role throughout all stages of my composing for Designing Sound for Health and Wellbeing, particularly through their ability to translate and migrate disparate musical components into a cohesive and narrative musical whole.

The recorded works of the duo Cluster, one of the primary Krautrock groups, comprising Hans-Joachim Roedelius (Germany, b.1934) and Dieter Moebius (Switzerland, b.1944) also embedded crucial influences in my performance and composing methods. Two of their recordings in particular, Zuckerzeit (1974) and Sowiesoso (1976) strongly influenced the musical group I performed in at the time, Signals (Melbourne 1978-1983), and the sensibilities of these two recordings have remained an influence upon me as I still return to listen to them semi-regularly. Their earlier recordings (Cluster '71 [1971] and Cluster II [1972]) were long, abstract, textural, meandering electronic experiments.

\(^{22}\) The lyrics for Winter Songs are all drawn from straightforward descriptions of architectural elements from Notre Dame (Paris, France) and the Amiens (Amiens, France) and Nantes (Nantes, France) cathedrals. Some of the sculptural reliefs used as sources depict: a hermit roasting a fish over a fire, rats and monkeys overrunning a crumbling city and a boy chopping down a twisted tree.
whereas *Zuckerzeit* is a departure. It incorporates shorter pop-like vignettes that sonically describe mini-narratives or journeys through melody, whimsy and evocative instrumentation. The instrumentation for *Zuckerzeit* includes electronic keyboards, electronic processing devices, electronic rhythm machines, guitars, synthesizer and tape recorders. It is the resulting electronic, pop cameos and textures embodied with narrative and evocative atmospheres that have played such a constructive role in my compositional methods. The second of these influential *Cluster* recordings, *Sowiesoso*, elongates the short vignette-like formula into more complex, layered, sonic journeys where the electronic processing of instrumental elements creates parallel but distinct textures and washes which complement their specific instrumental antecedents. Although the compositions, like those on *Zuckerzeit*, retain similar instrumentation and wash-like, textural compositional techniques, their mixture of melody, electronic textures and improvisational performance methods meld into a unique whole that avoids any ties to musical fashions or paradigms of the era and allows both records to stand apart as ground-breaking and idiosyncratic. Both these recordings still retain the inherent grainy, textural experimentation of *Clusters’* earlier recordings and it is their unique mélange of effected instrumentation, timbre, granular electronics and evocative aural narrative that have all been absorbed into my instrumental and composing vocabularies. The notion of aural narratives and journey-like qualities within musical compositions and the emergence of narrative qualities during the gestation of my own compositions for *Designing Sound for Health and Wellbeing* will be further explained in chapters four and five.

Since first listening to Béla Bártok’s string quartets approximately thirty years ago my interest in the strident discordance of these quartets and their utilization of extended instrumental techniques has had a seminal influence on my approach to performance, composition and recording. In particular Bártok’s use of extreme pizzicato\(^23\) technique at times transforms the role of the stringed instruments to perform a predominately percussive function. Bártok’s use of pizzicato technique has been absorbed directly into my own use of plucking techniques for the prepared semi-acoustic guitar and includes plucking the short lengths of guitar string above the nut and behind the bridge of the guitar as well as the longer bulk of the string itself which I stretch, release and snap

\(^{23}\) Pizzicato is the technique of plucking the strings of a violin or other stringed instrument with one’s fingers.
back against the fretboard in order to create dramatic musical gestures. To illustrate the revolutionary approach Bůrtok took to the string quartet his biographer Paul Griffiths describes the percussive techniques employed in the fourth movement of the *Fourth Quartet* (1928) as:

...a new kind of pizzicato, often called a “Bůrtok pizzicato”, in which the string is pulled so hard it snaps against the fingerboard (Bůrtok, 1987).\(^{24}\)

Bůrtok’s meshing of these percussive techniques and discordant interjections with ostinato\(^{25}\) phrases derived from Bulgarian and Hungarian folk melodies inspired my use of extended instrumental techniques as percussive textures and interjections that were intertwined with fragmentary melodic passages, atonality and abrasive textural sounds. These techniques were engaged in the one-minute compositions *Guitar scrapes, Organ and percussion, Eukolin and electric guitar* and *Bass guitar and tambourine* along with several of the other early one-minute compositions for this PhD research project.

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\(^{23}\) This quote cited from CD booklet liner notes, without page numbers, that accompanies the Alban Berg Quartet’s 1980s recordings of the six Bůrtok quartets.

\(^{25}\) Ostinato is a short musical phrase or melody that is repeated over and over, usually at the same pitch.
CHAPTER FOUR: THE PHASES OF THE STUDY.

4.1 Outline of Phase One.

Phase One of Designing Sound For Health and Wellbeing took place between February 2008 and May 2009. At the commencement of Phase One the research team prepared an application for ethics approval from the St Vincent’s Hospital Human Research Ethics Committee and simultaneously I began bibliographical and sonic research to situate myself in the project and embed myself in the research field.

While continuing bibliographical research I concurrently developed 28 stylistically wide ranging, one-minute electroacoustic compositions based on acoustic and electric instrumental sounds subjected to electroacoustic processes and Dr Philip Samartzis developed approximately 20-25 one-minute soundscape compositions derived from natural and urban field recordings.

Through the use of ongoing listening sessions and group consultation, involving all the research partners, this broad range of compositions was redeveloped and refined to arrive at a quota of ten electroacoustic and ten soundscape compositions each of one-minute duration. Included in the process of arriving the final compositions was an Ambisonic listening session which involved the complete research team. This session replicated the sonic environment of the Emergency Department in surround sound while members of the team listened to the one-minute compositions through the use of iPods and headphones in a similar manner to that which patients would experience in Phase Two of the study.

4.2 Phase One development of the one-minute compositions.

When I was first recruited into the Designing Sound For Health and Wellbeing project as the PhD candidate and electroacoustic composer, one of the initial aspects that I found challenging was endeavouring to situate myself within an existing research project, which was not of my instigation. I found myself in a situation where I needed to familiarise myself with the expectations of my research partners and acquaint myself with the requirements of a research project where the aims, process, rationale and
timeline were already in place for the wider project and had been rigorously outlined within the initial Australian Research Council Linkage grant application. I wondered how my musical inclinations could be moulded and transformed sufficiently to fulfill the seminal aim of the research project, that of reducing Emergency Department patient levels of anxiety and stress, without grand compromises to my personal aesthetics. I was concerned that my style of composition would be too abrasive and radical to relax and distract patients and may in fact have a converse effect leading to patient agitation and uncomfortableness. These reservations arose from preconceptions I had about what my research partners and hospital Emergency Department patients would deem suitable for the research project. However, during the course of developing numerous one-minute compositions I realised how my musical sensibilities would play a crucial role in the project as a whole.

I used a range of instruments throughout the development of the one-minute compositions in Phase One of the project. These instruments were used to generate initial recorded sounds, musical gestures and instrumental passages that I subsequently altered and amended electronically. In addition I utilized the extended instrumental techniques described in Chapter Three to generate some of the source instrumental sounds. All these techniques, musical and recorded elements were amalgamated to shape the one-minute compositions. The types of instruments used were: alarm bells, analogue synthesizer, bass drum, Burmese gongs, child’s wooden percussion, chromatic harmonica, electric bass guitar, electric chord organ, electric guitar, Eukolin, metallic fruit bowl, nylon string acoustic guitar, Tibetan singing bowls, snare drum, soprano saxophone, steel string acoustic guitar and tambourine. During the development of the one-minute compositions I played all these instruments personally with the exception of the soprano saxophone, which was played by my co-researcher Dr Tracy Weiland.
Figures 17 to 21. Acoustic instruments including alarm bells, fruit bowl, singing bowls and a tin egg with homemade beater that were all used during the development of the one-minute compositions.


Early in the composing process I struggled with the blank one-minute compositional format. How could I produce a sense of development within this short timeframe? Where
would I start? How do I place the first recorded gesture, and then, where and what would dictate the placement of subsequent musical elements? Composing within the constraints of the one-minute composition dictated a certain pacing and progression from one musical activity to the next simply because there is such a short amount of time to work within. The timeframe dictates a similarity of musical gesture across an array of one-minute compositions. To some extent my own aesthetic requirements for a reasonable amount of action, rather than minimalism, contributed to this inherently dictated speed of activity. Any work on one-minute compositions would need to inherently hold the aesthetic and musical seeds of its possible twenty-minute descendent.

Some early attempts to arrive at one-minute compositions seemed to fall on unresponsive ears amongst my research partners while simultaneously failing to fulfill my own aesthetic needs. These early compositions tended toward a sparse, melodic or easy listening finish but ultimately created a bereft, cold and contrived atmosphere. These minimalist attempts, in their spareness, operated with extremely slow pacing and therefore included many fewer sonic events than my natural inclinations would normally dictate. The brevity of these early, minimal one-minute compositions stymied their ability to state a musical and formal case. Within these initial minimalist attempts, the short time span dictated the use of thinly spread singular sounds or sounds in unison, designed to avoid too much activity and crowding, thus allowing sounds to decay or have their place. For example, these singular or unison sounds included: one or two guitar notes, one or two gong or percussion sounds in different combinations. The feedback I received from the research team suggested that my early compositional attempts were more akin to studies than thoroughly developed compositions. They also indicated probable difficulties in transforming these musical and sound events into any subsequent expanded composition because of their overriding mood of contrivance, coldness and emptiness. Initial substance was missing and my preconceptions around style and content were debilitating and I came to realise that I should obey my own inclinations more stridently.

From this point on I began to make a more concerted effort to use electroacoustic processes in more forthright manners and to utilize the resultant textures and tones in a manner that allowed them to play a primary compositional role equaling the values of
the initial instrumental sounds they accompanied and were derived from. Previously they had performed secondary roles closer to embellishment or cosmetic enhancement. For this stage of the project electroacoustic processes were increasingly important in shaping my one-minute compositions and my compositional emphasis focused upon the removal and transformation of core elements of acoustic and electric instrumental sounds. Examples of these electroacoustic techniques included combining core elements of a particular acoustic sound with those of another (for example isolating and removing the sonic decay of an acoustic guitar note and replacing it with the sonic decay of a gong sound through the use of editing software) and manipulating the movement of individual sounds or momentary fragments of sounds around the stereo spectrum through the use of panning software. Other examples include electronic processing of isolated aspects of acoustic sounds that allow the composer to create derivative atmospheres, tones and timbres to complement or replace the sounds from which they are initially derived and the sonic reversal of acoustic sounds or fragments thereof by electronically reversing their waveforms to arrive at unusual sonic crescendos.

These methods did not involve a visionary way of working where I set out with a compositional objective and then used my various skills to achieve that objective. Rather I initiated compositions from random starting points and followed circuitous pathways to completion. These pathways would deviate at serendipitous moments as a result of surprising listening experiences that arose from unexpected and chance conjunctions of sonic events and structures. These compositional pathways also deviated through my implementation of aleatoric or mathematical processes or through unforeseen sonic ‘mistakes’ as well as being moulded by encouragement and feedback from my research partners. All these inputs absorbed along serpentine compositional pathways were continually refined, adjusted or abandoned during the process of arriving at each one-minute composition. These compositional methods have grown out of composing and performance techniques intertwined with a set of musical responses and vocabularies learnt and built over a long period where sound is shaped to obey my particular aesthetic ideals and culminates in my distinctive form of electroacoustic music.
As an expanding group of one-minute compositions began to develop in Phase One of the study, initial conversations and feedback from my research partners pre and post-listening sessions made it apparent that within the research team there were already theories and recommendations in place regarding what compositional elements, shapes and forms would be conducive to alleviating the stress and anxiety levels of Emergency Department patients. As listening sessions with the research team continued concurrently with the development of further one-minute compositions, some of my compositional sequences and qualities therein received less than enthusiastic responses. These qualities, traditionally inherent in my musical vocabulary were abrasiveness, brittleness or harshness of tonal character, atonality and discordance, lack of melody, large dynamic range, dense textures and sudden elements of surprise. Whereas, elements that gained more favourable responses and were encouraged by my research partners included a playfulness, radical use of the stereo spectrum, surprisingly unconventional or mysterious sound sources, imitative sounds and the inclusion of percussion sounds in general. In the case of the percussion sounds in particular, my research colleagues felt they added a theatrical element to the compositions and in instances where the percussion functioned to add a rhythmic feel or pulse-like atmosphere, they felt these qualities glued the more disparate sonic elements together.

The listening sessions that were held with the research team during Phase One development (2009) to test the one-minute compositions as they progressed impacted strongly and incrementally on the overall compositional process and upon the resultant
one-minute compositions. Listening sessions were intermittent (from March to the end of 2009) and sometimes involved the majority of the research team. At other times listening sessions involved two or three members of the research team. Each of these listening sessions provided direct or allusive criticisms or suggestions as to how I might improve, progress, expand or abandon compositions or approaches. These suggestions also lead to adjustments, additions or major revamps of the compositions in progress. These adjustments were carried out as either direct implementations of their suggestions, or as a somewhat looser, interpretative application of their suggestions. I also amended some compositions through new approaches I experimented with while responding to a general need for change or improvement. In the great majority of cases these suggestions from the research team came from the point of view of what was needed to improve functionality of the compositions within the hospital environment, either from the perspective of the compositions ability to potentially relax and soothe and relieve patient anxiety, or from its ability to function practically and have an effect within the aural environment of the Emergency Department while remaining aesthetically, rigorously and formally developed. There were also instances where impetus for change and re-development of the one-minute compositions arose from my specific aesthetic, compositional and formal motivations.

The research team offered recommendations about possible compositional, structural and instrumental amendments during these continuing listening sessions. As a result it became obvious that what was required to improve my one minute compositions was the use of more conventionally musical and melodic elements along with, in particular, more percussive sounds. As the composing and testing process progressed, I was guided towards extending my palette of sounds into unnatural and unfamiliar territory. This became a balancing act between juggling new approaches and retaining some of the compositional techniques integral to my oeuvre.

During Phase One, the developmental stage, of the Designing Sound for Health and Wellbeing project, I composed 28 one-minute electroacoustic compositions in total. A minority of these were abandoned early in the consultation process because the research team considered them either underdeveloped and simplistic or too abrasive and discordant to facilitate patient relaxation or relieve patient anxiety. After consultation with my research partners it was clear that the early compositional attempts derived
from gong and bell sounds were too simplistic and inactive to progress further. However, I felt a strong resolve in regard to the compositional strength of some of the discordant and strident early compositions but understood the concerns about their challenging nature. The remaining compositions underwent an ongoing re-development process until finalized. Two of these early compositions were considered by the research team to be initially well resolved and strong and thus required very minor re-working to bring them to fruition. These two compositions were stylistically very different. The first, Guitar scrapes, is abstract and textural and was described by my research colleagues as playful. While the second, Pianorgan hi chord drone is a slowly expanding and decaying drone-scape and was described by the team as having a meditational atmosphere. Other compositions required more thorough re-working. It was through continual listening and feedback sessions within the research team that these twenty-six compositions were refined to 10 final one-minute compositions that were included in Phase Two of the study.

In Phase Two of the study patient preferences for particular styles or genres of music and sound would be ascertained through questionnaires given to patients in the St Vincent's Hospital Emergency Department. While I developed the acoustic compositions for the study, Dr Philip Samartzis recorded and isolated multiple one-minute excerpts of both natural and urban field recordings that were also subject to the same listening and selection methodology with my research colleagues. Thus, through a process of selection and refinement, the research team also agreed upon a final ten one-minute field recordings that would also be included in Phase Two of the study. For the purposes of this exegesis I will be concentrating my discussion and analysis predominately upon my musical contribution (the electroacoustic compositions) to the project, whereas, my references to Dr Samartzis' compositions and working methods will only be discussed where they are relevant to my project component and the overall findings of the project.
Figures 24 and 25. Dr Philip Samartzis recording in the field during Phase One development of his one-minute soundscape compositions. Photos: David Brown, 4 March 2009, food court, Melbourne Central shopping plaza.

4.3 The Ambisonic listening session.

An important component of the process of developing the one-minute compositions and assessing the suitability of their various compositional elements for use during Phase Two testing on the patients, was an Ambisonic listening session during which the research team members listened to selected electroacoustic compositions and soundscape compositions through headphones while immersed in a reconstituted aural replica of the St. Vincent’s Hospital Emergency Department.
Dr Philip Samartzis and I produced recordings of the ambient aural environment of the Emergency Department with an Ambisonic\textsuperscript{26} microphone. The ambient recordings were to perform a dual role as both a sonic background for the Ambisonic listening session with the research team and also later as a control composition during final Phase Three implementation within the Emergency Department.\textsuperscript{27} One recording was made within the hectic doctor’s station and the other in the passageway outside the cubicles where the ambulances deliver patients. These corridor recordings produced more distant ambient sounding results with less constant activity and more intermittent passing activity compared to the intense, constant hubbub of the doctor’s station area. While recording Dr Samartzis simultaneously took regular readings of the general amplitude of the regions being recorded. All these recordings concentrated on capturing details of the activities, machinery and the internal sonic architecture of the Emergency Department and were comprised of the audio phenomena emanating from telephones, air conditioning, specialised medical equipment, staff footsteps and activities, fluorescent lights, slamming doors, staff pages and emergency announcements, computers and patient traffic. The most constant and prominent of these audio phenomena was a continual low-end hum generated by the air conditioning system. All these audio phenomena were accentuated by ubiquitous, hard, angular, polished surfaces within the Emergency Department. The research team made the decision to listen to the recording made in the corridor area for the upcoming Ambisonic listening session. This recording was constant and repetitive yet sparse and thus less likely to override or interfere with the one-minute compositions during the Ambisonic listening session. At a later stage the research team also made a decision to use consistent and sparse sections of the corridor area recordings Dr Samartzis and I had made within the twenty-minute Emergency Department ambient sound composition used in Phase Three of the trial.

It was a prerequisite of ethics requirements of the \textit{Designing Sound for Health and Wellbeing} project that any conversational fragments inherent in the recording be

\textsuperscript{26} The Ambisonic microphone is designed to digitally record multi-channel sonic phenomena in encoded form. After recording the digital information can be decoded and replayed through multi-channel speaker systems to create a ‘surround sound’ experience for the listener that replicates the real-time recorded environment.

\textsuperscript{27} During Phase Three of the project five groups of patients were tested. One of these groups acted as a placebo or control group by listening to ambient recordings of the Emergency Department through stereo headphones in an identical manner to those patients hearing the electroacoustic and soundscape compositions.
purposely muted and indecipherable to patients during listening in Phase Three of the project. This requirement came about in order to retain the anonymity and integrity of nursing and medical staff, patients and patient family members who may have been compromised through recognizable conversational elements, statements and personal or diagnostic details decipherable within the ambient recordings.

Figures 26 and 27. Recording set-ups within the St Vincent’s Hospital Emergency Department (ED). The resultant recordings were utilized to replicate the aural environment of the ED during the Ambisonic listening session and also for inclusion in the final twenty-minute ED sound composition or control track during Phase Three testing. Photos: David Brown, 11 November 2009, Emergency Department, St Vincent’s Hospital, Melbourne.

For the purpose of the Ambisonic listening session the Ambisonic recordings made in the Emergency Department were decoded into 5.1 surround sound data and utilized by Dr Samartzis and I to re-create the sonic environment of the Emergency Department in the Virtual Reality Studio at RMIT University. Here the corridor-based hospital environmental recordings were replayed through a five-channel surround sound speaker system at the same average amplitude at which their original counterparts are generally experienced in situ. This listening session was designed to assist the team members in ascertaining the most suitable one-minute compositions for Phase Two testing. The Ambisonic listening session produced breakthrough responses from research team members in regard to the electroacoustic compositions. It was as if they were hearing them ‘accurately’ for the first time. Comments from team members included: “This is a completely different experience listening on headphones” and “The stereo and general activity is fantastic.” They also indicated that this first instance of listening to the acoustic compositions through iPods with audio delivered through headphones enriched and
highlighted the sonic breadth of the compositions and provided another dimension to the listening experience. In contrast, all previous, and some subsequent listening sessions utilized monitor speakers alone. As a result of this headphone based listening session it seemed that the richness and dynamic nature of the instrumental sounds (especially elements like stereo activity and the movements of sounds through the depth of space) were assigning the compositions an additional level of sonic complexity not so obvious in the previous monitor speaker based listening sessions. After listening to a number of the one-minute electroacoustic compositions through headphones within this virtual Emergency Department environment, researcher Elizabeth Grierson observed that, individual sounds seemed to travel about her head and brought on a relaxed state where she nearly fell asleep. I saw this as an encouraging achievement particularly in regard to my use of panning techniques which were forthright but less strongly received or remarked upon during most previous listening sessions which utilized monitor speakers rather than headphones.

The effect on Emergency Department staff members (Professor George Jelinek, Dr Tracey Weiland and Dr Craig Winter) of listening to the sound world of their daily working environment when reconstructed in the Virtual Reality Studio was poignant and surprising. All complained of encroaching headaches and experienced a growing sense of fatigue as well, which suggested that this recorded version might not have been truly representative of their actual experience of the workplace, any differences amplified by the focused listening required during the Ambisonic listening session. In this impartial environment it was an endurance test for them to experience the sonic representation of the Emergency Department in isolation. The elements of the reconstituted sounds that seemed strikingly unusual to the staff were constant multiple layers of hum and in particular a predominant low-end bass hum emanating from air-conditioning apparatus and other machines. There was another frequency band that seemed unusually prominent and was commented upon as “unreal” by a number of the research team members. This was a high frequency hissing originating from pressurised oxygen dispersal.

The Ambisonic listening session raised questions for the research team about the fatiguing nature of the Emergency Department sonic environment. For instance, why were Emergency staff relatively unaware of these ever-present sonic beds and their
fatiguing effects on their work within the hospital environment? Were general levels of staff fatigue and its effects on workplace efficiency a direct result of these constant machine-like tones? What self-protective measures do staff members develop when constantly subjected to these types of sonic assault in order to allay the physiological and psychological effects of this exposure? What effects do these ever-present sonic beds have on patients undergoing treatment within the Emergency Department? Do patients have the same opportunities as staff to develop self-protective mechanisms to combat these effects? Are patients more susceptible to experiencing adverse reactions to the fatiguing tones and environment because of their infrequent exposure to and unfamiliarity with the Emergency Department environment? And would listening to electroacoustic compositions and soundscape compositions relieve the effects of Emergency Department noise upon patients?

The Ambisonic listening session was one of the final steps in the development of the one-minute compositions and took place during the culmination of the development phase. As a result I reflected on the role the listening sessions with my research partners had on the overall compositional process particularly given that responses to the one-minute electroacoustic and soundscape compositions had received a universally positive response from my fellow researchers after their use in the Ambisonic listening session. I questioned if the positive responses arising from the ‘first headphone’ listening session were influenced by factors other than the focus headphones had brought to the selection process. Although I am convinced that the headphone listening, during the Ambisonic session, contributed to a sudden upward incline in appreciation of all the one-minute compositions, I am also in no doubt that members of the research team were able to acclimatise to the compositions incrementally after several earlier speaker based listening sessions. In addition, I became more intuitive and sophisticated in my compositional methods over the period of time devoted to the development of the one-minute compositions.

My initial thoughts about the researchers’ growing familiarity with the one-minute compositions raised questions for me about how patients being treated within the Emergency Department would respond to the electroacoustic and soundscape compositions given that they would receive only a single opportunity to experience each of the twenty compositions. My thoughts around this issue arose from the fact that in
some cases responses from my research partners often had a negative tenor after early listening sessions and I suspected that patient responses might reflect these uninitiated reactions. Across a series of listening sessions there had been some quite contradictory verbal responses from individual research partners to the core characteristics of some compositions. Compositions that drew agitated or disquieted responses upon initial listening were often greeted with more positive and encouraging responses upon subsequent listening. This turnaround in feedback may to some degree have been due to improvements and developments in the compositions themselves but because core characteristics were still in place I am convinced improved appreciation was also due to the gradual familiarisation to the compositions that my research partners underwent over a series of consecutive listening opportunities. In contrast to this gradual escalation in appreciation of some core musical characteristics within the one-minute electroacoustic compositions, other responses I received from my research partners highlighted evocative, filmic, narrative and journey-like qualities of the one-minute compositions that occurred to some degree from the very first listening and were consolidated across all subsequent listening sessions. This early awareness of inherent evocative and narrative elements was significant and encouraged my escalating emphasis on these qualities across all ensuing stages of composing for the Designing Sound for Health and Wellbeing project. Therefore, evocative and narrative qualities capable of conjuring imaginary scenarios later became a central focus of my final twenty-minute composition.

As a result of Phase One (the development phase) Dr Samartzis and I arrived at a total of twenty one-minute compositions that traversed a range of styles and genres but ultimately were coloured by our personal compositional and recording vocabularies. It was our application of personal tastes and aesthetics along with the feedback and recommendations gathered through initial listening sessions and the Ambisonic listening session with our research partners that shaped our final twenty compositions for use during Phase Two testing in the St Vincent’s Hospital Emergency Department. The final twenty one-minute compositions were:
Electroacoustic compositions (David Brown).

1. **Guitar scrapes**
   Sounds generated predominately from plectrums scraping on guitar strings with accentuated panning of sounds with bass drum punctuations.

2. **Pianorgan hi chord drone**
   Chord organ drone that crescendos and then falls away.

3. **Organ and percussion**
   Chord organ drone with short textural bursts of percussion saturated with reverb.

4. **Steel string blues theme**
   Repetitive, melodic chord progression on acoustic guitar.

5. **Nylon string drone**
   Melodic nylon string guitar passages accompanied by watery pulses, high sine wave-like drones and Indian bell sounds.

6. **Nylon string loops and gongs**
   Intermittent nylon string guitar melodic phrases triggered by chords derived from multiple gong tones, the whole enveloped in atmospheric loops.

7. **Eukolin and electric guitar**
   Composition in two halves with discordant eukolin chords, bass drum and percussive textures followed by a distorted blues-style, electric guitar resolution.

8. **Bass guitar and tambourine**
   Snare and bass drum phrases, conduct bass guitar chords and phrases with textural tambourine interludes.

9. **Percussion, bass and sax**
   Theatrical marching drum figure with intermittent bass guitar notes and melodies complemented by synthesizer drones and soprano sax melodies in the second half.

10. **Bass swells and synth**
    Pulsing and swelling chords constructed from multiple individual bass guitar notes with an organ-like tone, punctuated by percussive synthesizer notes.
Soundscape compositions (Philip Samartzis).

11. **Fireplace**  
   Sounds of a wood-fire with occasional loud, explosive cracks.

12. **Gravel**  
   Gravel surfaced schoolyard with children playing, running and conversing, Mont Blanc, France.

13. **Kangaroo Island**  
   Sounds of wind with profuse seal calls, Kangaroo Island, South Australia.

14. **Kings Canyon**  
   Evening chorus of cicadas, crickets, other insects with birdsong, King's Canyon, Northern Territory.

15. **Lagoon wind**  
   Dead or desiccated tree branches clacking together in the wind, Kangaroo Island, South Australia.

16. **Mall**  
   Sounds of distant buskers, trams and foot traffic, Bourke Street Mall, Melbourne, Victoria.

17. **Mount Buffalo**  
   Frog calls reflected across and off the surface of Lake Catani, Mount Buffalo, Victoria.

18. **Norwegian water**  
   Sounds of a small stream flowing through an icy course, Nordkapp, Norway.

19. **Snowy River**  
   Spacious bellbird calls with other intermittent birdcalls, Snowy River, New South Wales.

20. **Trams**  
   Sounds of W-Class trams at a tram depot, Port Melbourne, Victoria.

The broad range of styles and genres across the final twenty compositions was more obvious throughout the ten electroacoustic compositions, whereas the ten soundscape compositions were closer in sonic palette due to the fact that they were predominately derived from recordings of nature with only three compositions (Gravel, Mall and Trams) developed from recordings made in urban settings. The research team arrived at a joint
hypothesis that the majority of the soundscape compositions would be inherently evocative and relaxing as a result of their derivation from the sonic worlds of flora and fauna. In addition, there were mysterious qualities inherent in some of the soundscape compositions that produced querulous responses from the research team as to the sources of the strange, mysterious sounds contained in the compositions. Other qualities that added to this puzzling and elusive quality were the high fidelity and clarity of the source recordings along with the textural, almost electronic timbre they entailed and induced. The soundscape compositions which predominately evoked this spirit of mysterious enquiry were King’s Canyon (insect chorus), Snowy River (bellbird calls), Lagoon Wind (dead or desiccated tree branches clacking together in the wind) and Mount Buffalo (frog calls). The research team also thought that their enquiry into the origins of the soundscape compositions would be duplicated in responses and reactions from Emergency Department patients once they also experienced the compositions.

4.4 Outline of Phase Two.

Phase Two of Designing Sound For Health and Wellbeing took place between June 2009 and August 2009. As Phase Two commenced I delivered the final 10 one-minute electroacoustic compositions and 10 one-minute soundscape compositions in randomized order through iPods and hygienically sealed headphones to a cohort of one hundred patients across all five Australasian Triage Scale28 categories.

Through a purposely-designed questionnaire, administered by myself, participating patients are firstly asked about their historical listening habits and preferences. Secondly, through the subsequent section of the questionnaire, patient preferences for each of the final 10 one-minute electroacoustic compositions and 10 one-minute soundscape compositions were gauged to measure which of those compositions were most favourably received by participating Emergency Department patients.

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28 The Australasian Triage Scale (ATS) is a 5-step scale and was developed for use in Emergency Departments to ensure that patients are treated in the order of their clinical urgency and in a timely, efficient manner. The ATS is explained in more detail in chapter five.
4.5 Testing of the one-minute compositions.

The primary endpoint of Phase Two testing within the Emergency Department was to determine the patients’ listening preferences of the ten electroacoustic and ten soundscape compositions completed during Phase One. Patient preferences for the one-minute compositions were gauged through the use of a patient survey in the form of a two-stage questionnaire produced at St Vincent’s Hospital specifically for use in this project. The purpose of ascertaining patient preferences for particular one-minute compositions in Phase Two was to allow Dr Samartzis and I to use these most preferable compositions as integral elements of our twenty-minute compositions that would be developed and trialed during Phase Three.

Phase Two testing of the one-minute compositions in the Emergency Department began on the 9th June 2009 and continued until completion on the 10th of August 2009. Adult Emergency patients across all five Australian Triage Scale categories were eligible for Phase Two testing. Those patients ineligible for the trial were those under eighteen years of age; those of non-English speaking background (who would thus find it difficult to decipher the questionnaire), those with cognitive impairment, those too highly dependent on nursing care and those unable to consent. I delivered the twenty compositions to patients within their Emergency Department cubicles in random order via ten iPods using semi-enclosed headphones. The headphone earpieces were covered with hygienic mesh covers, akin to a hairnet. The hygienic mesh covers were employed to prevent the spread of infection that may have been transmitted through the interchange of headphones from patient to patient. The use of the hygienic mesh covers was recommended and approved by the St Vincent’s Hospital Human Research Ethics Committee. After each use by individual patients these hygienic mesh covers were disposed of and replaced. The random order in delivery of the compositions was designed to defer any bias in results that may have arisen through listening fatigue.
During Phase Two testing it was my role to deliver all aspects of the trial to Emergency Department patients. Eligible patients were first approached within their Emergency Department cubicles where I explained an overview of the project to them before asking them to consent to take part in the trial. Patients were also given the opportunity to read a more thorough consent document which detailed patient involvement along with information about the project including the researchers involved, their roles and responsibilities, possible and desired outcomes along with a guarantee that patients could remain anonymous post testing if they so desired. In approximately fifty percent of cases patients chose either not to read the explanatory document, or gave up the task of reading it part way through, or chose to have me read the document to them. In the majority of cases patients who chose not to read the document in full, only partially or not at all stated that they were happy to take part in the trial after I had read the consent document to them. After agreeing to take part in the trial patients signed the explanatory consent document that I, as the researcher involved, countersigned. In addition a relative of the patient or a member of the medical or nursing staff signed as a witness to the patient’s consent signature. All patients participating in the trial were given the option of retaining a copy of the information and consent document in the event that they may desire to follow up the progress and results of the project. Only one patient participating in Phase Two testing took this option and during the concluding
Phase Three testing of the final twenty-minute compositions and control tracks no patient took the option of retaining this information and consent document.

For Phase Two of the study Dr Tracey Weiland developed a purposely-designed questionnaire, with input from the research team, to gauge patient preferences for the one-minute compositions and the effectiveness of each of the compositions to relax patients. The terms of reference included in the questionnaire (e.g. Confused, Relaxed, Inspired) were based on consultation between all members of the research team and also developed from the contents of previous similar research models utilized in Emergency Department research. Below is an extract from the Phase Two study questionnaire. This extract corresponds to the first composition each patient experienced and resembles each consecutive stage of the questionnaire that was directly linked to each of the ten electroacoustic compositions and ten soundscape compositions. After testing all of the questionnaire, responses were collated and interpreted in order to gauge patient preferences for each of the 20 one-minute compositions.

![Questionnaire Example](image)

**Figure 30. Sample questions from the Phase Two patient preferences questionnaire.**

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29 For a complete version of the Phase Two questionnaire and consent form see Appendix 5.
After consent was granted, patients listened to each of the twenty one-minute compositions randomly ordered and delivered via one of ten iPods. Subsequent to experiencing each one-minute composition via headphones patients would complete the corresponding multiple-choice section of the questionnaire. This block of nine questions (see figure 30 and appendix 5), designed to gauge patients’ emotional responses and preferences for the compositions, was identical for each of the individual one-minute compositions. Each section of the questionnaire also gave patients the opportunity to add another identical multiple-choice response to a composition if they found the nine questions offered were inadequate or if there was another specific response a composition engendered. After answering the multiple-choice questions relating to each one-minute composition the final step of each questionnaire provided an opportunity for patients to offer brief written responses to each of the compositions.

During Phase Two testing one hundred and eighty-nine patients were considered for inclusion in the trial. Of these one hundred consented to take part. Of the other eighty-nine patients considered who did not participate, twenty were not approached due to time constraints, forty-two refused to participate, thirteen had been discharged before they were approached, five suffered from a degree of hearing impairment, three had English as a second language, two were non-cognizant, one was under the age of eighteen years and two had already taken part in the trial on a previous occasion (these patients were making return visits to Emergency subsequent to their earlier visits when they had undertaken the trial). Of the one hundred patients who took part in the trial, fifteen failed to complete the listening and questionnaire process although the data elicited from these fifteen patients was sufficient to allow the results to be legitimately included for analysis at the completion of Phase Two testing. Some of these patients failed to fully complete the testing process due to overwhelming fatigue or because they were interrupted by medical procedures that precluded my returning to complete testing or due to the fact they had been discharged post diagnosis and/or treatment.

Many patients found the consent and questionnaire process daunting and fatiguing. For patients in pain, distressed by attending Emergency, confused about Emergency Department procedures, immersed in the prolonged process of waiting for diagnosis and treatment the obligation to concentrate on reading and absorbing the five page consent and information document became, in a majority of cases, an undertaking that
discouraged patients from becoming involved. These apprehensions were expressed verbally and also through aggrieved body language like sighing, shrugging and frowning. In five cases this daunting consent process led directly to patient refusal to participate. Also, although Phase two testing was primarily designed to gauge patient preferences for our compositional styles and genres, the one-minute timeframe of each individual composition worked at odds with the intention of employing listening as a relaxing and absorbing procedure. This came about because the compositions were too short to allow patients to become absorbed in a concentrated listening process. In addition to this short term exposure to each individual composition the need for the questionnaire to be addressed after each of the twenty one-minute compositions also acted to regularly interrupt the process of patient envelopment in listening and negated some of the positive effects of listening. For instance it appeared that patient relaxation and alleviation of their stress and anxiety might have been negatively impacted by constant questionnaire interruptions. Expressions of frustration from patients occurred throughout the Phase Two testing process with patients making comments such as: “How many more to go?” or, “Are we nearly finished?” Overall these expressions of frustration, along with aggrieved physical responses from patients, illustrated exhaustion and a sense of resignation in response to the repetitive listening and questionnaire structure. The constant interruptions to listening and the resignation they produced also led me to believe that patients may have been better served by a more constant or elongated listening session.

Figure 31. Researcher David Brown engaged in testing one-minute compositions. Photo: Katharine Dettmann, St Vincent’s Hospital Emergency Department, Melbourne, 15 March 2009.
4.6 Phase Two patient responses and results of testing.

Verbal and written responses from patients to both the ten one-minute electroacoustic compositions and the ten one-minute soundscape compositions varied widely. Patient verbal responses had a predominately negative bias, particularly in regard to the electroacoustic compositions. This was counteracted by a small percentage of electroacoustic listeners who were genuinely engaged and gave positive responses. In contrast, across both listening groups there was a large quotient of respondents who were generally indifferent and disinterested.

I have included some patient comments from the questionnaire to illustrate the diversity of patient written responses to a particular acoustic composition. Some examples of responses to Track 2, (Pianorgan hi chord drone): “Awful”, “I found the synth sound very relaxing”, Overpowering, feeling of being trapped”, “Plane or train taking off”, “Just boring, didn’t seem anything to it”, “Sounds like horns”. Track 2 is comprised of a chord organ drone that begins with a simple chord. Gradually two or three other notes are progressively added producing gently beating frequencies. As these notes are added the composition plateaus in density and then notes are rapidly, successively subtracted to leave a different final chord which fades out.

The negative responses, both verbal and written, which patients proffered in reaction to the electroacoustic compositions were discouraging to me as a composer. A selection of examples of these discouraging written responses to the electroacoustic compositions were: “I associate the drum with terrifying experiences”, “Irritating, slightly grating, not calming”, Vaguely threatening, aggressive quality”. These first three comments were in response to Track 1, (Guitar scrapes) which comprised sounds generated predominately by scraping a plectrum along electric guitar strings. These scraping sounds were overlaid against each other to create textures that were occasionally punctuated by individual bass drum sounds and bass drum pulses accompanied by overt panning of the guitar textures and intermittent hints of guitar melody. A further negative response came when a patient commented in regard to the previously discussed Track 2, (Pianorgan hi chord drone): “Worst one yet”. While in response to Track 6, (Nylon string loops and gongs) a patient stated the sonic experience reminded him of “Bumble bees coming to get you”. Track 6 is comprised of intermittent nylon
string guitar chords, the attacks of which are accentuated by mallet strikes upon high-pitched Burmese gongs. These chords and gongs are accompanied by snatches of soprano saxophone melody, all embedded in electronic atmospheres that echo the chords.

In contrast, patient responses to the soundscape compositions heralded a comparatively smaller percentage of negative responses. Along with this, amongst responses to both the electroacoustic and soundscape compositions, there were a number of purely descriptive answers. There was an even heavier bias in purely descriptive responses directed toward the soundscape compositions. The comparative volume of these responses and their nostalgic and associative inclinations strengthened my theory that field-recording based compositions were somehow inherently evocative and transported listeners to either imaginary scenarios or to historical situations reawakened by the experience of listening. Descriptive examples of patients responding to the sounds of water running through an icy landscape during Track 18, (Norwegian water) were: “Oh, water”, “Running water feels relaxing on the ear”, “Water sounds are great”, “I can listen to this all day, puts me back to my childhood”. All these comments reveal a sense of comfort and contentment while experiencing water sounds and the last comment reiterates the ability of natural sounds to conjure associations with past experiences. Other patients responding to the dense, textural frog chorus heard in Track 17, (Mount Buffalo – frogs) wrote that the sounds were “Very textural, visualising wood grain” while another responded simply descriptively, “Frog pond”, and another wrote emotively, “We need frogs!” So once again these responses illustrate an easy affinity with the frog calls and different types of associations that listening to frog calls suggested for the patients. There were also a number of written responses that reflected the ability of the soundscape compositions to relax the listener. For example patients who listened to the sounds of spacious interactive birdcalls during Track 19, (Snowy River – bellbirds) responded with these written comments, “Bird calls are also very relaxing and the panning effect is great”, “I could hear this all day, I could relax to this all day”, “Very relaxing listening to nature”. In addition another patient responding to the dense insect textures and intermittent birdcalls of Track 14, (King’s Canyon – insects) wrote, “Relaxing sound – reminded me of a swamp”. All these written responses illustrate that patients were impressed by the ability of birdcall and other animal sounds to induce a relaxed state.
Across both groups of one-minute compositions there were a number of written responses that highlighted their ability to distract, engage and draw in the attention of patients. Perhaps, the most direct of these responses, which reflect the ability of a composition to distract patients from their Emergency Department predicament, came from one patient in response to the intermittent nylon string guitar chords, gongs and saxophone of Track 6, (Nylon string, loops and gongs) who suggested that I rename the composition “The Distracter”. Patient comments that describe how the one-minute electroacoustic and one-minute soundscape compositions act as a distraction can be seen as an early indicator of the discovery made during final Phase Three testing that perhaps it is the act of listening itself that occupies and distracts patients and strongly contributes to the resultant reduction of Emergency Department patient stress and anxiety levels.

Of the 100 Patients tested during Phase Two, in response to the electroacoustic compositions, 9.7% (14 Patients) voted the blues themed, repetitive acoustic guitar of Track 4, (Steel String Guitar) their most preferred composition while 4.8% (7 patients) preferred Track 5, (Nylon String Drone) and 2.8% (4 patients) preferred the chord organ drone and reverb saturated percussion interludes of Track 3, (Organ and Percussion). These three electroacoustic compositions were the most preferentially received by patients during Phase Two testing. For the soundscape compositions, 15.2% (22 patients) voted the sounds of water running through an icy landscape of Track 18, (Norwegian Water) the most preferred composition, while 14.5% (21 patients) preferred the spacious birdcalls of Track 19, (Snowy River), 9.7% (14 patients) preferred the sounds of trams, pedestrians and buskers of Track 16, (Mall) and 9% (13 patients) preferred the dense insect textures and intermittent birdcalls of Track 14, (King’s Canyon). These four soundscape compositions were the most preferentially received by patients during Phase Two testing.
Phase Two Final Patient Preferences Table

<table>
<thead>
<tr>
<th>Electroacoustic Compositions</th>
<th>Patient Preference Frequency</th>
<th>Valid Percentage</th>
<th>Cumulative Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guitar scrapes</td>
<td>3</td>
<td>2.1</td>
<td>2.1</td>
</tr>
<tr>
<td>Pianorgan hi chord drone</td>
<td>1</td>
<td>0.7</td>
<td>2.8</td>
</tr>
<tr>
<td>Organ and percussion</td>
<td>4</td>
<td>2.8</td>
<td>5.5</td>
</tr>
<tr>
<td>Steel string blues theme</td>
<td>14</td>
<td>9.7</td>
<td>15.2</td>
</tr>
<tr>
<td>Nylon string drone</td>
<td>7</td>
<td>4.8</td>
<td>20.0</td>
</tr>
<tr>
<td>Nylon string loops and gongs</td>
<td>1</td>
<td>0.7</td>
<td>20.7</td>
</tr>
<tr>
<td>Eukolin and electric guitar</td>
<td>2</td>
<td>1.4</td>
<td>22.1</td>
</tr>
<tr>
<td>Bass guitar and tambourine</td>
<td>2</td>
<td>1.4</td>
<td>23.4</td>
</tr>
<tr>
<td>Percussion, bass and sax</td>
<td>3</td>
<td>2.1</td>
<td>25.5</td>
</tr>
<tr>
<td>Bass swells and synth</td>
<td>1</td>
<td>0.7</td>
<td>26.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Soundscape Compositions</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fireplace</td>
<td>5</td>
<td>3.4</td>
<td>29.7</td>
</tr>
<tr>
<td>Gravel</td>
<td>6</td>
<td>4.1</td>
<td>33.8</td>
</tr>
<tr>
<td>Kangaroo Island</td>
<td>7</td>
<td>4.8</td>
<td>38.6</td>
</tr>
<tr>
<td>Kings Canyon</td>
<td>13</td>
<td>9.0</td>
<td>47.6</td>
</tr>
<tr>
<td>Lagoon wind</td>
<td>9</td>
<td>6.2</td>
<td>53.8</td>
</tr>
<tr>
<td>Mall</td>
<td>14</td>
<td>9.7</td>
<td>63.4</td>
</tr>
<tr>
<td>Mount Buffalo</td>
<td>8</td>
<td>5.5</td>
<td>69.0</td>
</tr>
<tr>
<td>Norwegian water</td>
<td>22</td>
<td>15.2</td>
<td>84.1</td>
</tr>
<tr>
<td>Snowy River</td>
<td>21</td>
<td>14.5</td>
<td>98.6</td>
</tr>
<tr>
<td>Trams</td>
<td>2</td>
<td>1.4</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Figure 32. Phase Two Final Patient Preferences Table (table authored by Dr Tracey Weiland with assistance from David Brown).
CHAPTER FIVE: FURTHER RESEARCH METHODOLOGIES.

5.1 Outline of Phase Three.

The development of the twenty-minute electroacoustic and soundscape compositions for Phase Three of *Designing Sound for Health and Wellbeing* was undertaken between August 2009 and February 2010 while testing, data collection and analysis took place between February 2010 and December 2010.

I instigated Phase Three of the project by beginning development of a twenty-minute electroacoustic composition that utilized elements of the most preferentially well-received one-minute electroacoustic compositions trialed in Phase Two. Concurrently Dr Philip Samartzis began development of a twenty-minute soundscape composition that utilized elements of the most preferentially well-received one-minute soundscape compositions trialed in Phase Two.

Members of the research team engaged in further listening sessions and consultation to refine and finalize the twenty-minute electroacoustic and soundscape compositions. This consultation process (along with Dr Samartzis and I obeying intuitive musical responses to the progress of the compositions) culminated in our final twenty-minute compositions.

Dr Samartzis and I developed a twenty-minute Emergency Department soundscape composition derived from on-site recordings made in the Emergency Department alongside the development of the twenty-minute electroacoustic and soundscape compositions. Dr Samartzis also completed an additional twenty-minute composition utilizing his recently completed soundscape composition that was augmented by embedding binaural beat tones\(^30\) within the soundscape composition.

Research assistant Kate Berger and I delivered the twenty-minute compositions through iPods and hygienically sealed headphones to a cohort of one hundred and seventy

\(^{30}\) Binaural Beat tones were included in the *Designing Sound for Health and Wellbeing* project to determine whether or not they provided any advantage in anxiety reduction for patients. In a previous study they had been shown to significantly reduce anxiety levels and facilitate mood effects (Le Scouarnec. et al, 2001, p.58).
Emergency Department patients triaged in category three of the Australasian Triage Scale. The listening trial was blinded and randomised so that neither the patients tested nor the researcher conducting the test were aware of which listening group the patient belonged to. This blinding and randomisation was designed to avoid listening or reporting bias. In each of the five groups thirty-four patients participated. The five listening groups were:

1. Electroacoustic composition.
2. Soundscape composition.
4. Emergency Department environmental sounds.
5. Non-listening intervention (without headphones).

Subsequent to the listening trial research assistant Kate Berger and I utilized the Spielberger State-Trait Anxiety Inventory questionnaire (STAI) (Spielberger et al. 1970), administered to participating patients both pre and post-listening, to assess patients’ self reported levels of stress and anxiety. An additional portion of the questionnaire addressed patient satisfaction with the general levels of care they experienced in the Emergency Department.

During the final stage of Phase Three research data collected via the questionnaires was collated and analyzed by Dr Tracey Weiland and I to ascertain whether Emergency Department patients’ levels of stress and anxiety had been positively or negatively impacted by the listening trial.

5.2 Phase Three development of the twenty-minute composition.

The process of developing the final twenty-minute composition from sonic material contained in the patient preferred one-minute compositions was easier than anticipated. As outlined in Chapter Four, I was not sure how this short compositional template could be elongated or if it would contain the necessary strengths and musical elements to

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31 The STAI is the definitive clinical instrument for measuring anxiety in adults. It clearly differentiates between the temporary condition of “state anxiety” and the more general and long-standing quality of “trait anxiety”. The STAI is explained in more detail in Chapter Five.
carry weight and formal responsibilities across a twenty-minute duration. Initial apprehensions about difficulties in expanding a one-minute composition dissolved with the realisation that because Emergency Department patients preferred several one-minute compositions, they could all be used in combination to develop an initial compositional shape across the twenty-minute duration. For the longer twenty-minute composition the possibility of combining the three preferred one-minute compositions, Track 4, (Steel String Guitar), Track 5, (Nylon String Drone) and Track 3, (Organ and Percussion) provided a multi-faceted compositional basis.

My first inclination was to use the Track 4, (Steel String Guitar) as a thematic starting point to bookend my twenty-minute composition. As I have noted, this composition was preferentially most successful with patients. I elongated the Steel String Guitar theme by dissecting the waveforms into smaller sub-themes and conjoining elements of these sub-themes to extend the original one-minute theme past its original duration. I used this elongated Steel String Theme as a stylistic centrepiece around which to construct and add further sonic elements. I then added Track 5, (Nylon String Drone) along with the Track 3, (Organ and Percussion) at random points over the twenty-minute duration.

Having composed 28 one-minute compositions during the First Phase of the research project, I subsequently reworked some of my earlier one-minute compositions that had been discarded or considered unsuitable for use during this First Phase of testing. I began the reworking process because I felt it was important to determine how I could progress some of these discarded compositions and whether they could be developed into resolved compositions regardless of whether they were to be used in the Designing Sound For Health and Wellbeing project. During a listening session with co-researcher and supervisor Dr Philip Samartzis, he suggested that some of these new iterations I had re-developed would be suitable for use as additional segments within the structure of my twenty-minute composition. As a result of this, Track 10, (Gongs, sparse hi chords) containing bell and gong sounds arranged to create intermittent gong chords and Track 26, (Noise) containing slow pulses of synthesizer generated white noise were incorporated to compliment the original guitar and organ compositions. The gong sounds were ultimately used as interludes and contrasts to the denser guitar drenched

32 For a complete list of all 28 one-minute compositions see Appendix No 1.
instrumental passages. Through the course of the compositional process the gong interludes began to rival the guitar sequences in their thematic reprise like role.

It was clear that other raw recordings, as yet unused, of the nylon string acoustic guitar could be expanded, developed and included as an additional melodic passage within the twenty-minute composition. As a contrast and variation, I selected melodic passages played in a lower register than all other acoustic guitar material previously included. This new nylon string guitar material came from a stockpile of recorded instrumental sounds that had been assembled through two initial recording sessions from which all previously utilized instrumental material had been extracted.

Once the twenty-minute composition was close to completion more percussive elements were included across all the guitar passages. These inclusions consisted of both abstract textural percussive elements and single percussive strikes, particularly bass drum accents. The bass drum strikes accentuated rhythmic points throughout the guitar passages providing them with an emphasized pulse and drive, which had only been alluded to previously. This pulsing percussive accompaniment lent the guitar sections a folk music-like ambience. In addition to this, the newly included textural percussion encouraged associations, similarities and connections with other percussive elements already present throughout the duration of my twenty-minute composition.

My adherence to composing in a repetitive, thematic manner while utilizing acoustic guitar passages as a structural basis proved to be a challenge on occasions while arranging the twenty-minute composition. There were points where the composition was incomplete or unresolved and had arrived at an impasse. Transitions from movement to movement were too abrupt, rushed or clumsy and interrupted a potentially fluid sonic narrative. It was during listening sessions with Dr Philip Samartzis and Dr Keely Macarow that these impasses were resolved through suggestions from these research partners. One formal breakthrough occurred when Dr Philip Samartzis recommended that the Steel String Guitar should be abandoned as the final event of the composition. Instead peripheral, background drones and atmospheric textures that had accompanied the Steel String Guitar in earlier scores were now featured as focused musical events. As a result of this my original intention of book ending the twenty-minute composition
with the Acoustic Steel String Guitar theme saw it now became a singular musical feature.

Regular listening sessions with the research team were carried out throughout the construction of the final twenty-minute composition. I provided my fellow researchers with a report of my compositional progress in order to garner feedback about the composition. Their suggestions around structural issues and the emotional responses the composition engendered in them were constructive and encouraging. As the composition neared completion some members of the research team commented that they found the sounds absorbing and relaxing, whereas others were more concerned with the structural makeup and general flow of the composition. Over the course of composing, the piece had taken on a narrative structure through the ability of disparate elements within the composition to evoke imaginary scenarios. At various stages of appraisal members of the research team commented that the composition had taken on a sense of journey across its duration and that it conjured up cinematic images.

Dr Philip Samartzis also developed his final twenty-minute soundscape composition alongside my development of the final twenty-minute electroacoustic composition. The constituent elements of Philip’s composition were derived from his Mount Buffalo frog, Norwegian water and Snowy River bellbird recordings. Other recorded elements amalgamated into his final composition were the sounds of a gate, waterfalls, cicadas, rain, footsteps squelching through a wet environment and Kookaburra calls. These nature-based recordings segue from one sonic event to another with Philip’s intention being to replicate a day-long sonic journey through a wilderness or rural environment.

Patient preferences for the one-minute soundscapes tested in Phase Two also indicated a strong preference for the sounds of a city mall. This was the only favoured recording with an urban emphasis. In order to establish and perpetuate aesthetic continuity across the duration of the soundscape composition Dr Samartzis and the research team made a decision not to include this one recorded element with urban-based components because it seemed to be too severely at odds sonically with the nature-based elements to be included in the final soundscape composition.
Dr Samartzis undertook the development of the twenty-minute Binaural Beat composition subsequent to the development of his final twenty-minute soundscape composition. He embedded Binaural Beat audio as a sonic undercurrent into the soundscape composition, derived from field recordings. The Binaural Beat elements were constructed through the use of digital sine tone generators. Two separate sine tones were created, one at 200Hz and another at 210Hz. Over the duration of the composition the intervals between these two tones decreased incrementally by steps of 2Hz until they reached a frequency differential of 4Hz. Then over the final movements of the composition they increased incrementally again until they had reached a differential of 10Hz.

5.3 Testing of the twenty-minute compositions.

The primary endpoint of Phase Three testing within the Emergency Department was to determine patients’ self reported levels of anxiety through the use of the Spielberger State-Trait Anxiety Inventory. The STAI is the definitive instrument for measuring anxiety in adults (Spielberger, et al. 1970). It clearly differentiates between the temporary condition of “state anxiety” and the more general and long-standing quality of “trait anxiety”. The STAI is used in a variety of settings including clinical research projects. Some examples of its uses include; to evaluate how respondents will feel in given situations to be experienced at some time in the future; to assess the levels of anxiety induced by real-life events such as academic examinations, medical or dental treatments and employment interviews; to evaluate the outcomes of psychotherapy and counseling (Spielberger, et al. 1970). The STAI consists of a questionnaire in two sections; the first section of the questionnaire measures “state anxiety” and consists of twenty statements that evaluate how respondents feel “right now, at this moment”.

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Figure 33. Shows an excerpt of sample questions from the State Anxiety questionnaire (Spielberger, 1970).

The second section of the questionnaire measures “trait anxiety” and consists of twenty statements that assess how respondents feel in “general” terms.

Figure 34. Shows an excerpt of sample questions from the Trait Anxiety questionnaire (Spielberger, 1970).

During Phase Three testing only patients within triage category 3 were eligible to participate in the Designing Sound for Health and Wellbeing project. Category 3 is the median triage category of 5 in total. The Australasian Triage Scale (ATS) was developed for use in Emergency Departments to ensure that patients are treated in the order of their clinical urgency and in a timely, efficient manner. The ATS categories range from 1 to 5 with patients presenting with immediately life threatening ailments assigned to ATS category 1, the categories progress through declining degrees of medical severity to ATS category 5 where patients present with low risk conditions and minor symptoms. Patients within ATS category 3 are normally seen within 30 minutes of
triage assessment and arrive at the Emergency Department with conditions that may progress to life threatening. Patients who are assessed as ATS category 3 present with symptoms like; severe abdominal pain, head injuries with loss of consciousness, moderate limb injuries (fractures or sever lacerations), persistent vomiting, severe blood loss or displaying psychiatric problems.

The Phase Three testing involved the recruitment of five groups of patients, each group comprising 34 patients with a total cohort of 170. Over a three-month period 175 patients were enrolled in the trial with 5 ineligible through incompletion of the questionnaire process. 93 male patients and 77 female patients completed the trial (54.7% male). The median age of the cohort was 52 years with those trialed ranging from 19 years to 99 years of age. Of 170 patients trialed, 118 (69%) required pain relief, which was administered before the sound trial. The listening process was blinded and randomised so that neither the patients tested nor the researcher conducting the test were aware of which listening group the patient belonged to. This randomisation was designed to avoid listening or reporting bias. The five listening groups tested were comprised of:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Electroacoustic composition.</td>
</tr>
<tr>
<td>2.</td>
<td>Soundscape.</td>
</tr>
<tr>
<td>3.</td>
<td>Soundscape plus binaural beats.</td>
</tr>
<tr>
<td>4.</td>
<td>Emergency Department ambient sound.</td>
</tr>
<tr>
<td>5.</td>
<td>No headphones.</td>
</tr>
</tbody>
</table>

In groups one to four audio was delivered via iPods and headphones whereas group five received no audio or headphones and functioned as a control group or placebo. Group four was an alternative control group that listened to a composition based on recordings of the ambient sound of the Emergency Department, while groups one to three listened to audio compositions purposely composed for the Designing Sound for Health and Wellbeing project. Group Five was an additional placebo or control who instead of listening to one of the sound or music compositions who asked to experience the Emergency Department in a normal fashion for twenty minutes.
During Phase Three testing I was aided by Kate Berger, a research assistant, in administering both the sound and music compositions via iPods and the questionnaires. We performed these tasks independently of each other, each testing individual patients. Patients were first approached within their designated area of the Emergency Department and invited to consent to take part in the listening trial after initially having the procedures and purpose of the project elucidated to them by Kate Berger or myself. After each patient signed a consent form a member of the nursing or medical staff or a patient relative signed the consent form as a witness. After signing of the consent form the trial began with completion of the first stage, before listening, of the Spielberger State-Trait Anxiety Inventory (STAI) questionnaire. As mentioned previously this comprised twenty multiple-choice questions relating to the patient’s current emotional condition (state anxiety). After listening to 1 of the 4 twenty-minute compositions, or (in the case of the no headphones control group), after a twenty-minute break with no intervention, patients would once again answer the identical 20 state anxiety questions in order to gauge differences in before and after listening responses. Patients would then move onto the next section of the questionnaire answering a further 20 multiple-choice questions enquiring how they felt in general terms (trait anxiety), on a day to day basis.

The final section of the questionnaire, the Davis Consumer Emergency Care Scale, comprised nineteen questions designed to gain responses to patient thoughts on their treatment and service from nursing and medical staff during their stay in the Emergency Department. Post testing, the questionnaires were stored in a locked filing cabinet in the Emergency Department research offices.

During the Phase Three testing I observed some reticence from patients upon asking that they take part in the study. This was similar to the reticence expressed by patients during Phase Two of the study. Patients in both Phase Two and Phase Three conveyed that their apprehension was due to the length and complexity of the consent form and questionnaire. As in Phase Two of the study the consent and questionnaire process was taxing for some patients who were already under stress due to their unfamiliarity with the Emergency Department environment, the consultation and diagnosis process,

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33 For an example of the complete STAI questionnaire see Appendix No 6.
and idle times while waiting combined with the pain or anxiety due to their ailments. In some cases the questionnaire proved a deterrent or discouragement to being involved in the trial. In saying this, although the consent and questionnaire process was long and fatiguing during the Phase Three testing for the study, it was more efficient, less time consuming and less obviously stressful for patients compared to that of Phase Two. The primary reason for this improved efficiency during Phase Three of the study was that patients could relax into the listening experience and devote time afterwards to the questionnaire. Whereas Phase Two listening was interrupted with questions patients had to answer after each of the one-minute compositions.

Along with some reluctance from patients to take part in Phase Three testing, I also experienced some other practical difficulties in recruiting patients for the trial. In Phase Two of the study the trial had been open to patients across all triage categories (categories one to five) whereas in Phase Three this was reduced to those patients within triage category three only, in order to arrive at a homogenous, refined patient base for testing. This categorical reduction severely narrowed down the number of suitable patients that could be included in Phase Three. Another aspect that slowed the recruitment procedure was the hectic nature of the Emergency Department environment where technology and computers are in constant demand. It was very difficult at times to source a computer to ascertain patient suitability and availability.

There was one area within the Emergency Department where computer access was less troublesome than elsewhere. This was the ‘Short Stay Unit’ (SSU) and this was also the area most useful for patient recruitment. A number of factors contributed to this regional orientation. Firstly, it is the quietest and most relaxed area of the Emergency Department with fewer cubicles to floor space and with a greater degree of privacy. Secondly, patients are situated here for longer periods of time and thus are less prone to interruption. It is an area where patients are located after initial consultation elsewhere in Emergency and await results, further treatment, and observation before discharge or admission to inpatient wards within the hospital. This explains the longer duration of patient stays in this area of the Emergency Department. Thirdly, nursing care in the SSU is more personal, relaxed and more focused with fewer distractions for nursing staff. In contrast, the more hectic areas of the Emergency Department were less suitable for testing primarily because of the high frequency of interruptions for
patient treatment and the distraction of continual intense activity in close proximity that
acted as a deterrent to concentrated patient listening and testing. Because patients in
the SSU are situated in an area where their cubicles are not directly exposed to the
noise and intensity of the busier regions of the Emergency Department and because
patients have already been through some degree of consultation and diagnosis it is
possible that the resultant slightly more relaxed and resolved environment and
treatment regime of the SSU may allow patients within this area to be more open and
susceptible to the relaxing and anxiety relieving possibilities of taking part in the
research project. The length of the testing process during Phase Three ranged from a
minimum of thirty minutes and at the most extreme, approximately two hours. The time
span in each individual case depended on a number of factors which include each
patient’s ability to concentrate on the listening and questionnaire process, the patient’s
level of coherence, their time of arrival and length of stay in the Emergency Department
cubicle, absorption in initial consultation, treatment, medical tests and procedures,
subsequent consultations with medical and nursing staff plus interruptions for meal
breaks.

As I tested the twenty-minute compositions during Phase Three, across the first three
groups (electroacoustic composition, soundscape and soundscape with Binaural
Beats), and patients listened through headphones, I observed a settling in period of four
to five minutes in the majority of cases. This involved differing degrees of fidgeting,
adjusting headphones, turning off mobile phones and other electronic devices, adjusting
bedding and clothing as well as getting comfortable on the hospital trolley or chair.
These activities became a preamble to relaxation and thus a more settled listening
state. Patients began to relax around the four to five minute marks, often closing their
eyes for periods of time with a small number of participants eventually nodding off or
falling asleep. Across these same three listening groups (electroacoustic composition,
soundscape and soundscape with Binaural Beats) patient relaxation became obvious
through visible and audible deeper and slower breathing along with a physical sinking
into their bedding. There were occasional exceptions where patients were relaxed and
intently listening from the onset of listening and a minority who could not settle or listen
in a concentrated fashion at all. Some patients interrupted their listening to make
comments and observations about the audio they were hearing.
As a contrast, patients within the fourth group listening to the Emergency Department soundscape produced extremely varied responses and did not appear relaxed to the same degree. Nineteen of thirty-four patients (59%) commencing the trial within this group failed to complete the twenty-minute listening session and many were puzzled by the listening experience enquiring as to when something was going to happen or why there was no musical content. Sometimes agitation surfaced due to patients' unfulfilled expectations of the sound. In addition some patients found intermittent periods of near silence mystifying. General patient disengagement and puzzlement was at odds with small number of patients within this same fourth group who were able to engage in listening and relax, at least outwardly, in similar ways to those in groups one, two and three.

Throughout Phase Three of the study the testing process was blinded and randomised. Through a computer generated randomisation process each of the compositions were delivered to patients in a random order so that neither the researcher nor the patient involved were aware of which composition was to be utilized until the testing process was underway and patient consent had been granted in each case. On occasion it became obvious to me in my role as researcher which of the twenty-minute compositions a patient was listening to. The semi-open design of the headphones in use allowed some of the audio being delivered to patients to be partially audible externally. At some points I could occasionally overhear minute details of the compositions. These escaping sonic details were a factor in informing me as to a current compositions identity. Sonic details that projected sufficiently to be recognized externally were the sounds of bellbirds and frogs calling within the soundscape composition, gong and bell sounds featuring sharp attacks situated within the electroacoustic composition and the sound of prominent footsteps within the Emergency Department ambient recording. These more prominent sonic elements were not always externally audible, as the audibility was dependent on volume and proximity. In addition to these factors, patient exclamations and questions with respect to audio content of the compositions allowed me to occasionally identify particular compositions. This awareness on the researchers behalf of which composition was involved after testing had begun in no way biased patient questionnaire responses, as these responses were the patient’s alone.
In the majority of cases, after testing, I enquired of patients what their responses were to the compositions. In so doing I was attempting to encourage some level of verbal interchange in order to garner any particular repetitive responses or patterns of dialogue around the evocative effects of individual compositions or indications of the ability of particular compositions to transport, relax and engage patients. Any substantial verbal interaction with patients, in regard to the nature and effects of their particular audio composition, came about through this prompting for responses on my part subsequent to completion of listening and the questionnaire process and therefore could not have compromised the blinding procedure or introduced any systematic bias in reporting.

As Phase Three testing progressed patient concentration across the twenty-minute time span was generally more studied and absorbed compared to the general level of involvement while listening to the one-minute compositions used in Phase Two of the testing. The diversity of style and brevity of the one-minute compositions made it more difficult for patients to be absorbed in listening and to address the questionnaire, where regular interruptions acted to thwart more consumed listening. As such it appeared that the one straight, unbroken listening experience in Phase Three was more conducive to relaxation.

Patients in groups two and three, listening to the soundscape and soundscape plus binaural beats often gave overt visual and verbal responses to the compositions. Their comments often centred on the ability of the natural elements of the audio to transport them and raise emotional connections to feelings of home, past and youth. The common responses seemed to indicate that water and bird sounds were evocative as they had the ability to transport patients to a nostalgic world or past experience. Even patients with an urban background, having not been habitually immersed in the natural world, found these sounds connected them with an ingrained notion of a ‘natural’ home. Patients conveyed that these natural sounds produced pleasant, comforting reminiscences. I observed facial expressions in response to some natural sounds, often a smile in recognition of a familiar element or a raised eyebrow in appreciation or identification. Many patients commented that these natural sounds engendered a rapport between listener, sounds, and events past or imagined. One particularly striking patient response came from a woman suffering abdominal pain who commented upon the ability of the natural sounds to invade or transform the Emergency Department environment. In contrast ambiguous or less discernable natural sounds would evoke
puzzlement and sometimes minor shock for patients due to their abrasive, disquieting edge. One element of the soundscape composition in particular that some patients remarked upon as having an abrasive quality was a period of dense cockatoo squawking and calls.

While testing the one-minute electroacoustic compositions during Phase Two I garnered a number of responses, from both my research partners and the patients tested, which referenced the evocative nature of the compositions and their ability to conjure images, feelings and reminiscences. In contrast, during Phase Three testing I found that, in conversations with the patients after the testing, responses to the twenty-minute electroacoustic composition were entirely bereft of any comments regarding the composition’s evocative nature. Even though I realise that perhaps I am a more sophisticated listener with a more complex listening history than the majority of patients involved, I found this lack of comments about evocativeness doubly puzzling as I had grown to see the composition as a picturesque representation of journey through place and history while referencing folk and acoustic music. Added to this my fellow researchers had remarked not only upon its evocative aspect but also upon its narrative, journey like nature. So at the completion of Phase Three post testing patient responses to both the soundscape composition and the soundscape plus binaural beats seemed to illustrate that these compositions were more capable of facilitating a psychological journey for patients either through reminiscence, imagination or nostalgia. This led me to question why during Phase Three I had been unable to gain any overt opinions from patients regarding the electroacoustic composition that supported or reiterated my fellow researchers opinions that it contained a narrative, filmic quality. A contributing factor to this discrepancy in responses between patients and researchers may be the differences in listening procedures for both groups. In the case of my fellow researchers they had the opportunity to listen to the composition on multiple occasions during its gestation and also three or four times as the composition approached completion and while final refinements were made. These multiple listenings may have contributed to an acclimatization and growing familiarity with all elements of the electroacoustic composition. This was in essence a long term accumulative listening that bred more complex relationships between composition and listener. All patients tested in Phase Three did not have this opportunity to develop more detailed interactions with the composition but rather had only an individual listening session in
which to respond. As a result I believe the familiarity my co-researchers were able to develop with the composition facilitated their comparatively evocative responses.

During Phase Three testing, (as with Phase Two of the study), there were numerous sources of distraction for patients as they listened. For example, in cubicles fitted with a television, the image and sometimes the sound of the television program were often left operational providing at least a visual distraction. Aurally, public address announcements frequently interrupted listening, while interruptions from medical or nursing staff for administration of medication, observation and further consultation also had the effect of interrupting the patient’s ability to relax and listen. Perhaps the most frequent and obtrusive element effecting patients taking part in Phase Three testing was the general Emergency Department cacophony and visible surrounding activity. Components of this general atmospheric distraction included the movement around the Emergency Department of staff, patients and medical equipment plus the attendant sounds and noises from these activities, adjacent patients in conversation with relatives and staff, constant noises, beeps and alarm sounds from medical machinery, perpetual noise from air conditioning systems (including a fatiguing low end hum), the sound of oxygen under pressure escaping oxygen lines throughout the Emergency Department and other electronic tones and hums from perennially activated machinery.

Figures 35 and 36 show examples of St Vincent’s Emergency Department machinery, which contributed to the constant sonic atmosphere therein. Photos: David Brown, 6 November 2010 and John Billan, 8 November 2011.
All these factors combined in a sonic ebb and flow with periods of lull and crescendo but always an ever-present sonic bed or backdrop. Patient ability to ignore these distractions varied widely with some patients seeming to be more engaged with surrounding activity and sounds than the compositions while others used the listening session to block out all these external noises and activity.

5.4 Clinical Outcomes of Phase Three.

In total, 509 patients, from within the St Vincent’s Hospital Emergency Department, were considered to participate in Phase Three of the Designing Sound for Health and Wellbeing project. Phase Three testing took place between the 1st of February and the 14th April 2010. Of these patients considered suitable 175 granted their consent to take part in the study but 5 of these patients failed to sufficiently complete the state anxiety questionnaires and were thus withdrawn from the study. The remaining 170 patients were evenly spread across the five study groups and amounted to thirty-four patients per each study group.

Of the 334 other patients considered eligible for testing, 137 were not approached through lack of time or coordination, and 80 were discharged from the Emergency Department before being approached for consent, 14 were inappropriate as they used English as a second language, 10 were non-cognizant or psychologically unsuitable, 4 were infectious and in isolation, 2 were not within the appropriate triage category, 2 had already been tested, 1 was hearing impaired and 84 were approached but refused to give consent to take part in the study.

Of the 170 patients who took part in the study, 93 (54.7%) were male and 77 (45.3%) were female. The median age of all patients taking part was 52 years. 118 (69%) of patients tested had received pain relief before or during testing. 133 (78.2%) participants originated in a country where the national language was English and 116 (68.2%) were born in Australia. No significant variances were detected between groups of participants in terms of gender, age or pain relief required (Weiland, 2011, Macarow, 2011).
For this study, the patients' mean normal state anxiety levels before listening, across all five-study groups, ranged between 38.8 and 43.8 indicating moderate anxiety, with no significant differences from group to group. Following all three musical and sound interventions, anxiety was significantly reduced, however the two control groups (both the group listening to ED ambient sound and the no headphones group) remained moderately anxious. Group by group the pre-listening and post-listening average anxiety levels were:

<table>
<thead>
<tr>
<th>GROUP</th>
<th>PRE-TEST STATE ANXIETY LEVEL</th>
<th>POST-TEST STATE ANXIETY LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Electroacoustic composition</td>
<td>38.9</td>
<td>33.7</td>
</tr>
<tr>
<td>2. Soundscape</td>
<td>42.2</td>
<td>34.6</td>
</tr>
<tr>
<td>3. Soundscape plus Binaural Beat audio</td>
<td>42.6</td>
<td>36.9</td>
</tr>
<tr>
<td>4. Control (ED ambient sound)</td>
<td>40.3</td>
<td>40.8</td>
</tr>
<tr>
<td>5. Control (no headphones)</td>
<td>43.7</td>
<td>43.7</td>
</tr>
</tbody>
</table>

Figure 3 shows levels of patients' state anxiety pre-test and post-test after Phase Three testing. Table authored by Dr Tracey Weiland with assistance from David Brown.

Across the three musical and sound intervention groups these results equate to an average anxiety level reduction of 10-15%, a clinically significant result. Whereas, of the two control groups there was a slight increase in anxiety level for those patients in the ED ambient sound group while anxiety levels of those within the no headphones group remained static. This illustrates significant differences in results between the three musical and sound interventions and the two control groups.
Figure 38. Shows Pre and Post listening State Anxiety levels illustrating 10-15% reduction. Graph compiled by Dr Tracey Weiland, Emergency Department, St Vincent’s Hospital, Melbourne.

The positive component of these results is that they illustrate the ability of electroacoustic compositions and soundscape compositions comprised of field recordings to significantly reduce the stress and anxiety levels of Emergency Department patients. These results seemed to contradict some of the verbal responses I received from patients during and post testing. These responses were predominantly quite negative, with some exceptions. These were aesthetic responses from patients some of whom indicated that neither the electroacoustic composition nor the soundscape-based compositions were suitable for therapeutic use in the Emergency Department. I also received somewhat negative responses from patients who had listened to the Control track (ED ambient sound), but in these cases the criticisms and doubts seemed to be based around puzzled reactions to the audio content, rather than expressing negative aesthetic judgements. Patients seemed to be wondering why they were hearing these non-musical sounds derived from the hospital. I was surprised at the positive results when the test data was collated, interpreted and analysed as I expected them to more closely reflect the less than enthusiastic verbal feedback from patients. Another element of surprise arrived due to the similarity in positive results between the electroacoustic composition, soundscape and soundscape with Binaural
Beats as my intuition and expectations had led me to assume that the soundscape compositions, due to the inclusion of bird, animal, insect and amphibian sounds, would be ‘naturally’ more effective in relaxing patients because of their evocative character. This was a belief that Dr Philip Samartzis had also expressed to the research team in consideration of both compositional phases of the study. The fact that results across all three electroacoustic and soundscape test groups differed only slightly led me to question whether perhaps the act of listening itself was the primary factor in reducing patient stress and anxiety. I wondered whether this listening process acted as a distraction, a separate activity, to draw patients’ attention away from their predicament and the stress inducing conditions of the Emergency Department. Could the act of listening, no matter what the audio content, operate to sidetrack Emergency Department patients from anxiety producing circumstances?
CHAPTER SIX: INFLUENCES ON THE FINAL ELECTROACOUSTIC COMPOSITION.

6.1 Literary and Sonic Influences on the twenty-minute electroacoustic composition.

Along with the inclusion of extracts and sequences from the successful one-minute compositions, the process of devising the twenty-minute composition also drew on literary and musical influences existing both previous to and concurrent with this final compositional process. There is no direct borrowing or sampling of literary and musical influences in this composition. However, a spirit and kinship of fragmentary passages and sounds are brought together in a journey-like musical narrative.

In Chapter Three of the exegesis I discussed the historical and social makeup of Palermo and how the conglomeration of disparate factors and influences evident there reflected the diverse influences historically brought to bear on my own compositional, recording and instrumental techniques. In this chapter I will explain the specific influence of Sicilian literature that I investigated leading up to and during the intensive construction period for my final twenty-minute electroacoustic composition. My interest in Sicilian literature grew out of study trips to Palermo and Catania in 2008.

My visit to Sicily, and Palermo in particular, had a flow on effect that generated an interest in Sicilian literature and writings chronicling Sicilian history. Peter Robb’s *Midnight In Sicily* (1999) is a cultural history of Sicily that explores food, history, painting, literature, political corruption and the mafia to evoke the city as a rich, dark entity. In contrast Giuseppi Tomasi Di Lampedusa’s semi-autobigraphical novel *The Leopard* (1960) chronicles the social changes taking place around the central character, an aristocratic prince, in the era from 1860 till his death in 1883, a time when the unification of Italy and Sicily promised Sicilian peasants and workers equality with the landowning class and freedom from the incumbent Bourbon colonists. Several books by Leonardo Sciascia including *Open Doors* (1992), *Death of an Inquisitor* (1990), *To Each His Own* (1968), *Sicilian Uncles* (2001) and *Sicily as Metaphor* (1994) are part detective story and part descriptors of the contrasts of Sicilian life. They illustrate the impossibility of equity and justice in Sicilian society and an attachment to its roots in peasant culture. These books evoke the contrasts in Palermo that were inspiring to my compositions for
Designing Sound for Health and Wellbeing. They echo the puzzle-like impression I formed of Palermo as a conglomerate of interlaced architectural, social and cultural disparities. The disparities and contrasts in Sicily and Palermo influenced the melding of contrasting musical elements in the twenty-minute composition for Designing Sound for Health and Wellbeing.

My first impressions of Palermo were shaped by a bombardment of the senses through a broad range of stimulation. For example, the architecture, dirt, graffiti, windblown dust, partially ruined buildings, industry, food smells, flies, friendliness and social warmth of the population and sinister undertones of unspoken control stemming from the hidden Mafia presence and history attacked my senses simultaneously. In the introduction to a book of conversations with Sicilian author Leonardo Sciascia, interviewer Marcelle Padovani states:

The traveler disembarking in Palermo is immediately assaulted by an atmosphere of violence. The violence of certain graffiti on the walls. The violence of a sky that’s too blue when it’s blue and too scintillating when it’s stormy. The violence, above all, of centuries of sunlight and an eternity of dust (Sciascia, 1994: p.1).

Here Padovani’s words reiterate the atmosphere of contrasts, beauty and violence that all worked in concert to inform my time in Palermo. Impressive contrasts between everyday life, brutality, human insight, traditional means of existence, corruption and coping with modernity are also paramount in Sciascia’s books. My experience of the diversities of the city of Palermo and Sciascia’s literary contrasts reflect and informed the disparate elements within my twenty-minute composition.
Figures 39 and 40 show images of Palermo that illustrate the presence of architectural ruins, graffiti, modern and vintage automobiles, clutter, dust and dirt that impact on the visitor. Photos: David Brown, Palermo, Italy, 20 November 2008.

In *Midnight In Sicily* Peter Robb describes arriving in Palermo in the late 1970’s and it’s initial effect on an individual:

..... by comparison with Naples Palermo was desolate. The streets were closed and shuttered outside business hours, and empty of pedestrians. I saw for the first time the extent of the ruination in the centre, the rubble, the abandon, the places you couldn’t see if they were lived in or not. Rain sharpened the sour smell of rotting masonry (Robb, 1999: p.7).
It is this assault on the senses that is so striking in Palermo itself and it is remarkable that writers such as Di Lampedusa, Padovani, Robb and Sciascia discuss a bombardment of the senses. Their stories resonate with attachments and responses to crafts, lifestyle, danger, political corruption, potent weather and the exotic nature of foods in Sicilian cities. It is the diverse elements and impressions of these stories and Palermo itself that permeate the disparate musical and electroacoustic techniques that combine to form the narrative of my twenty-minute composition. The narrative or journey-like atmosphere of my final composition grew out of my use of disparate, thematic elements drawn from the one-minute compositions tested in Phase Two of the study and from the inclusion of subsequent recordings with similar thematic constituents. In addition, electroacoustic treatments and processes were implemented to bind all these fragments together based on aesthetic judgments and feedback from the research team. The sonic results of these electroacoustic treatments became integral and prominent compositional ingredients themselves and assisted in embellishing a feeling of journey from one musical theme to another across the duration of the composition. They also supported the evocative character of the entire composition.

6.2 Direct compositional influences on the twenty-minute electroacoustic composition.

There were also composers whose compositions, use of specific instrumentation, application of musical and structural techniques and electroacoustic processes informed my composition for Designing Sound for Health and Wellbeing. Composers who had a primary and direct influence on the sensibility of my twenty-minute composition include the electroacoustic composer Bernard Parmegiani (France) and improviser and soundtrack composer Ennio Morricone (Italy). However my longtime fascination with

34 Bernard Parmegiani was born in Paris in 1927. He is an Electroacoustic composer with a history in radio, television and film sound. In 1964 he composed his first work for the concert hall. He combined improvisation techniques with electro-acoustic techniques and has completed over seventy compositions. For details on Parmegiani’s career and works see [http://www.parmegiani.fr/](http://www.parmegiani.fr/) accessed 06/06/2010.

35 Ennio Morricone was born in Rome in 1928. He has a long history as a composer of theatre, television and film music and has also been involved in improvised music with the group Nuova Consonanza. He has scored over four hundred films and has conducted multiple orchestras. For details of Morricone’s career and works see [http://www.enniomorricone.it/uk/biography.htm](http://www.enniomorricone.it/uk/biography.htm) accessed 06/06/2010.
Asian musical and percussive sounds, especially through the soundtrack work of Toru Takemitsu36 (Japan) also influenced the composition.

Beforehand and during the development of my twenty-minute composition I studied Parmegiani’s *L’Oeuvre Musicale En 12CD* (Parmegiani, 2008), an overview of his recorded works up to its release date. There is simplicity in approach and structure across the majority of Parmegiani’s works that is at odds with my own approach to composing as I work with complexity, density and overwork. However, there is also directness and rigorousness of finish in Parmegiani’s work, a sense of space, movement and clarity that gives his works depth and complexity. Parmegiani’s use of stereo space in a composition like *Capture éphémère* (*Ephemeral Trap*, CD, 1967) is a polished, rigorous exercise yet also somewhat crude. The movement in this composition reveals in the straightforwardness of its effect where sonic elements travel extremely around the stereo spectrum. This is reminiscent of the similar strong impression evinced for me by the groundbreaking use of extreme panning techniques developed in the late 1960s and early 1970s for rock music and concurrent recording technology.37 The sense of space and movement prevalent in Parmegiani’s compositions also informed my twenty-minute composition. I specifically attempted to emulate Parmegiani’s movement of individual sounds around the stereo spectrum, not only with overt movements from left to right and vice versa, but reverbs and panning were used to create subtle depth of movement through the listening space. I also used silences between individual sonic phenomena and musical elements to help facilitate a sense of space in the composition. This was achieved by focusing attention on individual sonic events and upon their subsequent movements through otherwise silent periods. I used sonic phenomena derived from fragments of acoustic instrumental sounds and electronic sounds to create related drones and echoes, which function as audio aftershocks surrounding the source sounds to accentuate atmospheres and movements. These are techniques inspired by

36 Toru Takemitsu was born in Tokyo in 1930. He has worked extensively as a film composer and became renowned for his work integrating traditional Japanese folk instruments and percussion with contemporary European composition techniques. Silence that accentuates and envelops individual instrumental sounds plays a major role in his compositions. He composed over one hundred film scores and one hundred and thirty concert works. He died in 1996. For details on Takemitsu’s career and works see [http://www.schottmusic.com/shop/persons/featured/18799/index.html](http://www.schottmusic.com/shop/persons/featured/18799/index.html) accessed 08/04/2011.

37 For example the panning techniques used on vocal refrains during the introduction to the song *Crosstown Traffic* by Jimi Hendrix and producer/engineer Eddie Kramer where the vocals pan extremely from left to right and vice versa continually. Similar techniques are used on the primary vocal elements later in the song. From the recording *Electric Ladyland* (Hendrix, 1968).
Parmegiani’s modus operandi.

My interest in the Surrealist practice of generating strange, unusual and unforeseen juxtapositions of text, objects and sound has influenced my compositional practice over the course of my musical career. The positioning of diverse sonic elements within my twenty-minute composition for *Designing Sound for Health and Wellbeing* also reflects this interest. Parmegiani also admits a Surrealist influence on his compositions and explains this in conversation with the French researcher and composer Évelyne Gayou:

> In fact, it wasn’t so much what I read by the Surrealists than their way of seeing the world which revealed, in all possible sense, a surprising and unusual vision I felt very close to (Parmegiani, 2008).

Throughout his composition *Pour en finir avec le pouvoir d’Orphee* (*To end Orpheus’s power. 1972*) Parmegiani uses reverb to soften the edges of sounds and create atmospheres and tonal beds that bathe, envelop, support and contrast with other more present, hard-edged sonic elements such as strident acoustic piano chords and bowed string instruments. These reverb atmospheres carry the harder elements through space and time and evoke imaginary spaces and scenarios. Parmegiani’s reverberant atmospheres and textural drones inspired the dronal, atmospheric elements of my twenty-minute composition. I created these through the use of reverb, resonances and looping of fragmental facets of acoustic instrumental sounds, all of which were embedded in the twenty-minute composition. These loops and resonances sit underneath, echo and support their source material of acoustic instrumental sounds. This process of electronic transformation of acoustic instrumental sounds reveals hidden characters inherent within the acoustic sounds. Though transfigured to form electronic echoes and fragments derived from their original source material, they mysteriously retain elements of their essential timbre, tone, density and gesture. Simultaneously, these new transformations include new sonic complexions, textures and timbres that act to compositionally support the acoustic sounds they spring from. In the case of my twenty-minute composition these source sounds transformed were primarily decays of gong tones, decays of acoustic guitar notes and decays of bass drum tones. In particular the loops and resonances derived from gong and guitar sources accompany the thematic guitar passages early in the composition and stand alone in their own right.
in the penultimate atmospheric passage of the composition. Parmegiani has described this transformative process in relation to his composition *Sonare* (1996):

'Sonare' means ‘to resonate the sound’, in other words, to create ‘sounding’. This is what the piece relates to. Thanks to the combination of electronic treatments, it tries to unveil every latent aspect of the tone (Parmegiani, 2008).

In my own twenty-minute composition there is a struggle between density and sparseness that arises from the need for contrast between the power and intensity of individual sounds and the blatancy of bombast. It is as if the reverence of the individual sound or musical gesture and the impact of undisguised density and volume need each other to find their own place, potency and musical relationships. Over the time spent composing my twenty-minute composition for the *Designing Sound for Health and Wellbeing* project I researched the soundtrack compositions of Toru Takemitsu and, almost unknowingly, correlations began to appear in my composition between his sense of space and my sense of space, along with a shared passion for the drama of isolated sounds. It is as if Takemitsu’s sounds themselves evoke drama, as if theatrics are inherent in the structure of the isolated sounds and with anticipation isolated sounds haunt the silences that precede them. As Takemitsu has observed:

> In its complexity and it’s integrity this single sound can stand alone (Takemitsu, 1995: p.51).

Takemitsu’s romantic engagement with the power of individual sounds is something I have connected with over the course of my musical career and throughout the compositional process for this research project. Listening to the weight Takemitsu accords individual sounds, has led me directly to a process of bolstering and refining the significance of isolated sounds within my twenty-minute composition. Illustrating this engagement of individual sounds Takemitsu says:
Now we can see how the master shakuhachi player, striving in performance to re-create the sound of wind in a decaying bamboo grove, reveals the Japanese sound ideal: sound, in its ultimate expressiveness, being constantly refined, approaches the nothingness of that wind in the bamboo grove (Takemitsu, 1995, p.51).

It is this continual refinement of sounds, their power and complexity that informed my twenty-minute electroacoustic composition for Designing Sound for Health and Wellbeing. In my composition the use of spare, sparse and single percussive sounds as dramatic punctuation points, alongside the use of denser percussive textures, creates emotive and atmospheric contrasts. This composition connects with the work of Takemitsu and links with my fascination with Japanese traditional music, Javanese and Balinese folk music and their use of percussion, stringed instrument techniques, sustained tones and silence. My affinity and fascination with Asian sounds has developed from an inherent evocativeness embedded in these sounds. I have replicated this evocative quality throughout my composition for Designing Sound for Health and Wellbeing in particular through the use of sparse gong sounds and wooden percussive textures that focus the listener’s attention on the guitar and organ passages that they link together.

My fascination with evocative and emotive instrumental sounds has informed my development of instrumental and compositional techniques which bring to the fore the sounds and textures I discussed in chapter three that are derived from areas of the instruments outside of, and as an adjunct to, conventional instrumental practice. Takemitsu elucidates this practice when describing the allure of the Japanese instrument, the Biwa, and its musical purpose:

The major characteristic that sets it apart from Western instruments is the active inclusion of noise in its sound, whereas Western instruments, in the process of development, sought to eliminate noise. It may sound contradictory to refer to “beautiful noise,” but the Biwa is constructed to create such a sound. That sound is called sawari (Takemitsu, 1995, p.64).
Figures 42 and 43 show examples of the Japanese instrument the Biwa as discussed by Takemitsu in regard to intentional noise incorporated within the instruments' structure, http://kabuki64.webs.com/instruments.htm accessed 14 June 2011.

Takemitsu has also explained the incorporation of an extraneous noise element as a feature of the instrument's tonal character and how this extra sonic component is emotionally charged:

On the Biwa the sawari is part of the neck of the instrument where four or five strings are stretched over a grooved ivory plate. When a string is stretched between these grooves and plucked, it strikes the grooves and makes a noise. In a sense it is an intentional inconvenience that creates a part of the expressiveness of the sound (Takemitsu, 1995, pp. 64-65).

My enchantment with these alluring, outside sounds, generated as an adjunct to conventional musical vocabularies, stems from their inherent pathos and poetic edge which engender exhilaration and emotional responses in me. All these associations and musical elements coalesce in a unique musical vocabulary that informed the compositions I composed for this research project.
CHAPTER SEVEN: OUTCOMES, CONCLUSIONS AND RECOMMENDATIONS.

7.1 Compositional outcomes of the study.

The influence and direction of both my research partners, and the patients tested during Phase Two and Three of the *Designing Sound for Health and Wellbeing* project resulted in significant, positive impacts on the approaches I take to composition, recording and live performance. Over the last twelve to thirteen years I have developed a range of extended instrumental techniques and explored atonality to expand the sonic repertoire of acoustic stringed instruments. I have refined these techniques to the point where my references to melody, diatonic tonalities and conventional guitar technique are fleetingly present, if at all, and only occasionally alluded to. As a result of these refinements I have developed new instrumental techniques focused on percussive and textural musical outcomes that are further highlighted by the sonorous, wooden qualities of my instruments.

However, the composing process for this research project, especially during Phase Three of the study, forced me to work outside my usual musical abilities and added new sonorities and elements to my compositional vocabulary thus contributing to the broadening of my musical palette. These new elements, which include simple, melodic, acoustic guitar passages along with the use of bells have opened up new areas of interest and in their clarity and focus, provide a perfect foil to some of my distinctly divergent compositional foci (for example the use of atonality, instrument preparations and extended instrumental techniques). These new, more melodic elements lend a gentler quality to my compositional process that I would not have arrived at independently without the influences of the research project. My natural inclinations would have led me to pursue more atonal and abrasive investigations. While still retaining a dedication to extended instrumental techniques and more abrasive textures, the new, more melodic elements discovered during composing and testing for *Designing Sound for Health and Wellbeing* now act as integral elements in cross-pollination having been absorbed into my larger armoury of compositional and recording techniques.
The *Designing Sound for Health and Wellbeing* project strengthened my ability as a composer to mould fragmentary sonic elements, be they the one-minute compositions themselves or shorter fragments contained therein, into a lengthy, extended composition. This was compositionally a formal advancement for me. Previously I had experienced some difficulties in resolving compositions for which I had intended durations exceeding five to eight minutes. Attempts at longer compositions would often be divided through the use of radical edits, and the resultant shorter compositions succeeded formally and structurally after I had imposed these more succinct durations. So, to be able to arrive at a successful twenty-minute composition was a formal breakthrough for me when approaching lengthier compositions.

The project also facilitated an additional compositional approach through the focus it engendered upon the overall journey-like, storytelling, filmic and narrative structure embedded in my final electroacoustic composition. During the mid to later stages of composing I experienced a crucial instrumental breakthrough that solidified the evocative and narrative elements of the composition. This breakthrough occurred through my development of, and emphasis upon, purely textural passages constructed from the sounds of small bells, tambourines, gongs and small wooden percussion instruments. These textural passages contained no rhythmic component and are sometimes either dense or airily spacious. They not only became a primary compositional focus in their own right but also play crucial roles accompanying and embellishing melodic and tonal sections of the composition as well as functioning as atmospheric bridges between adjacent sections of the composition. In particular it is this role they play in gently bonding together instrumental sections that brings the feeling of a relaxed journey to my twenty-minute electroacoustic composition. The textural percussive components solidified an inclination to bring into play arrhythmic textures already latent in my compositions and performance vocabulary and their formal success encouraged me to utilize them as ongoing compositional tools.

**7.2 Other Outcomes of the study.**

While testing the electroacoustic and soundscape compositions during Phase Two and Phase Three of *Designing Sound for Health and Wellbeing* a large percentage of the verbal feedback and responses I received from Emergency Department patients had a
negative tenor due largely to the patients’ lack of familiarity with the compositional styles and audio content they were hearing. In addition, another factor that contributed to the negative responses, was the length and tediousness of the patient consent process that immediately preceded listening. The consent process itself induced agitated and frustrated responses from the patients participating which may have had a carryover effect upon the process of listening, thus contributing to the patients forthright and agitated responses to the compositions. An intriguing outcome of the trial resulted when I examined the negative verbal responses from patients in conjunction with the results the trial questionnaire gained where the electroacoustic, soundscape and soundscape with binaural beat compositions all proved successful in significantly reducing levels of patient anxiety. The resultant somewhat contradictory outcomes from these two groups of feedback led me to reflect on the ability of the electroacoustic, soundscape and soundscape with binaural beat compositions to act as agents of distraction for Emergency department patients enabling them to engage in an activity (listening) that sidetracked them from their immediate situation and predicament in the Emergency Department. In deference to this theory of distraction, the success of the three musical and sound interventions in reducing patient anxiety levels to comparable degrees suggests that the compositions are infused with qualities designed and focused on relaxing and reducing the anxiety of Emergency Department patients. This is backed up by the results from the two control group interventions (Emergency Department ambient sound and non-listening, no headphones group) where patients remained moderately anxious or anxiety increased slightly. In the case of the patients participating in the Emergency Department ambient sound intervention the suggestion is that it is not purely the act of listening that distracts and relaxes. Due to the ambiguous nature of these results I concluded that the act of listening as a distracter and the presence of rigorously designed compositional and sound elements within the three musical and sound interventions may have conspired together to reduce the anxiety of Emergency Department patients.

An ancillary outcome of the negative verbal responses I received from patients during Phase Two and Phase Three testing I realised I needed to develop strategies for coping with blatant criticisms of my electroacoustic compositions in order to preserve my own belief in their strengths and worthiness. I held an underlying, naïve expectation when I entered the initial stages of testing the electroacoustic compositions that participating
patients would be instantaneously immersed in and becalmed by the listening experience. So, the undisguised criticisms I received were a dent to the conviction I felt in the compositions. I also felt an attachment to Dr Samartzis soundscape compositions and similar sensitivity to some dismissive feedback his compositions sustained. I developed an immunity and ‘thick skin’ to the criticisms but I simultaneously realised that I had to absorb the criticisms in order to remain engaged in the testing process without cultivating any bias or bitterness concerning the responses. It occurred to me that a straightforward way to combat patient criticisms was to hone my bedside manner with patients so as to appear unaffected by their negative responses and disapproval of the electroacoustic compositions. I found it simple to engage patients in a sensitive and sympathetic manner while gently encouraging them to concentrate on listening and the compositions. This gentle bedside engagement with patients felt almost like ‘second nature’ to me and grew seamlessly out of the methods of communication I had developed over the course of testing in the Emergency Department and especially through the gentle approach I had developed to encourage patients to participate in the trial. In retrospect I see this desire to adapt to the needs of strangers in a community situation as a substantial personal outcome of the Designing Sound for Health and Wellbeing project.

Another major outcome of Designing Sound for Health and Wellbeing occurred through the success of the electroacoustic and soundscape compositions in reducing levels of anxiety amongst Emergency Department patients. This outcome illustrates that rigorously composed and refined musical and sound compositions can be used in public forums where a range of participants from broad social and ethnic backgrounds and can be an active ingredient in improving their wellbeing while encouraging engagement between areas of community life not traditionally seen as intertwined. As a result the outcomes of Designing Sound for Health and Wellbeing illustrate that rarified arts practices need not be confined to more traditional venues such as, art galleries, performance spaces and theatres and can in turn act as catalysts for breaking down entrenched expectations that restrict the roles and functions of arts practices, including sound and musical artworks by confining them to the venues that traditionally support them.
7.3 Recommendations.

As the human interface between the Designing Sound for Health and Wellbeing project and Emergency department patients at St Vincent’s Hospital during Phase Two and Phase Three of the trial, I had the unique opportunity to observe patient reactions to all facets of the trial. It appeared that patients were universally discouraged from participation to varying degrees by the complexity and length of the patient consent and questionnaire process. The first element of the trial, the patient consent form proved a particular sticking point with patients because of its complexity, and at six pages, its overly long structure. The consent form seemed to be an endurance test and beyond most patients comprehension particularly in the case of patients who were experiencing severe discomfort or exhaustion from their medical conditions. It appeared to me that the patient consent and questionnaire process was at crossed purposes with the aims and desired outcomes of Designing Sound for Health and Wellbeing. Why compose highly refined musical and sound compositions specifically designed to relax patients and reduce their levels of stress and anxiety and then, as the first stage of gauging the compositions effectiveness, expose patients to a consent and questionnaire process that appeared to distress patients and raise their anxiety levels.

For future research projects undertaken in an Emergency Department I recommend reducing the workload for patients during the initial exchanges between researchers and participants. It appears that the patient consent component would be the most suitable to prune as it is not as integral to the research outcomes in comparison to the questionnaire component. To put this in context, I also observed that both questionnaire stages (Phase Two and Three) of the Designing Sound for Health and Wellbeing project were so repetitive in structure that they also negatively impacted upon the ability of Emergency Department patients to remain engaged and concentrate across the duration of their involvement. Perhaps a shorter patient consent component would alleviate this problem of patients waning engagement.

I found the liaison between myself, as a researcher in the Emergency Department and the nursing and medical staff a difficult relationship to foster or sustain, although the nursing staff were generally more approachable and inquisitive about the project than the medical staff. Even though the research team held educational forums with both
nursing and medical staff, I had to regularly explain the project and my role within it to staff as I worked in the Emergency Department. This may have been partially due to the high turnover of staff along with regular shift changes for staff. I recommend that for future research projects in the Emergency Department, where researcher and staff interactions are frequent and essential, that a more thorough and regularly reiterated procedure for educating and updating medical and nursing staff is instigated. I also came to realise that there needed to be a more hands on involvement and awareness of the research project from the medical staff. As a result of this I recommend that for future research projects a member of the medical staff would ideally be recruited to take an active role in decisions about patient suitability, availability and recruitment. This medical staff recruit could also act as project ambassador with an investment in the research project that assures medical and nursing staff were educated about the methodology and tenure of the project and what requirements would be expected of staff members in general.

As a researcher in the Emergency Department the recommended method of deducing patient availability and suitability to participate in Designing Sound for Health and Wellbeing was through consultation of the St Vincent’s Hospital Emergency Department electronic database (PAZ). The information on the PAZ database showed patient details such as their locations throughout the Emergency Department cubicles, details of the reason for their visit, time elapsed since arrival and some diagnostic and treatment details. Although I mastered this patient selection method to a sufficient degree I also felt unqualified to interpret patient data, because the database displayed it in unfamiliar abbreviations, acronyms and medical terms that were largely indecipherable to me. Also with computer availability at a premium in the hectic Emergency Department I frequently found it difficult to locate an unengaged computer terminal and as a result my ability to examine data to determine patient suitability was delayed. A project ambassador selected from among the medical staff would be ideal to assist a researcher with interpretation of PAZ data and could also make recommendations about patient suitability and aid the recruitment of other staff members to assist with decision making tasks.

As the clinical results of Designing Sound for Health and Wellbeing illustrate (significant reduction of patient stress and anxiety levels), the study has opened a path for further
purposely designed musical and sound compositions to be developed for specific medical and community settings. I recommend that St Vincent’s Hospital endeavour to secure significant funding to finance, commission and develop a collection of additional musical and sound compositions designed for the Emergency Department based on the compositional discoveries of the project. In addition, I recommend that St Vincent’s Hospital also develop infrastructure to diffuse the compositions electronically to the treatment cubicles throughout the Emergency Department through the use of a computer based or radio broadcast system and offer patients headphones and a bedside module to select from a variety of musical and sound compositions designed to distract and relax patients. The compositions could be offered to Emergency Department patients by nursing staff as an alternative treatment method to pharmaceutical interventions and similarly help relax patients, assist with raising pain tolerance thresholds and reduce anxiety levels.

I believe the *Designing Sound for Health and Wellbeing* project will play an important role in expanding the body of research that investigates the role of the arts in health and specifically the efficacy of music and sound to improve the hospital experiences of Emergency Department patients.

Finally, I hope that my research for *Designing Sound for Health and Wellbeing* will act as an encouragement to other musicians and composers to undertake musical projects in milieus’ outside their habitual comfort zones with the benefits being, a broadening of their artistic vocabularies and the growth in acceptance and practical application of rarefied musical and sound practices in groundbreaking community settings.
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Appendix 1

Complete list of one-minute compositions developed during Phase One of the research project.

01  **Guitar chords**
Series of two and three note guitar chords with atmospheric embellishments.

02  **Guitar scrapes***
Sounds generated predominately from plectrums scraping on guitar strings with accentuated panning of these sounds and bass drum punctuations.

03  **Guitar scrapes with metal-egg percussion**
Sounds generated predominately from plectrums scraping on guitar strings with metallic textural percussion.

04  **Bells**
Shifting chords constructed from the sounds of a fruit bowl and alarm bells.

05  **Clean guitar with 2 note chords**
Guitar chords constructed by overdubbing individual guitar notes upon each other.

06  **Amplified guitar with 2 note chords**
Guitar chords constructed by overdubbing slightly distorted guitar notes with accompanying small bell percussion.

07  **Chord organ, pulsing drone**
Sustained organ chord with pulsing beat frequencies.

08  **Chromatic harmonica, melodic**
Alternating melodic harmonica passages with sustained trills and distant organ chord.

09  **Processed harmonica**
Pulsing harmonica notes with dramatic shifts in pitch.
10. **Gongs 2, sparse high chords**
Sparse high register gong sounds that occasionally form chords.

11. **Gongs 3, sparse soft attack**
Gong chords with the attacks removed so that each chord enters gently.

12. **Gongs 4, busy with organ**
Burmese gong chords that trigger short sustained organ chords.

13. **Pianorgan hi chord drone**
Chord organ drone that crescendos and then falls away.

14. **Organ and percussion**
Chord organ drone with short textural bursts of percussion saturated with reverb.

15. **Steel string, blues theme**
Repetitive, melodic chord progression on acoustic guitar.

16. **Steel string guitar 2**
Intermittent short guitar passages with atmospheric accompaniment constructed from featured guitar notes.

17. **Nylon string, low melodic**
Repetitive, low register, melodic guitar passages.

18. **Nylon string, high melodic**
Repetitive, high register, melodic guitar passages.

19. **Nylon string drone**
Melodic nylon string guitar passages accompanied by watery pulses, high sine wave-like drones and Indian bell sounds.

20. **Nylon string loops and gongs**
Intermittent nylon string guitar melodic phrases triggered by chords derived from multiple gong tones, the whole enveloped in atmospheric loops.
21  *Eukolin and electric guitar*  
Composition in two halves with discordant Eukolin chords, bass drum and percussive textures followed by a distorted blues-style, electric guitar resolution.

22  *Bass guitar and tambourine*  
Snare and bass drum phrases conduct bass guitar chords and phrases with textural tambourine interludes.

23  *Percussion, bass and sax*  
Theatrical marching drum figure with intermittent bass guitar notes and melodies, complemented by synthesizer drones and soprano sax melodies in the second half.

24  *Bass swells and synth*  
Pulsing and swelling chords constructed from multiple individual bass guitar notes with an organ-like tone, punctuated by percussive synthesizer notes.

25  *Bass swells and mini guitar*  
Bass guitar chords that swell and are accompanied by textural, percussive guitar and hand bells.

26  *Backwards guitar and wood*  
Distorted electric guitar chord progression followed by linear, backwards, melodic guitar complimented by wooden percussion.

27  *Backwards saxophone and synth*  
Backwards soprano saxophone melodies alongside pulsing atmospheres generated from a selection of saxophone notes.

28  *Noise*  
Drone-like passage of white noise textures with accentuated bass frequencies.

* The 10 titles marked with asterisks denote those one-minute compositions that were selected for testing in Phase Two of the project.
Appendix 2

Publications, conferences, seminar presentations, awards and reports.

Publications


Conferences and seminars


Awards

Keely Macarow, Philip Samartzis and Tracey Weiland were awarded The Arts and Health Australia Award for Excellence 2010 in Arts and Health in Primary and Acute Care for Designing Sound for Health and Wellbeing (2010).

Elizabeth Grierson, Philip Samartzis, Keely Macarow, Andrew Dent, George Jelinek and Tracey Weiland were awarded an RMIT University Research Award for Designing Sound for Health and Wellbeing (2007).

Reports

Appendix 3

Editor's Choice

HTML One more (editorial) for the road

Editorials

HTML Not much need for ambulatory blood pressure monitoring
A risk-based approach could take the pressure down

HTML Dog bites in Australian children
Dogs aren’t the only ones who need training

HTML 2011: the trifecta
Recapping a busy and productive year at the MJA

In brief

PDF From the Australian Commission on Safety and Quality in Health Care
PDF News

Perspectives

HTML Reducing farm injury deaths through regulation
We should not roll over to quad bike manufacturers

HTML Medication to prevent breast cancer — too much to swallow?
We have effective drugs, so why aren’t they being used?

HTML What’s in a name? Brand name confusion and generic medicines
Marketing is muddying the waters

HTML Closing the Gap and Indigenous housing
We need to build more than just infrastructure

HTML Complementary medicine use in cardiovascular disease: a clinician’s viewpoint
Not such a safe alternative after all

HTML Doctors and global health: tips for medical students and junior doctors
Want to make your mark on the world?
Alcohol tax reform: now is the time

Is it ethical for medical practitioners to prescribe alternative and complementary treatments that may lack an evidence base?

Neonatal vitamin D supplementation: are the protocols getting ahead of the evidence?

Distance to the closest radiotherapy facility and survival after a diagnosis of rectal cancer in Queensland

The dangers of dogma in medicine

Clinical Focus

Australian guideline for treatment of problem gambling: an abridged outline
A review of the evidence reveals how to best beat the odds

Research

The health impacts of khat: a qualitative study among Somali-Australians
Chewing the khat: let’s spread the word about this not-so-harmless leaf

Secular changes in sleep duration among Australian adults, 1992–2006
Are we really sleeping less?

Animal bites and rabies exposure in Australian travellers
A call to boost travel vaccinations

Drug interaction alerts in software — what do general practitioners and pharmacists want?
A timely message to the clinical software industry

Funding for mental health research: the gap remains
Let’s grant a fairer slice of the pie to mental health

The effects of early paternal depression on children’s development
Dad needs to be happy too

Effect of the increase in “alcopops” tax on alcohol-related harms in young people: a controlled interrupted time series
New laws fail to make a dent in dangerous drinking
Original sound compositions reduce anxiety in emergency department patients: a randomised controlled trial

Turning down the volume on anxiety

Determining priority for joint replacement: comparing the views of orthopaedic surgeons and other professionals
Physical pain or psychological pain — which should take priority?

Case reports

Propeller and jet-ski injuries during Christmas and New Year in Western Australia
We need to improve public awareness of the risks

Penetrating eye injury from a crayfish antenna
A mystery aetiology unravelled

Orbital sinker — Snapshot
What happens when two round objects collide?

Stab in the dark — Snapshot
The case for digging a little deeper

Birthmarks: phacomatosis pigmentovascularis — Snapshot
Extensive capillary malformation makes its mark

Reflections

The humbug syndrome
Seasonal syndrome alert: observational studies suggest medical practitioners severely affected

Weather to evacuate? — History
How to empty a hospital before wild winds hit

Fit for purpose: Australia’s National Fitness Campaign — History
Federal fitness campaigns come and go but the message remains the same

Register of reported cases of leprosy
An artefact of medical history salvaged

Sexually transmitted infections. 3rd ed — Book review

Fast facts: chronic and cancer pain. 2nd ed — Book review

Disaster medicine — Book review
From Kurmond kid to cancer crusader. Pioneering integrated cancer treatment — Book review

Christmas crackers

Mushroom poisoning: a personal vignette — Perspective
Don't try this at home

The Telco Coma Scale — Letter
Dial N for neurological assessment of phone-addicted teens

Wife carrying for health — Research
Winner's wife turns into keg at the Finnish

Housing, health, heroes and philanthropy: Australia's Healthabitat wins the 2011 World Habitat Award — Reflection
Indigenous housing initiative edges out global entrants — and inspires hope for indigenous health

The glass stethoscope — History
A fond look at the instrument's formative years

Bibliophiles beware — a light-hearted look at book collecting
A firsthand encounter with Penguinius collectionavidus

Two visitors from the nether world?
When physiological explanations falter

How to make a tuning fork vibrate: the humble pisiform bone
How do you get your buzz?

Grief and the medical referral
Having a patient referred to you by the ED can be grief-inducing
Original sound compositions reduce anxiety in emergency department patients: a randomised controlled trial

Emergency departments (EDs) can provoke anxiety among patients. There have been few trials of interventions that might reduce this anxiety. Although live performance has positive effects on patients and staff, incorporating live music in busy EDs is unrealistic.

Several auditory interventions can modify patients' anxiety in hospital. The positive effect of music on anxiety has been well demonstrated. A review of 42 randomised controlled trials found that about half of them showed that music was effective in reducing perioperative pain and anxiety. Reduced preoperative anxiety has also been associated with audio featuring binaural beats, which are apparent sounds perceived independently of physical stimuli. Binaural beats are perceived when two sounds of similar but slightly different frequencies are presented separately to each ear and produce two apparent new frequencies — the sum and the difference of the original two sounds. This is an auditory brainstem response to the difference in amplitude of the original two tones. Binaural beat may induce a meditative-like state and also reduce chronic anxiety.

Only a few studies have explored the impact of music on anxiety in the ED setting. Music therapy has been shown to alleviate anxiety among adults accompanying children to the ED but not among adults undergoing laceration repair. One pilot study showed reduced pain among ED patients, and others showed some benefit on self-rated stress and noise disturbance. No study has investigated possible amelioric effects of sound interventions or binaural beat among adult ED patients.

We conducted a randomised controlled trial to investigate whether emergency patients' self-rated levels of anxiety were affected by exposure to purpose-designed musical compositions and non-musical environmental sound recordings with and without embedded binaural beat.

Objective: To determine whether emergency department (ED) patients' self-rated levels of anxiety are affected by exposure to purpose-designed musical or sound compositions with and without the audio frequencies of embedded binaural beat.

Design, setting and participants: Randomised controlled trial in an ED between 1 February 2010 and 14 April 2010 among a convenience sample of adult patients who were rated as category 3 on the Australasian Triage Scale.

Interventions: All interventions involved listening to soundtracks of 20 minutes' duration that were purpose-designed by composers and sound-recording artists. Participants were allocated at random to one of five groups: headphones and iPod only, no soundtrack (control group); reconstructed ambient noise simulating an ED but free of clear verbalisations; electroacoustic musical composition; composed non-musical soundtracks derived from audio field recordings obtained from natural and constructed settings; sound composition of audio field recordings with embedded binaural beat. All soundtracks were presented on an iPod through headphones. Patients and researchers were blinded to allocation until interventions were administered. State—trait anxiety was self-assessed before the intervention and state anxiety was self-assessed again 20 minutes after the provision of the soundtrack.

Outcome measures: Spielberger State—Trait Anxiety Inventory.

Results: Of 291 patients assessed for eligibility, 170 patients completed the pre-intervention anxiety self-assessment and 169 completed the post-intervention assessment. Significant decreases (all P < 0.001) in anxiety level were observed among patients exposed to the electroacoustic musical composition (pre-intervention mean 39; post-intervention mean 34), audio field recordings (42; 35) or audio field recordings with embedded binaural beats (43; 37) when compared with those allocated to receive simulated ED ambient noise (40; 41) or headphones only (44; 44).

Conclusion: In moderately anxious ED patients, state anxiety was reduced by 10%—15% following exposure to purpose-designed sound interventions.

Trial registration: Australian New Zealand Clinical Trials Registry ACTRN 12608000444381.

Methods

Tool development

Sound compositions were developed in studios at RMIT University. Ambient noise recordings, composition testing, and the clinical study were conducted in the ED at St Vincent's Hospital, Melbourne (SVHM). SVHM is an adult tertiary referral hospital on the fringe of the central business district of Melbourne, with about 40,000 ED attendances annually.

Using the results of a preliminary study to determine patients' listening preferences (Box 1), four 20-minute sound recordings were created:

- Electroacoustic musical composition:
- Sound compositions from audio field recordings of natural and constructed settings;
- Sound compositions from audio field recordings obtained from natural settings with embedded binaural beat;
- Reconstructed ambient noise simulating the ED but free of clear verbalisations.

Use of specific sounds, instruments, tempo, dynamics and timbre for both the electroacoustic composition and the audio field recordings were based on feedback from patients in the preliminary study, the composer's aesthetic judgements and feedback from fellow investigators. The electroacoustic musical composition used software-based electronic processing to transform a variety of sounds produced by melodic and percussion instruments. Audio field recordings included sounds of bellbirds, cocka-
Research

1 Preliminary study

In a preliminary study, ten 60-second electroacoustic soundtracks, and ten 60-second composed environmental soundtracks were created. For electroacoustic soundtracks, decisions regarding the inclusion of sounds, instruments, tempo, dynamics and timbre were based on the composer's aesthetic judgements and feedback from fellow researchers—for example, what they liked and what they found relaxing. Environmental soundtracks were created, arranged and mixed to reflect the acoustic and spatial complexities of regional and urban environments, including natural bush habitats, farms, city streets, the beach and factories.

One hundred emergency department patients were recruited using convenience sampling. Patients aged 18 years or over were eligible if they presented between 9 am and 6 pm on weekdays during the data collection period. The brief tracks were played to patients on iPods through headphones. The play order was random. Participants were administered a purpose-designed survey about their usual listening preferences and their responses to the sound compositions (by rating the extent to which each track evoked each of ten emotions). Before the patient listened to the tracks, the researcher demonstrated use of the iPod, and participants were encouraged to pause between each track to answer the survey.

...toos, bullfrogs, green frogs, a glacial stream, footsteps on snow, trees blowing in the wind, water in a lake, sailing-boat masts, crickets, and rain on a tin roof.

The binaural beat was embedded into the background of the audio field recordings. We constructed binaural beat audio using two digital sine-tone generators at 200 Hz and 212 Hz. To alter the depth of the meditative state, the interval between generators was reduced by 2 Hz during the course of the composition until a 4 Hz frequency difference was achieved, gradually increasing to 10 Hz over the final movement of the composition.

To construct the ambient soundtrack, the ED was analysed for key sounds to determine the range of sounds occurring within daily operation. Closed-field condenser microphones captured specific sounds such as air conditioning, fluorescent lights, telephones, computers, specialist medical equipment, etc. This type of microphone did not record anything in close proximity (such as human voices). Additional sounds generated by staff, such as footsteps, were later re-created in a studio.

Participants

Patients were eligible to participate if they were > 18 years of age and were classified on arrival in the ED as category 3 according to the Australasian Triage Scale (ATS)13—that is, patients with an acuity level indicating they required medical assessment within 30 minutes. Participation was restricted to these patients to maximise homogeneity in the sample. Participants were excluded if they had a hearing impairment, did not speak English or were unable to give informed consent (eg, cognitively impaired or highly care-dependent patients). No attempt was made to specifically recruit patients who were anxious.

Main outcome measure

Patients’ anxiety levels were self-reported as measured by the Spielberger State–Trait Anxiety Inventory (STAI),14 a 40-item self-report measure containing 20 items measuring state anxiety (anxiety experienced at that moment) and 20 measuring trait anxiety (usual level of anxiety). Scores for state and trait components each range from 20 to 80, with a higher score corresponding to higher anxiety. This scale is the most widely validated anxiety scale.15

Procedure

Between 1 February 2010 and 14 April 2010, one of us (DMB) and another researcher recruited participants between 9 am and 6 pm on weekdays. Category 3 patients were identified using the ED administration system. After each patient was allocated to a cubicle, had an initial medical assessment and gave consent he or she was given the STAI to self-administer (state and trait components). We used a computer-generated block-randomisation sequence (administered by a non-recruiting researcher). Participants and researchers were blinded to allocation until interventions were administered. Allocations were concealed using opaque paper, folded and stapled to data collection instruments. Removal of the paper revealed the allocation. Participants were allocated at random to one of five groups:

- no soundtrack intervention, headphones only (control group);
- reconstructed ambient noise simulating ED noise but free of clear verbalisations;
- electroacoustic musical composition;
- composed non-musical audio field recordings;
- combination of audio field recordings with embedded binaural beat.

Participants were asked to listen to the soundtrack through headphones attached to an iPod. Soundtracks were played through semi-open professional headphones (AKG, k121 studio; Harman International, Stamford, Conn, USA). The headphones were covered with disposable sanitary covers (SSL-3-100; Scan Sound Inc, Deerfield Beach, Fla, USA) for each listener. Headphones and iPods were wiped with alcohol. Patients in the control group wore headphones attached to an iPod but did not hear a soundtrack. The researcher recorded the duration of listening or headphone wearing. Medical and nursing assessment and management took precedence over any study activity. The listening was sometimes interrupted for treatment. Staff were advised to carry on as normal, interrupting patients if they normally would do so. Regardless of the actual listening duration, the STAI (state component) was readministered 20 minutes after the provision of the soundtracks, thereby keeping exposure time consistent. Neither participants nor researchers were blinded to allocation at the post-intervention assessment of outcomes.

We recorded participants' receipt of analgesia before or during the study. Basic patient demographics (age, sex, country of birth, presenting complaint) were recorded to determine whether the sample was representative of the broader population of category 3 patients.

This study was approved by the Human Research Ethics Committee at SVHM.

Data analysis

We analysed data using SPSS version 15.0 (SPSS Inc, Chicago, Ill, USA) using an intention-to-treat approach. We used descriptive statistics including frequencies, percentages, measures of central tendency and cross.
2 Recruitment, randomisation and retention of patients throughout the trial

Excluded (n = 116)
- Non-cognisant: 11
- Refused consent: 84
- In isolation: 4
- Hearing impaired: 1
- Tested on previous visit: 2
- Unable to communicate in English: 14

Provided consent (n = 175)

Completed baseline anxiety self-assessment (n = 170)

Allocated to intervention (n = 170)

No soundtrack intervention, iPod and headphones only (control group) (n = 34)
- Completed listening: 14

Reconstructed ambient noise simulating an ED (n = 34)
- Completed listening: 29

Electroacoustic musical composition (n = 34)
- Completed listening: 29

Composed non-musical soundtracks derived from audio field recordings (n = 34)
- Completed listening: 26

Composed non-musical soundtracks derived from audio field recordings + binaural beat (n = 34)
- Completed listening: 26

Completed post-intervention anxiety self-assessment (n = 169)
- Withdrawals: 0
- Incomplete: 1, from electroacoustic composition intervention group

Tabulations. Demographic data were analysed using the Fisher exact test for 2 x 2 cross-tabulations and the independent samples t-test for interval data. Preliminary analyses indicated there was no significant departure from normality. Therefore, data were analysed using repeated measures analysis of variance (ANOVA) to determine any change in anxiety from baseline within each group. Univariate ANOVA was used to compare levels of anxiety for each group after accounting for baseline differences (using percentage difference from baseline). No attempt was made to adjust for multiple comparisons. Alpha was set at 0.05.

Sample size calculation
Our sample size estimate was based on previous studies investigating binaural beat and anxiety using the STAI. With power set at 90%, to detect a difference between means with a two-sided test at a 5% significance level, a sample size of 34 in each group was required (assuming a difference in means of 13% and a common standard deviation of 10%).

Results

Participation
Between 1 February 2010 and 14 April 2010, 291 category 3 patients in the SVHM ED were considered for participation in our study. Of those approached, 84 refused consent, 32 were considered ineligible and 175 consented (Box 2). Five of those who consented failed to complete baseline STAI and were withdrawn. The remaining 170 participants were equally allocated to one of the five interventions (34 per group). There were no violations of allocation protocol; however, one patient did not complete the post-intervention STAI. Those refusing consent did not differ significantly from the sample in terms of

3 Comparison of participants with all patients attending the ED during the study period and classified as category 3 on the ATS

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sample (n = 170)</th>
<th>Eligible* (n = 3117)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median age in years (range)</td>
<td>52 (35–69)</td>
<td>47 (30–70)</td>
</tr>
<tr>
<td>Men (no. [%])</td>
<td>93 (54.7%)</td>
<td>1078 (58.3%)</td>
</tr>
<tr>
<td>Country of birth Australia (no. [%])</td>
<td>110 (65.9%)</td>
<td>1018 (58.3%)</td>
</tr>
<tr>
<td>Modal presenting complaint</td>
<td>Abdominal pain</td>
<td>Abdominal pain</td>
</tr>
</tbody>
</table>

ATS = Australian Triage Scale. ED = emergency department. *2.9% required an interpreter.
of age, sex, Australian country of birth, or modal presenting complaint.

Demographics and clinical data

The demographic characteristics of the final sample were comparable to all other patients who would have been eligible to participate based on ATS code (Box 3). Sixty-nine percent (118) of participants required pain relief during their ED stay. No significant differences were found between any groups in terms of age, sex or pain relief required. Participants had a broad range of presenting complaints (Box 4).

State anxiety

There was a significant interaction effect between time and intervention \( F(4,146) = 6.28; P < 0.001 \), indicating a change over time in some, but not all, of the intervention groups. Pairwise comparison based on mean total state anxiety levels (Box 5) revealed a significant decrease in anxiety (post-intervention mean compared with pre-intervention mean) among participants listening to the electroacoustic composition \( P = 0.001 \), composed audio field recordings \( P = 0.001 \), and composed audio field recordings + binaural beat \( P < 0.001 \). When compared with each other, these same three groups showed no significant difference in post-intervention mean level of anxiety.

After accounting for baseline anxiety levels, significant differences were observed between groups, with those allocated to receive the electroacoustic composition, composed audio field recordings, or composed audio field recordings + binaural beat reporting significantly lower levels of anxiety after the intervention compared with those in the control group and the group listening to simulated ED sound (Box 6). These effects were unchanged after controlling for provision of pain relief.

Trait anxiety

Mean trait anxiety did not differ significantly between groups and ranged from low to moderate (Box 7).

Discussion

Our study is the first randomised controlled trial to show that sound compositions decrease anxiety in adult ED patients. We showed that the baseline level of anxiety in patients in the mid range of urgency in an Australian ED was moderate at baseline. Mean normal state anxiety scores have previously been reported as 35.7 for men and 35.2 for women. In our study, they ranged between 39.9 and 43.7 for the five groups, indicating moderate anxiety. Mean anxiety was significantly reduced among patients who listened to electroacoustic music, audio field recordings or audio field recordings with embedded binaural beat, to between 33.7 and 36.9—a level of low or low anxiety. The statistically significant effect size of about 10%—15% was felt to be clinically significant as well. We did not investigate whether the effect persisted beyond the post-intervention assessment or was transient. The control group and the participants who listened to simulated ED sounds remained moderately anxious after the intervention.

A previous study using music during laceration repair in a Pittsburgh ED showed that listening was associated with reduced pain but not reduced anxiety. In that study, participants chose the artist and style of music. In contrast, our study used highly original compositions developed by experienced musicians and composers, and we did not record particular anxiety-provoking activities experienced by our patients, who received usual ED care and procedures for category 3 patients. Such patients are typically quite unwell and undergo many investigations and procedures. Our results indicate that these patients gained considerable relief from anxiety by listening to sound compositions and raise the possibility that such original compositions are more effective in alleviating anxiety than simply listening to well-known music. This should be explored in future research.

We found that binaural beat provided no additional anxiety reduction over audio field recordings alone, in contrast with the 26% reduction in preoperative anxiety observed elsewhere. This raises the possibility that binaural beat is less effective in the busy ED environment than in the quiet preoperative area.

As we had no previous experience of applying binaural beat audio to soundtracks, it is possible that this intervention was not delivered appro-
prisitely, although we followed standard advice in programming. As we only tested these interventions on ATS category 3 patients who had received medical assessment in the ED, we cannot generalise our findings to all ED patients, including those with illness or injury of a different severity, or those who presented outside the hours of recruitment. It is possible that patients requiring more urgent treatment, who are presumably more anxious, might not derive similar benefits.

A potential limitation of this study is the use of the STAI. At a total length of 40 items (20 state, 20 trait), the length of the scale may limit its clinical utility in the ED. Although a 6-item short version of the STAI exists, the validity in a broad range of clinical samples was unknown at the time we began the study. Nonetheless, only five patients (2.9%) failed to complete the pre-intervention STAI.

The use of randomised controlled trial methodology precluded allowing patients to choose preferred or familiar sounds. Although sound preference and familiarity are important factors in the efficacy of sounds to relieve anxiety, this has not always been observed.

Our findings have important implications for emergency medicine. Original sound compositions delivered in EDs can significantly reduce the anxiety of patients waiting for further management in this busy environment.

Acknowledgements: This study was supported by the Australian Research Council Linkage Project's funding scheme (project number LP0991346), project title ‘Designing sound for health and wellbeing’. David Brown received support in the form of research assistance from St Vincent’s Hospital, Melbourne. We acknowledge the work of the late Associate Professor Andrew Davis who was instrumental in the development of this study. Competing interests: No relevant disclosures.

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Appendix 4

Journal of Applied Arts & Health

Volume 2 Number 3
AIMS & SCOPE

Journal of Applied Arts & Health intends to serve a wide community of artists, researchers, practitioners and policy-makers evidencing the effectiveness of the interdisciplinary use of arts in health and arts for health. It provides a forum for the publication and debate within an interdisciplinary field of arts in healthcare and health promotion. The journal defines ‘health’ broadly, to include physical, mental, emotional, spiritual, occupational, social and community health.

The journal provides artists, researchers, healthcare professionals, educators, therapists, programme administrators and funding bodies with an opportunity to report and reflect upon innovative, effective practices. The effectiveness of applied arts practices is currently under-researched and this journal provides a vehicle for high quality scholarly activity. The journal embraces contributions of an international dimension.
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EDITORIAL

ROSS W. PRIOR
Principal Editor

Welcome to Volume 2: 3 of the Journal of Applied Arts & Health (JAAH).

In August 2011 the WHO Regional Committee for Europe published the ‘Interim second report on social determinants of health and the health divide in the WHO European Region’ (World Health Organization Regional Office for Europe 2011). Noticeably within this report there is no reference to the role that the arts play within the area of health and well-being. Zsuzsanna Jakab, WHO Regional Director for Europe, says in the preface of the report:

Health is a key and unique resource for the European Region of today and tomorrow. It is a resource that must be nurtured. It is a resource that is much needed and that will help Europe to be more united and stronger in dealing with its present economic and social difficulties. Can we perform better in promoting health in the European Region? Can we reduce health inequities by levelling up the health status of the weakest segments of our population and across the social gradient? Can we, with our efforts to promote population health, provide added value to the social, economic and human development of our countries, regions and cities? I firmly believe that we can.

(p. iii)

Regrettably what follows these encouraging words is complete inattention to creative arts practices that are being undertaken throughout Europe either in response to health and well-being issues or occur without imperative that assist in benefiting individuals and societies. Within the report, reference is made to ‘small-scale intersectoral projects and initiatives’ although again no specific reference is made to the contribution of the arts:

Strategies to deliver systematic joint action on major public health priorities such as non-communicable diseases or social inequity in
health have proliferated. Small-scale demonstration projects are useful for testing what works, but their impact is limited unless they are part of a broader commitment to scale up learning across the systems that promote and protect public health. This was one of the clear messages from *Fair society, healthy lives* (8), the analysis of existing and previous policies in England. High-level ministerial support is key to the success of intersectoral planning and action, but ensuring participation from various institutions with different institutional cultures, objectives and experiences cannot depend on presidential or ministerial will alone. Technical and political leadership should be accompanied by objectives and goals shared and understood across the workforce. This requires ongoing support to building the knowledge, skills and tools and developing the leadership potential of those in key roles. This is essential to ensure that relevant policies and initiatives are taken forward across all sectors that have the potential to affect the social determinants of health. This requires both advocacy around mainstream policies and effective partnership work on joint projects. The governance and delivery systems task group and the WHO governance review will cover these issues, which will feed into this review and into Health 2020.

The report does address the issue of evidence and this is particularly welcomed by *JAAH*. The report acknowledges that the evidence base for measurement and action has advanced considerably in the last decade. However, the Measurement and Evidence Knowledge Network of the Commission on Social Determinants of Health identified six problems that make developing the evidence base on the social determinants of health potentially difficult:

- lack of precision in specifying causal pathways;
- conflating the causes of health improvement with the causes of health inequalities;
- lack of clarity about health gradients and health gaps;
- inadequacies in the descriptions of axes of social differentiation in populations;
- the impact of context on interpreting evidence and on the concepts used to gather evidence; and
- problems in translating knowledge into action (21).

They also made the case for methodological diversity in building the evidence base for action on social determinants of health to ensure that all relevant knowledge can be collected and learning from practice in a systematic way (22): “... much can be gleaned from the tacit knowledge of practitioners about how things work by supporting them to document the processes that lead to effective delivery of social interventions”.

Researchers may find these useful points of reference when conducting their own projects and find possible solutions to developing the ‘evidence base’. Indeed questioning some of the assumptions that underpin what actually constitutes ‘evidence’ must be further interrogated and questioned.

Subsequent to the publishing of this report the Marmot Review team has been commissioned and launched a consultation on the social determinants of health.
of health in Europe. The review looks at health inequalities within and between different European countries in the World Health Organisation (WHO) region. \textit{JAAL} and others have lodged concerns over the lost opportunity by omitting the arts within the report and the likely omission of the arts within future strategy. We await the findings.

Volume 2:3 of \textit{JAAL} again represents a broad range of innovative projects from around the world that present us with strong cases to not only advocate for the role of the arts but also to acknowledge the very real contribution that the arts are making to personal and public health and well-being.

The first article by Keely Macarow and colleagues ‘Designing sound for health and well-being in emergency care settings’ is a fascinating and timely case study examining how applied art, music and sound research and inter-disciplinary collaborations can positively benefit hospital communities and engender a practice of non-invasive, non-chemical interventions to relieve patient stress and anxiety. The second article ‘An arts-based approach to co-facilitation of a theatre programme for teenagers with acquired brain injury’ by Julia Gray et al. documents an innovative theatre programme for adolescents with acquired brain injury that found suitable ways of working with these participants. David Grant et al. in their article ‘Coping with the challenges of caring for older people with dementia’ report on a multi-arts project that involved creative artists working with older people with dementia. The article finds the use of a documentary-style film text successful in capturing and translating the ‘live experience’. Jennie Norfield and Sanna Nordin-Bates’ article ‘Holistic approach to integrating arts and health care practice for community dance’ explores the relationship between community dance and the importance of promoting task-involving climates. Katinka Tuisku et al. reveal the association between the frequency and type of cultural leisure activities and well-being and creativity at work in their article ‘Cultural leisure activities and well-being at work: A study among health care professionals’.

The new results support cultural activities as a possible empowering factor in occupational well-being among health care professionals.

In the Notes from the field section we have four fascinating and varied reports. The first is by Katie Beswick entitled ‘A place for opportunity: The Block’, representing the council estate in a youth theatre setting’ explores issues surrounding the representation of contested place by looking at the links between a Council Estate in Britain and social well-being. The next article is by Zoe Zontou ‘Applied theatre as an “Alternative Substance”: Reflections from an applied theatre project with people in recovery from alcohol and drug dependency’.

The title suggests this article explores how applied theatre has the potential to have a positive impact on problem drug and alcohol users. Theatre for a change in Malawi: Participatory approaches to development’ by Matthew Hahn explores a theatre company’s use of innovative strategies to empower vulnerable and marginalized groups through positive behaviour change and advocacy of gender and sexual equality in specific communities within Malawi. The final article is by Emily Lebowitz and Chandra Reber entitled ‘The union of the expressive arts and Dialectical Behaviour Therapy with adolescents presenting with traits of Borderline Personality Disorder in a residential setting’ and documents the journey of expressive arts-based Dialectical Behaviour Therapy groups with adolescent females struggling with Borderline Personality Disorder.
Thanks to our hard working team that includes our generous editorial board, Reviews Editor Hayley Singlehurst, and Dr Mitchell Kessak my Associate Editor. The impact this journal has around the world is testament to the credentials of the team and their belief in work that makes a difference to health. It is with great pleasure that I announce a forthcoming special issue of JAAH (3: 1) with inaugural guest editor Professor Shaun McNiff. This exciting issue will bring together innovative practitioners and some leaders in the field of art-based research.

Finally thanks to all our subscribers and readers who make this work worthwhile. JAAH is delighted to be associated with the International Expressive Arts Therapy Association (IEATA) and its active network of members around the world. May the coming year bring you health and happiness.

Here's to your very good health.

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ARTICLES

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Designing sound for health and wellbeing in emergency care settings

Abstract
Medical research and interventions can lead to new discoveries in treating cancer, understanding the human genome or the prevalence of diabetes in emergency department patients. However, practice-based art research in medical settings can also

KEYWORDS
sound
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emergency medicine
stress
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wellbeing
test questions, experiment with ideas and contribute to new knowledge about human health and wellbeing. This article will focus on the sound and emergency medicine project, 'Designing Sound for Health and Wellbeing' as a case study to examine how applied art, music and sound research and interdisciplinary collaborations can benefit hospital communities and engender a practice of non-invasive, non-chemical interventions to relieve patient stress and anxiety. As this project demonstrates, sound art and music does not have to be developed, created and presented for exhibitions and performances alone; it can also have a strategic role in clinical interventions and health care provision.

BACKGROUND

Medical research and interventions can lead to new discoveries in treating cancer, understanding the human genome or the prevalence of diabetes in emergency department patients. However, practice-based art research in medical settings can also test questions, experiment with ideas and contribute to new knowledge about human health and wellbeing. This article will focus on the sound and emergency medicine project, 'Designing Sound for Health and Wellbeing' as a case study to examine how applied art and sound research and interdisciplinary collaborations can benefit hospital communities and engender a practice of non-invasive, non-chemical interventions to relieve patient anxiety.

'Designing Sound for Health and Wellbeing' is a three-year interdisciplinary project funded through an Australian Research Council Linkage grant. From 2008 to 2010, the research team of composers, art producers and art historians, emergency medicine practitioners and health psychology researchers from the School of Art, RMIT University and St Vincent's Hospital Melbourne investigated whether sound compositions of audio field recordings and electroacoustic music can ease the stress and anxiety of patients based in the often difficult environment of a hospital emergency department. St Vincent's Hospital is a tertiary referral hospital located in metropolitan Melbourne. The emergency department sees approximately 40,000 patients a year and serves a diverse population including a disproportionately high number of people from socially disadvantaged groups, elderly people and people affected by drug and alcohol use and mental health issues. The hospital is also a leader in the field of art and health programmes in Australia and has a professional artist residency programme and extensive art collection.

While St Vincent's Hospital is active in the arts and health area, it is one of many hospitals internationally working in the burgeoning field. Researchers have written how visual art exhibitions and musical performances have been presented in hospital and community health settings to enhance the wellbeing of patients, carers and staff (Naughton 2003; Lelchuk Staricoff 2006; White 2009; Parkinson 2009); and of the benefits of integrating artworks, especially designed furniture, and gardens into the design of new hospital buildings (Amaroli 1999; Behman 1997; Cole 1999; Mitchell and Dose 2004). British hospitals such as the Chelsea and Westminster Hospital (London) and the Royal Brompton Hospital (London) have developed major international profiles for their extensive art collections, art commissions, and research of the relationship of art to human health and well-being (Lelchuk Staricoff et al. 2001; Mitchell and Dose 2004). In Australia, Westmead Hospital (Sydney) has run extensive art prizes and art programmes, and commissioned new art works and art for patients' and visitors' wellbeing.
artworks to display throughout the Hospital since it opened in 1978 (Bercy and James 2009). In the United States, a survey conducted in 2007 by the Society for the Arts in Healthcare in partnership with The Joint Commission and Americans for the Arts found that 45% of the 1807 health care organizations surveyed (hospitals, long-term care facilities and palliative care organizations) offered art programmes featuring a range of activities from gardens, displays of visual art and sculpture and performances to staff orchestra and theatre groups (State of the Field Committee 2009: 4). The State of the Field Report: Arts in Healthcare 2009 demonstrates that art in health programmes and projects are becoming more common in US health care settings, with hospitals predominantly offering permanent displays of art (State of the Field Committee 2009: 4). Data from the 2007 survey overwhelmingly demonstrated that health care organizations invested in the arts for ‘patient benefits’ (80%) and to ‘contribute to a healing environment’ (70%) (State of the Field Committee 2009: 6). However, investment in research rated the lowest percentage (almost 10%) in the organizations’ responses (State of the Field Committee 2009: 6). Clearly, further work needs to be initiated by art and medical researchers in US health care settings to encourage and facilitate applied arts and health research and to determine and measure how art practices can inform clinical interventions and the health and well-being of patients. In addition, Dileo and Brack (2009: 179) suggest that the long-term effects on art-based clinical research on participants needs analysis.

In England, the Chelsea and Westminster Hospital is a leading innovator in the collection, exhibition and performance of artworks in a hospital setting. A Study of the Effects of Visual and Performing Arts in Health Care (Lelchuck Staricoff et al. 2004) was undertaken by the Hospital during 1999-2002. For this project, researchers used medical tests (t-cell counts, foetal heart beat monitoring, etc.) to measure responses to the impact of visual and performing arts on patients based in the Medical Day Unit, Antenatal Clinic, High-Risk Clinic, Maternity Unit, Post-Natal Ward, Day Surgery Unit, Trauma and Orthopaedics Ward and HIV/AIDS Services. Staff responses to the integration of visual artworks (which included wall-based artworks, painting and purpose built screens) and live performances of classical, jazz and world music in the Hospital were gauged through evaluation forms (Lelchuck Staricoff et al. 2004). The researchers reported that ‘the results of this research provide the evidence that the integration of visual and performing arts into the health care environment induce psychological, physiological and biological outcomes which could have clinical significance’ (Lelchuck Staricoff et al. 2004: 3). Further, the study concluded that ‘The Integration of the Visual and Performing Arts in Healthcare, induces significant differences in clinical outcomes: Reduces amount of drug consumption; Shortens length of stay in hospital; Improves patient management; Contributes towards increased job satisfaction; Enhances the quality of services’ (Lelchuck Staricoff et al. 2004: 5). While an emergency department was not included in the Chelsea and Westminster Hospital research, the affirmative outcomes of the study suggested that emergency patients could also benefit from exposure to visual art and musical interventions in this busy clinical setting.

Not surprisingly, a visit to the emergency can be a stressful and frightening experience for patients due to acute pain and unclear diagnostic and prognostic information. Patients present with a range of mental and physical symptoms and it may take some time before they are discharged or become an inpatient of the hospital. However, once patients are triaged into the system
they become captive, medicalized bodies waiting for diagnosis, prognosis and decisions by the attending medical staff. As such, emergency departments are highly charged and stressful health settings and patients wait for medical attention in an environment that is loud and daunting. Hence, the sonic cacophony of verbal interactions between medical staff, patients and their carers and family, beeps from medical machinery, low hums from air conditioning and complaints and moans from other patients can also add to the stress and anxiety of patients in this frenetic clinical environment.

Interestingly, clinical research has demonstrated that music has alleviated the stress and anxiety of patients listening to pre-recorded music in day surgery (Leardi et al. 2007), a burns unit (Pratiame et al. 2001), cardiac surgery (Nillson 2008b) a chemotherapy department (Burns et al. 2008) and in patients with chronic obstructive pulmonary disease (Singh et al. 2009). Systematic analytical literature reviews undertaken by researchers suggest that musical interventions can effect the reduction of stress and anxiety in patients located in a range of hospital settings (Gillen et al. 2008; Nillson 2008a; Pelletier 2004). Research has also demonstrated that music interventions have reduced pain in adult cancer patients (Huang et al. 2010) and in children with leukemia, who receive lumbar puncture as a part of their medical procedures (Nguyen et al. 2010). Studies have also discussed a reduction in stress and anxiety levels in patients who have experienced live music in hospital settings (Leluch Sturczkoff et al. 2004; Walworth et al. 2008; White 2009).

A Swedish study into the effectiveness of music and sound on the well-being of patients in a post-anesthesia care unit tested patient responses to music that was designed especially for use in this clinical environment alongside a sound intervention which tested patient responses to the sound of the unit (Fredriksson et al. 2009). The musical intervention (two speakers and a CD player) was contained in a pillow and the composition comprised of different melodies composed of harp, cello and strings with elements of natural sound, e.g. rainforest, birdcalls and falling rain” (Fredriksson et al. 2009: 209). The study tested the music intervention and sound intervention on 44 patients and found that the patients preferred to listen to music rather than the sound of the unit, and that “playing recorded music can be a helpful therapeutic tool to facilitate healing in patients” (Fredriksson et al. 2009: 213).

To our knowledge there appears to be little research into the effect of especially composed sound and musical compositions on emergency department patients. However, in paediatric emergency departments, music therapy has been demonstrated to alleviate anxiety among adults accompanying children (Holm and Fitzmaurice 2008) but does not increase parental participation in distracting children undergoing laceration repair (Sobieraj et al. 2009). A study into the effect of music from pre-recorded and purposely selected playlists of classical, ambient, world music and modern music on a small cohort of fifteen emergency medicine patients in a Sydney hospital also established that the patients who listened to music on playlists on MP3 players over a two-hour period ‘reported feeling better because of the music’ (Short and Ahern 2009: 19). Furthermore, the authors of the study recommended that additional research be conducted of ‘the music tool across a larger population in the ED, in order to obtain a large data set and obtain statistical significance’ (Short and Ahern 2009: 19). Although the Short and Ahern (2009) study was undertaken in a Sydney Hospital to test the impact of pre-recorded music on emergency patients, there appears to be an absence of research into the effect of original music and sound compositions that have been especially composed

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to be tested in clinical settings for emergency medicine patients. This may be due to the challenges involved in undertaking clinical much less applied research in the frenetic environment of emergency departments as they are unbooked hospital units that treat people who present with a range of conditions.

In contrast, the objective for 'Designing Sound for Health and Wellbeing' was to purposefully design musical and sound compositions which would alleviate stress and anxiety levels of patients as they wait for medical attention in the emergency department of St Vincent's Hospital – a busy Melbourne inner city hospital. The focus at the beginning of the research was in composing and testing a suite of short sound compositions on emergency patients to ascertain patient preferences for specific sound and music sequences. Data gained from the early stages of the study were used to determine the compositional strategies for longer compositions that were designed for the final phase of the project. Hence, the aim was to compose and test sound and music compositions on patients and to arrive at a suite of original compositions that would be available to be used as a tool to relax and distract patients during their stay in emergency departments.

PHASES OF THE STUDY

The three-phase study was given ethics clearance by St Vincent's Hospital and included a developmental period in which twenty one-minute sound and music compositions were composed by researchers, Philip Samartzis and David Brown, to test on patients in Phase two of the clinical trial. In Phase one of the study, these researchers composed ten one-minute electroacoustic compositions and ten one-minute sound compositions comprised of audio field recordings from rural and urban environments to ascertain patient preferences of an array of sounds and musical techniques.

In Phase two of the study, the twenty one-minute compositions were tested on a cohort of 100 adult patients, who were triaged with a range of medical conditions from abdominal and chest pain and were waiting for medical attention in emergency. Excluded from the study were patients that did not speak English, or who had cognitive impairment, were highly dependent on care or unable to consent. After indicating their personal music listening history in a patient questionnaire, the patients were given an iPod™ and hygienically sealed headphones to listen to and rate the twenty one-minute electroacoustic music and sound compositions that were stored in a random order on the iPod™ playlist. The patients rated each of the twenty one-minute compositions according to the Spielberger State-Trait Anxiety Inventory (STAI) (Spielberger et al. 1970). The STAI is a 40-item self-report measure that contains twenty items measuring state anxiety (anxiety experienced at that moment) and twenty items measuring trait anxiety (usual level of anxiety). Scores for state and trait components each range from twenty to eighty with a higher score corresponding to higher anxiety levels. This scale is the most widely validated scale of anxiety (Spielberger et al. 1970; Bellinger et al. 1998).

The data gathered from Phase two of the study indicated the recruited patients' preferences were for:

- Steel string acoustic guitar
- Nylon string acoustic guitar
- Organ with percussion
• An audio field recording of a glacial stream recorded in Norway
• An audio field recording of bellbirds from the Snowy River, Australia
• An audio field recording of frogs from Mount Buffalo, Victoria, Australia.

The preferred one-minute compositions were developed into twenty-minute compositions for testing on patients in Phase three of the study. In this phase of the research, four twenty-minute compositions were composed by the researchers for testing on a cohort of 170 patients:

• an electroacoustic composition
• a sound composition with audio field recordings from rural and urban environments
• a sound composition with audio field recordings from rural and urban environments with an embedded binaural beat
• an audio recording (control track) of ambient sounds recorded in the St Vincent’s Hospital Emergency Department.

A non-sound intervention was also included in Phase three of the study. The non-sound intervention was designed to determine how much the listening experience is affected by the wearing of headphones and whether the wearing of headphones was an intervention in itself. This cohort of patients completed a patient experience survey and the patient questionnaire for Phase three of the study (which all patients tested in the trial were also given), but they did not wear headphones or listen to any of the music or sound compositions.

THE SOUND AND MUSIC COMPOSITIONS

Electroacoustic music combines and fuses instrumental recordings with computer-generated audio sequences, textures, sounds and effects. The electroacoustic composition composed for “Designing Sound for Health and Wellbeing” consists of percussion (alarm bells, Burmese gongs, marching bass drum, snare drum and various wooden percussion) and classical nylon acoustic string, folk steel string acoustic guitar, bandura (a Ukrainian zither-like instrument), chord organ, electric bass guitar, electric guitar, eukolian (a mail-order folky zither instrument designed to be bowed or plucked) and computer-generated drone sequences that stretched and manipulated the sound into gentle, languishing, whimsical and echoey sequences. The composition resembles a film soundtrack, with its movement from a warm and placid acoustic guitar and percussion to the textured drone sequences of airy, delicate sounds.

The sound composition (with and without the binaural beat) was composed to resemble an audio journey through a day in a rural setting. The composition takes the listener into an audio rural retreat, commencing with the light touch of bubbling water, crisply recorded to allow for single drips of water to percolate the soundscape and followed by the sounds of birdcall (Australian bellbirds), waterfalls, rain, cicadas, a gate, wind, kookaburras and footsteps trudging through what sounds like grime and mud. This composition suggests a passage of time (and perhaps seasons) and is an intimate journey through wilderness. The composition fuses audio field recordings from Australia and Norway to produce a sonic journey through water and bush landscapes that is soothing, evocative and sensuous.

The decision to embed a binaural beat into one of the sound compositions was to determine whether this extra sonic device would effect the results of the findings, given that binaural beats are widely used in sound recordings used for medical research.
used for meditation purposes to induce a state of deep relaxation. We embedded binaural beats into the sound composition of field recordings as many meditation soundscapes often use the lush sounds of rural landscapes. As a result of this there were two versions of this sound composition used in the study: but only one had binaural beats embedded into the composition.

The sound of footsteps and the hum of voices travel through the audio recording of ambient sounds recorded in the St Vincent’s Hospital Emergency Department. This composition was effectively the control track or placebo for the third phase of the study and was recorded so that patient responses to this audio environment of the emergency department would be included in the study. In this composition the listener hears the rattle of trolleys and equipment, the clatter of falling objects, the banging of patient files, the sound of opening doors and lockers, beeps and hums of machinery and computers, the interference of a hospital announcement and the muted but loud conversations between medical and hospital staff, patients and carers. A recurring feature of the audio recording of the emergency department is the sound of banging doors, footsteps and voices: they are relentless, repetitive and constant.

THE FINAL STAGE OF THE RESEARCH

Phase three of the study was a randomized double-blind-controlled trial. Patients recruited in this phase were Australasian Triage Scale category 3 patients (who ideally would wait no longer than 30 minutes for medical attention) and were triaged with conditions in the mid-range of urgency, that is conditions such as abdominal pain, shortness of breath, vaginal bleeding, broken bones, severe headache, and so on. The study had the same inclusion/exclusion criteria as Phase two. Five groups of patients were given one of the composition interventions to rate according to the STAI primary endpoint self-reported anxiety. For this phase of the study the sample size calculation was conducted with power set at 90%, to detect a difference between means of 13% assuming a common standard deviation of 10%. This indicated a sample size of 34 was required in each group. As such five groups were needed to test each intervention so the sample size for Phase three was 170 patients.

Whilst appearing to be a noisy workplace for the medical staff involved in this study, the St Vincent’s Hospital Emergency Department has a sonic environment equal to the audio environment of a busy cafe measuring between 55 and 65db on average. As such, the audio levels in the emergency department influenced the design of the sound compositions, as it was recognized that the sonic environment of the emergency department would be present in the listening experience of the emergency patients, even though high-quality headphones were used for the study.

It is worth noting that external noise can impact on the sonic and clinical experience of patients in clinical settings and is worthy of investigation (Short et al. 2010). Although the sonic environment of the emergency department was examined in tandem with the design and testing of the sound compositions, it was not the major concern of our study. However, the sonic ambiance of emergency departments was the focus in the Short and Ahern study on the effect of music on emergency patients (2009: 10) and the researchers suggested that ‘using music to alleviate noise stress offers potential in improving the critical care environment of the emergency department’ (2009: 19).

Interestingly, some of the patients listening to the sound and music compositions for ‘Designing Sound for Health and Wellbeing’ had their listening
experience interrupted during the testing of the compositions by medical staff intervening for required clinical interventions. However, the listening experience for emergency patients will always run the risk of interruption as medical staff, carers and family members attend to patients – for the main business of the department is the primary health care of the patient (Short and Ahern 2009).

RESULTS

For Phase three of the research, 175 patients were recruited into the study and 170 completed the study. About 93 out of 170 patients (54.7 per cent) were males and the median age was 52 (35–69) years. About 118 out of 170 (69 per cent) patients required pain relief and no differences between groups in age, gender or pain relief required were discerned. The mean normal state anxiety scores for patients recruited into Phase three of the study were 38.7 for men and 35.2 for women (Ruffinengo et al. 2009).

For Phase three of the ‘Designing Sound for Health and Wellbeing’ study, the pre-test anxiety score for the five groups was 38.8–43.8 (moderate anxiety). However, the post-test score was 33.8–37.0 (no or low anxiety) in the music and sound intervention patient groups. There was no change in the anxiety scores in the control groups who received the emergency control track intervention or the no-sound intervention. In comparison, each of the three sound/music interventions reduced anxiety from moderate to no or low anxiety, and the control groups remained moderately anxious. In addition, the sound composition with the embedded binaural beats provided no additional anxiety reduction over the same sound composition that did not have an embedded binaural beat.

IMPLICATIONS

As the ‘Designing Sound for Health and Wellbeing’ project demonstrates, sound art and electroacoustic music does not have to be developed, created and presented for exhibitions and performances alone; it can also have a strategic role in clinical interventions and health care provision. Clinical interventions through art can be realized in hospital settings for the benefit of medical and health communities and patients. As such, this article argues for a more expansive role for practice-based art research and for the benefits of using applied research to change traditional models of health care delivery, resources and services.

Projects such as ‘Designing Sound for Health and Wellbeing’ can lead to new methods in clinical practice in emergency departments and other medical and health-based settings by their focus on non-invasive and non-pharmaceutical interventions to relieve stress and anxiety. In addition, this study demonstrates that the sound and electroacoustic music compositions composed for the research alleviated stress and anxiety in emergency patients waiting for medical attention. Therefore, the application of music and sound compositions especially composed for medical settings is worthy of consideration for emergency departments and other hospital settings. While our study was located in an emergency department, other research has also indicated that live music played to patients has significant benefits (Lechuk Staricoff et al. 2004; Naughton 2003; White 2009). As such, the design and use of music and sound compositions in hospital settings such as emergency departments is to be encouraged as the results of the ‘Designing Sound for Health and Wellbeing’ project demonstrate positive outcomes for patients.
The creative design applied to this research project provides a framework for other health delivery and service models. By designing clinical interventions outside of traditional allopathic models of delivering and practicing medicine, and applying creative tools and application for use in emergency departments (or other hospital settings), patients’ stress and anxiety levels can be eased by non-pharmaceutical interventions. Our study suggests that a model of holistic, non-chemical, non-invasive clinical interventions for patients can yield affirmative results in the alleviation of anxiety in emergency patients. While other studies have suggested that music could reduce perceived noise stress in emergency department patients (Short et al. 2010), this is the first study demonstrating reduced anxiety in adult emergency department patients following the application of music.

It is hoped that the positive outcomes of this project will inspire hospitals to incorporate infrastructure in emergency departments in hospitals to enable patients to listen to sound and music compositions. Furthermore, unnecessary nursing and medical attention may be reduced if patients are given the opportunity to listen to clinically proven sound and musical compositions (State of the Field Committee 2009; Lechuck Staricoff 2006; Lechuck Staricoff et al. 2004). Our research suggests that hospital departments should invest in projects where musical and sound compositions are especially designed for their patient cohort, rather than using pre-recorded compositions. Further studies that examine the impact of sound on patients and staff in emergency department may also be able to offer recommendations for the design of hospital settings, which are less obtrusive sound-wise. We have documented how the emergency department of St Vincent’s Hospital has sound levels similar to a busy cafe. As such, we recommend that medical staff and administrators measure and address the acoustic environment of emergency departments to determine what sound levels they are operating in. The most desirable outcome would be the re-design of emergency departments that have unnecessarily loud sound levels. It may also be useful to implement strategies and training for staff to recognize and reduce unnecessarily loud and overly distracting sound emissions (loud voices, buzzing from machinery) where possible.

The significant reduction in the stress and anxiety levels of the patients tested for the ‘Designing Sound for Health and Wellbeing’ project indicate that creative and design-based clinical interventions in emergency departments could assist in significantly modifying patients’ experience of emergency medicine for the better. Furthermore, the application of creative and non-invasive clinical interventions in emergency departments encourages a patient-centred and holistic approach to emergency medicine.

This study has demonstrated that patient stress and anxiety levels can be reduced through listening to especially composed sound and music compositions. As a preventative measure it is recommended that further research also be undertaken into the impact that sound and music has on people before they enter emergency departments. Hence, while we can use music and sound-based clinical interventions in emergency departments to ease patient stress and anxiety, measures must also be taken to contribute to the health and wellbeing of people outside the hospital paradigm to reduce the stress and anxiety of people before they enter emergency. If music and sound compositions are key to reducing stress and anxiety, then investment must be made to ensure that sound and music research is funded, composed, presented and used as a strategy to improve human health, well-being and capacity – inside and outside hospital settings.
ACKNOWLEDGEMENTS

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Designing sound for health and wellbeing...


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**SUGGESTED CITATION**


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Appendix 5

*Designing Sound for Health and Wellbeing* Phase 2 questionnaire.
Designing Sound for Health & Well-Being Phase 2: Patient Survey

**Part One: About You**

Are you:  male  female  (please circle)

What is your age:  ______________________

What is your country of birth:  ______________________

**Part Two: Your usual listening preferences**

The following questions are aimed at assessing the type of sounds or music that you usually prefer.

For each sound type please choose one answer that best matches your opinion by marking ‘X’ in the circle.

<table>
<thead>
<tr>
<th>Sound type</th>
<th>Strongly dislike</th>
<th>Dislike</th>
<th>Neutral</th>
<th>Like</th>
<th>Strongly Like</th>
<th>Don’t Know</th>
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<td>1. Environmental sound. (Eg. wildlife, water, insects, street sounds.)</td>
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<td>17. Contemporary classical music.(20th century onwards.)</td>
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<td>18. Non-Western traditional music. (Eg. Australian indigenous, Indian, Greek, Turkish, etc.)</td>
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Part Three: Your response to sound works created for emergency department patients

In the tables below, please indicate the degree to which you feel each of the listed emotions/thoughts in response to the soundtrack.

1:
Please choose the answer that best matches your response to the soundtrack by marking ‘X’ in the circle.

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Do you have any comments about this track?

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**6:**

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Do you have any comments about this track?
17:
Please choose the answer that best matches your response to the sound track by marking ‘×’ in the circle.

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<thead>
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<th></th>
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Do you have any comments about this track?

18:
Please choose the answer that best matches your response to the sound track by marking ‘×’ in the circle.

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**19:**

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Do you have any comments about this track?

**20:**

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Do you have any comments about this track?

Thinking back over the soundtracks, which one did you prefer? (You may need to review the s briefly)

Thinking back over the soundtracks, which track helped you to feel most relaxed?

Thank you for your participation.
Appendix 6

*Designing Sound for Health and Wellbeing* Phase 3 questionnaire. (Spielberger State Trait Inventory).
State-Trait Anxiety Inventory

Directions: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel right now, that is, at this moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

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<tr>
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<tr>
<td>1. I feel calm</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. I feel secure</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. I am tense</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>4. I feel strained</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>5. I feel at ease</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6. I feel upset</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7. I am presently worrying over possible misfortunes</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8. I feel satisfied</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9. I feel frightened</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<td>10. I feel comfortable</td>
<td>1</td>
<td>2</td>
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<td>11. I feel self-confident</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>12. I feel nervous</td>
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<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>13. I am jittery</td>
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<td>2</td>
<td>3</td>
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<tr>
<td>14. I feel indecisive</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>15. I am relaxed</td>
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<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>16. I feel content</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>17. I am worried</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>18. I feel confused</td>
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<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>19. I feel steady</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>20. I feel pleasant</td>
<td>1</td>
<td>2</td>
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</table>
A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate what you *generally* feel.

<table>
<thead>
<tr>
<th></th>
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<th>Sometimes</th>
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<tr>
<td>21.</td>
<td>I feel pleasant</td>
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<td>2</td>
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<tr>
<td>22.</td>
<td>I feel nervous and restless</td>
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<td>2</td>
<td>3</td>
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<tr>
<td>23.</td>
<td>I feel satisfied with myself</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>24.</td>
<td>I wish I could be as happy as others seem to be</td>
<td>1</td>
<td>2</td>
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<td>4</td>
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<tr>
<td>25.</td>
<td>I feel like a failure</td>
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<td>2</td>
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<tr>
<td>26.</td>
<td>I feel rested</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>27.</td>
<td>I am “calm, cool, and collected”</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>28.</td>
<td>I feel that difficulties are piling up so that I cannot overcome them</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>29.</td>
<td>I worry too much over something that really doesn’t matter</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>30.</td>
<td>I am happy</td>
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<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>31.</td>
<td>I have disturbing thoughts</td>
<td>1</td>
<td>2</td>
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<td>32.</td>
<td>I lack self-confidence</td>
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<td>4</td>
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<td>I feel secure</td>
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<td>4</td>
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<td>I make decisions early</td>
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<td>I am content</td>
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<td>37.</td>
<td>Some unimportant thought runs through my mind and bothers me</td>
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<tr>
<td>38.</td>
<td>I take disappointments so keenly that I can’t put them out of my mind</td>
<td>1</td>
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<td>3</td>
<td>4</td>
</tr>
<tr>
<td>39.</td>
<td>I am a steady person</td>
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<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>40.</td>
<td>I get in a state of tension or turmoil as I think over my recent concerns and interests</td>
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</table>
Appendix 7

Composition recording notes from composition diary for all one-minute electroacoustic compositions.

01. **Guitar chords.**

Commenced: Brunswick 6/05/2008 + additional work.


(Guitar 1:... A string (mechanical scale from 1st fret).
(Guitar 2:... D string (mechanical scale from 1st fret).

Individual guitar notes isolated and placed in separate tracks against each other to create random, strange chords. All attacks of these notes removed to leave only their decays. Alternate 'played,' two-note, guitar chords placed between constructed chords in random fashion. Reverb added to one note from each of the constructed chords, and also to the played chords. Wildly panning, pitch-shifted, reverb added to the other single notes from the constructed chords.

Guitar 1 short & guitar 2 short = lots more of attack removed (faster sequence). Fades on all tails up to this point.
Last 3rd upon return to longer notes = Guitar 1&2 fades on heads, also fades on heads in first 3rd. Lots of panning guitar sounds around stereo space throughout.

02.* & 03. **Guitar scrapes, bass drum & percussion.**

Commenced: Brunswick 8/05/2008 (approx) + additional work.

Both compositions constructed almost entirely from sounds of a plectrum scraping on ridges of electric guitar strings (Profile stratocaster). Sounds segmented, isolated and formed into their own, almost constant, textural entities. Delays added to the majority of sounds to open up stereo spectrum and create movement, in conjunction with panning.

02: Reverbs added to some tracks of guitar scrapes. Multiple panning and volume parameters manipulated. Movement of scrapes due to panning concentrated in last third of composition. Bass drum strikes added to events in order to create a sort of random pulse. Lower tones of bass drum compliment the textural, percussiveness of the higher-toned guitar scrapes. Some bass drum strikes shortened through time compression.

03: Guitar scrapes initially positioned to create a type of ongoing, conversational dialogue between the different styles and tones of scrapes. In one short central section, extra high, pitch-shifted reverb added to duplicate/intensify the passage. Other selected guitar scrapes doubled up with radically equalized versions of themselves. 'Metal-egg percussion' added intermittently as punctuation points and to create complimentary actions. Reverb added to some selected metal-egg percussion phrases. Further volume differential changes added. 'Gladware percussion' added with pitch-shifted versions of the same added as further compliments.
04. Bells.

Commenced: Brunswick 13+14/05/2008 + additional work.

Mono recordings of two industrial alarm bells, one metal fruit bowl, and a large saucepan lid. Individual bell sounds isolated to produce chords through aligning individual sounds against each other using multi-tracking. (Some pitch shifting of bell sounds). Removal of attacks and decays through placement of fades on heads and tails of sound files.

Softening all sounds so that they become tonal swells (Fruit bowl sounds seem to have an inherent distortion, the way the metal vibrates). Composition thematically based around the tone (note) of the metal fruit bowl. Multiple sounds panned around the stereo space to create movement.

05. & 06. Clean and amp guitar 2 note chords.

Commenced: home 22/05/2008 + additional work.

Straight in guitar (5) & Amp guitar (6).
Mathematical scales (straight E&A strings/amp A string only).

5: Guitar two note phrases isolated. Chords formed from pairs of these phrases. (Roughly 2 lowest – 2 highest, next 2 lowest – next 2 highest, etc). Others formed through convenience or to instil a lack of repetition. First note of all two-note phrases has the attack removed to differing aesthetic degrees through volume manipulation. Some phrases pitch-shifted and added (One octave up and major thirds) to form alternate chords. Reverb added to a small number of guitar phrases and placed to act as a reverberant delay on the corresponding guitar phrases.

6: Amplified guitar two-note phrases isolated and placed adjacent to each other in order to form chords. All attacks on first notes softened. Reverb added to some passages of two-note phrases. Some guitar phrases pitch shifted to form alternate chords. Occasional guitar notes added with attack intact to provide a bright, present contrast. Some single notes also added with fades applied to their attack causing a sort of late doppelganger effect. ‘Children’s bells’ added and reverb added to these as intermittent punctuation points. Some bells pitch shifted to strengthen their textural role.

07. Chord organ, pulse drone.

Commenced: RMIT 2/06/2008 (approx) + additional work.

Five mono organ drones recorded with Minuette chord organ.
(Key number denotes pitch of drone or: chord button denotes pitch of drone).

Staggered entries of each drone created with volume parameters. Further volume swells or lulls created similarly. Stereo reverb applied to two tracks to open up stereo spectrum. All original drone tracks equalized to some degree to remove some organ fan noise. First two organ drones have automated equalization applied to create filtering or wah effects (this was done before reverb was applied). Reverb applied to organ drone one has automated panning included.
08. **Chromatic harmonica.**

Commenced: RMIT 2/06/2008 (approx) + additional work.

Chromatic harmonica trills and phrases isolated and layered to create an ongoing narrative. These sound sources processed to create extreme stereo movement. Resonant filtering and reverb added to some trills and phrases in order to create an otherworldly, spacey effect.

In some cases toward the end of the composition the direct sound was removed to leave only the reverberant processed signal. Also some sounds have resonant filters applied to isolate certain frequencies. Reverb saturated chord organ drone imported to session and added as a low-key dronal adjunct.

09. **Processed chromatic harmonica.**

Commenced: RMIT 10/06/2008 (approx).

Chromatic harmonica trills processed with panning and filtering to create radical stereo movement and warp effects. Some of these resulting processed, filtered sounds have reverb added.

Over the course of the 1-minute time frame volume parameters are used to progressively introduce each new voice thus creating a growth in density toward an almost crescendo.

10. **Gongs 2.**


From Japanese & Burmese gong sounds recorded at RMIT studio.

Single three-strike gong passage used as simple starting point. Attacks remain on gong sounds, as is (no amendments). Gongs 23 and 23a pitch-shifted a quartetone apart in order to create more beating frequencies. On a couple of strikes panning of reverb from extreme right to left to create movement. Quietest strike reduced to quartetone up version only. Apart from this instance volumes set standard to each other. Final gong strike 23 and it’s accompanying reverb boosted volume wise.

Originally composition comprised of only three by three note chords sparsely placed over the one-minute timeframe. Subsequent to listening, the suggestion of adding more random (played) gong tones taken up. Thus more gong tones added, natural and pitch-shifted up 2 semi-tones. Adjustment of volume relationships between elements of original 3 chords to soften of make less strident. Overall trying to create a more improvised feel.
11. **Gongs 3.**


Sound sources from Japanese gongs recorded at RMIT studio.

This composition is another attempt at simplicity. With only three gong strikes across the one-minute time frame. All gong sounds have their attacks softened with fades with the exception of one later gong sound. The only one to retain its natural attack. Addition of high pitched shifted and reverb infused signal enhancing one lower gong struck twice within the one-minute confines. Mix relationships differ from strike to strike.

12. **Gongs 4.**


Sound sources from Burmese gongs recorded RMIT.

Individual gong sounds isolated and positioned against other gong sounds to share the natural phrasing of one or two initial recorded takes. These combinations form chords and emphasize beating frequencies. Some slight volume adjustments employed to balance the elements of each of these constructed chords. Decays of pianorgan chords looped to form intermittent drones and situated as a sound bed underneath gongs. Reverb added to some gong sounds and the organ drone. Stereo movement of gongs created during initial recording by movement of the resonating gongs around microphones.

13. **Pianorgan high chord drone.***


Various chord organ chords recorded and layered across the one-minute time frame. Each recorded pass beginning with a single note, then the gradual addition of extra notes to construct the chord. After this build-up, all but one chord return to a single note. Reverb added to all organ drones, some equalized to highlight certain frequencies and/or to remove organ fan noise. Through application of volume parameters the reverb-saturated tracks predominate.

Toward the end of the composition a small number of single notes saturated with reverb are left to stand-alone as a sort of pastoral tail. Bass organ tones created through pitch shifting and equalization. Short passages of this bass tone form a looped drone.
14. **Organ & percussion.**


Pianorgan, gongs and percussion recorded RMIT 5/8/08. Single chord organ drone progresses from single note to denser chord and back to single note, like a mirror image centred around the middle of the one-minute piece. Significant reverb and panning added to the organ drone with a delay upon the reverb’s entry. Original drone includes inherent tonal beating. Bursts of differing percussion (bells and rattles) used at punctuation points. These points of change dictated by events within the original organ drone.

Individual Burmese gong strikes/chords placed as triggers to enhance initiation of the intermittent percussion textures. Panning and reverb added to textural percussion while gong sounds remain dry. Shuffling effect applied to one percussion texture to induce a delayed panning effect strengthening the texture. One percussion pass treated by a resonant, band-pass filter.

15. **Steel string guitar 1 blues theme.**


Original guitar recorded at RMIT. As played thematic blues piece with reverb added. Dronal atmosphere derived from processed, looped fragments extracted from guitar decays/sustains. This drone placed across the length of the composition and further processed to create a panning atmosphere then pitch-shifted to a lower frequency. Entry of these two drones staggered after more straightforward, acoustic guitar introduction.

16. **Steel string guitar 2 theme and space.**


Four thematic acoustic guitar phrases isolated and placed sparsely across one minute. Reverb added to these four simple phrases. Three acoustic guitar drones formed from fragments of the decays of guitar chords by looping these fragments. Each of these drones has a different pitch and different pulse rate. These drones fill the gaps between the acoustic guitar events, as if to extend the final sustain of each event. Reverb added to these looping drones. The space between the third and fourth acoustic guitar events has three differently pitched loop/drones playing simultaneously and creating more extreme tonal pulsing and harmonic complexity.

17. **Nylon string guitar 1 low melodic.**


By chance, nylon string guitar present in the studio, so utilized. Two sections of lower register, thematic melodies edited together to form one piece, as if actually played. Reverb added to these combined edits. This reverb further processed to fluctuate tonally and move around the stereo spectrum.
18. **Nylon string guitar 2 high melodic.**


Two sections of lower register thematic melodies edited together to form one piece, as if actually played. Reverb added to these combined edits.

19. **Nylon string guitar 3 melodic plus drone.**


Melodic passage constructed from edited fragments of longer melodic playing. Strong reverb added to develop spaciousness. Drone created and added from tail of guitar chord, reverb added to drone. These latter two create pulsing undertone.

Additional work at RMIT (first week of December ‘08). Bells and processed bells added as well as bowed cymbal with reverb that is pitch-shifted.

Further work RMIT (16/12/08). Two more stereo warbles added to tail section by further processing existing warbles with different speed Dopplers and slight raising of pitch, creating a watery field toward the culmination. Softening of attack of original nylon guitar by reduction of volume in relation to nylon guitar (same) reverb track.

Further work Brunswick 29/12/08. Volume parameters and relationships at beginning of piece (guitars’ prominence greatly reduced early on) radically shifted around. Bells and whistling processing added to beginning to pre-empt their later arrival. During the first half of the composition the guitar gradually appears out of wispy nothingness until, at roughly the halfway point, one guitar phrase is virtually isolated, if not totally in your face. (Prominent).

Additional work Brunswick 3/3/2009. Original nylon guitar now made more present and role/levels of its reverbs reduced. One more warble sound added to very tail of piece as well as whistling bell sound from beginning. All, thickening tail further.

20. **Nylon string guitar 4 low with wacky drones.**

Commenced: RMIT 23/9/08, additional work Brunswick 10/10/2008.

Nylon guitar notes or short phrases isolated and placed into drawn out melodic passage, reverb added. Second group of notes added to form chords or extend short phrases, reverb added. Decays of some notes processed and looped to form short, filtered, panning drones then placed strategically to extend note decays and fill gaps between chords or phrases. (Some appear mysteriously out of note decays). Different drones placed at different locations for variety. In some positions gong sounds added to the nylon guitar notes to create some ambiguities of tone, attack and decay. Reverb and pitch shifting added to isolated gong sounds.

Further work RMIT 18/12/08: Second totally atonal guitar chord removed (too challenging?) except for reverb that had been applied to the original, pure nylon guitar note. Warbling watery bed at end of piece faded down before culmination to ease it’s overriding position.
Further work Brunswick (Friday) 13/03/2009. Staccato Saxophone phrases with slightly melodic tendencies added to first half of the composition. These phrases assembled by extracting details, from longer passages, and organising them around existing forms. One long sax note added midway through second half of the composition with a barely audible harmony note joining it as a slight reprise, with a difference. Some refinement of the sax with equalization. Further work Brunswick 16/03/2009. Shuffle and tap delay added to raw saxophone sounds, mixed at different levels, against varying sections of the saxophone passage.

21. **Eukolin, bass drum and electric guitar.**

Commenced: Brunswick 29 & 30/12/08.

Eukolin plucks (staccato and sustained) kick drum strikes and rubber ball gestures (applied to eukolin strings and drum skin) all isolated and then randomly placed against each other to form some sort of pseudo-gestural passage. As a tail, simple, isolated electric guitar gestures spring from the former randomness. The segue from scraping and percussive sounds is facilitated by a crescendoing, backwards electric guitar chord. Reverb added to some sounds to create spaciousness and soften the attacks of some percussive eukolin sounds and the distorted electric guitar. More kick drum sounds and percussive eukolin sounds added to highlight and strengthen certain events, especially the guitar phrases toward the end. (Giving them a seemingly played feel). Tambourine and tambourine reverb added to the last guitar chord decay.

Further work Brunswick 9/01/08. First two eukolin notes/plucks strengthened by adding further harmonized reverb. In the first half of the composition two banks of percussive plucks on the eukolin added to enliven events there. (Previously a little empty or uneventful). These banks then are heavily processed and have reverb added to create movement and space. Volume of guitars in tail section slightly increased to match the intensity of additions to the first half.

Further work Brunswick 16/03/2009. Volume parameters of sounds of rubber ball on kick drum amended to reduce the overt presence of the most strident example, mid-composition. Looped drone formed from elements of the decay of an electric guitar chord. This drone positioned for the majority of the duration of the two guitar phrases that end the composition, and then processed with filters and Doppler and offset slightly time wise against its predecessor. Eventually this processed version is more constant and prominent with the original drone only making a brief appearance and fading out at the culmination of the piece.

22. **Bass guitar and percussion.**

Commenced: Brunswick late December 2008.

Isolated snare drum beats and bass guitar notes arranged into semi-narrative passage with kick drum sounds and phrases inserted as punctuation points and interludes. Tambourine strikes and trills added as further texture and interludes. Reverb added to tambourine and snare sounds. Warped filtering added to bass notes and softened with reverb simultaneously, then volume relationships between bass and bass filtering tweaked. At tail of composition one bass note was reversed to create a short crescendo to bring in the final tambourine texture.
23. **Percussion and bass guitar.***


Snare drum and kick drum hits and phrases assembled into two rhythmic passages with bass guitar notes and bass plucks added as formal adjuncts at strategic points. Drone-like scrapes on snare drum skin also added. (Predominately in the interlude between the two percussion passages). Snare and kick drum have reverb added. Snare scrapes are processed and have reverb added. Staccato bass section in the centre of the composition is edited, after reverb has been added, to open up some spaciousness or breathing space there. Heavy processing and reverb added to staccato bass interlude and sustained bass notes as well as the reverse bass crescendo toward culmination.

Further work Brunswick 11/12/01/2009. Melodic organ phrases added to last third of composition, these to provide something like a soloists’ voice. These subsequently processed with pitch alteration and reverb. Then a harmony of the organ phrases was added. (These to provide something like a soloist’s voice).

Further work Brunswick late February – 13/3/2009. Former organ sounds removed as unsuccessful and lacking presence (unable to stridently perform the soloist’s role). Synth, melodic phrases with filtering decay added to beginning and tail of composition, leaving an interrupted, open, pastoral interlude in the centre of the composition. Melodic soprano sax phrases added to last third of composition, now the soloist’s voice is there, adding an extra element.

24. **Bass and synth.***

Commenced: Brunswick January 2009 from sounds recorded RMIT 10/12/08.

Electric bass, two-note chords and single notes isolated and reversed. Attacks and tails have fades applied to create bass swells. Some chords created from combining to individual notes. Bass swells initially arranged to form a progressive, tonally descending musical passage. Reverb and pitch shifting applied to these bass swells creating modulations and stereo space. Melodic, percussive synth sounds added, some of these synth sounds have reverb added. Filtered synth swells recorded and reversed. Further bass swells added to tonally compliment the synth swells. Reverb added to both the synth and these new bass sounds along with severe filtration and panning. Tambourine strikes added to some percussive synth sounds to enhance their percussive role. A function that interrupts the general smoothness of the bass swells.

Further work Brunswick late Feb – 3/3/2009. Majority of second half of piece removed. From the end of the first synth interlude the piece returns to its own beginning point immediately after the insertion of a previously unused bass chord swell. Original bass swells increased in volume in order to make them more present. Their accompanying reverbs reduced in level to assist this purpose. Synth interlude at tail strengthened with the addition of extra synth, tambourine and snare drum sounds. Some tambourine sounds and their accompanying reverb pitched up ten semi-tones. These added to both synth interludes.
25. **Bass swells.**

Commenced: Brunswick January 2009 with bass sounds recorded RMIT 10/12/08.

Bass notes isolated and reversed. Then their crescendo like endings have fades applied to create slow swells. Bass swells descend tonally. Percussion textures added in gaps left by removing some bass swells. Reverb added to both bass swells and percussion textures. Bass notes shortened to become almost percussive while still retaining tonal character. Some of these shortened bass notes processed with pitch shifting, then reverb added to short bass notes. Pitch-shifted percussion added to enhance some already present.

Further work 11/2/2009. Reverse bass notes cropped, then using fades, transformed into short bass swells. These placed in a brief group as finale of the first bass swell section. Pitch-shifted reverb added to these short swells. An additional group of short bass swells added but then removed. Their reverb, left behind, becoming a solo feature and used again toward the end of the piece as a partial reprise. Further pitch-shifted reverb added to two of the initial slow bass swells including the ultimate one.

Further work 14/2/2009. Some tambourine sounds and corresponding reverb removed to open up space towards culmination of piece.

Further work Brunswick 10&13/03/2009. Existing reverbs on primary bass swells removed. Also some reverbs on percussion textures removed. Chained delays and reverbs added to these same bass swells to create blooming, tonal atmospheres that grow. A large number of other bass swells and staccato bass interludes (including their reverbs) removed, allowing the piece to exist on the strength of the new atmospheres and later percussive textures. One more percussion element added and treated by the same atmospheric processes. Longish, reverse bass swell added, at low volume, toward the culmination of the piece to add an aside to the decaying atmosphere and final predominate percussion passage.

Further work Brunswick 23/03/2009. Two melodic, acoustic guitar passages added across the whole length of the composition. One of these that are higher in pitch and reversed. Fragments of each of these passages removed in order to create a loose conversational feel between the two. Reverse version placed through the same generative treatments as the original bass swells. Short passages of textural guitar harmonics compressed to increase the speed of their gestures. These placed around the existing percussion textures to augment and thicken them. Entries and exits of these and original percussion softened with volume adjustments. Harmonics texture placed through the same generative treatments as several previous elements.

26. **Backwards guitar.**

Commenced: Brunswick late January 2009 with guitar sounds recorded RMIT 10/12/08 and percussion sounds recorded RMIT 5/8/08.

Electric guitar phrases and notes isolated. Some of these reversed. Short woodblock textures added at change or crescendo points. Tonaly resonant reverb added to woodblock sounds. Short kick drum phrases added to some of these punctuation points also.

Further work 14-15/02/2009. Kick drum phrases removed from second half of piece. Gong sounds added to strengthen attack of guitar chords/crescendos. Reverb added to these sounds. Then original gong sounds removed leaving only reverb version. Entry of percussion
textures and corresponding reverb softened through volume parameters. Snare drum hits added to two initial guitar chord entries.

Further work 17,19,24/02/2009. Numerous volume adjustments to percussive elements especially kick drum and snare sounds. Mid-point percussive, punctuation point added with tiny fragments of pitch-shifted percussive sounds added, plus a processed version of such using further pitch manipulation and sustaining shuffle function.

8/10/2008. First percussion interlude has lower pitched and lower level percussion sound added as prelude to lengthen the percussions’ initial entry.

27. **Backwards soprano saxophone.**

Commenced: Brunswick 13-17/03/2009 with saxophone sounds recorded at St Vincent’s Hospital 10/03/09.

Soprano saxophone long notes and short phrases isolated and reversed. Their heads and tails overlapped and placed to form one extended passage, their attacks and decays cross-faded to simulate one extended phrase. Flanging and shuffling effects applied to saxophone sounds. These effects incorporate delayed entry so that the effected signals echo or fall slightly behind their progenitors. Modulating synth drone added across length of composition. Volume parameters of all tracks manipulated extensively to develop relationships between each of the sound sources into a constant but conversational composition. Some saxophone sounds also passed through tonal, resonant filtering.

Further work Brunswick 23/03/2009. A further short passage of saxophone, treated with shuffling, is added toward the culmination of the piece to strengthen the presence of these effected, panning sounds. Entry of shuffling saxophone at beginning tempered, now more gradual in arrival.

28. **Noise.**

Commenced: Brunswick 26/03/2009.

Three passages of noise inflected synthesizer drones recorded, with varying length decays toward culmination. Each of these noise drones then passed through band pass filters to garner slightly differing alternate drones concentrated upon, roughly one each of, high-frequency, mid-frequency and low-frequency tonal areas. This process providing a final nine stereo tracks of white noise. Different length and shaped entries for each stereo track created with fades to stagger the beginning of each of the nine tracks. Shuffling effect added to one of the mid-frequency passages to create some stereo movement.

* The 10 titles marked with asterisks denote those one-minute compositions that were selected for testing in Phase Two of the project. Here they may have slightly different preliminary titles.
Appendix 8

Composition recording notes from composition diary for the final twenty-minute electroacoustic composition.

Composition, Long 1. Steel string & Nylon string basis.

Commenced: North Melbourne 19/10/2008 approx.

Nth Melbourne: Created new session and imported audio files from Steel String Blues Theme and Nylon String 17. Added an intro of high reverb and panning drones as a prelude to whole piece. Divided main Steel String one-minute motif into smaller sections and duplicated some of these divisions to elongate the main motif.

Bridged the gap between the prelude and Steel String motif with short high reverb interlude. Then the Nylon guitar piece was temporarily tacked onto the end of Steel String guitar.

Imported sound files from new, recent recording session where thematic material similar to Steel String guitar was repeated and expanded upon using the Mini Maton acoustic guitar. Added reverb to these mono files to create stereo space. Created a textural loop from the decay of one of the included Mini Maton chords. Further processed this loop to create more drone-like textures. Added intermittent fragments of bowed cymbal from “Nylon guitar” to help with continuity.

Replaced the prelude of reverb/panning drones with a sub-mix of a one-minute gong piece. Created another gong interlude to segue between the first Steel String and Nylon guitar sections. Added an interlude to the tail of Nylon guitar constructed with atmospheric and “wobble” textures garnered from within Nylon guitar. Subsequently extracted then added a fragment of the Nylon guitar theme to lengthen this whole thematic section.

At this point the rough form is:

Gongs – Steel guitar – Gongs – Nylon guitar/tail/Nylon guitar/tail – Mini Maton guitar theme = Approx. eleven minutes.

Two further Gong sub-mixes imported to create a longish segue after Mini Maton. Subsequent to this, chronologically, sub-mix of Nylon 16 was imported and added followed by another Gong interlude created from fragments of those already in use. Next, a sub-mix of Organ and Percussion was imported and tacked on the end of these Gong sounds.

New Yamaha Nylon String imported into session from which fragments are then extracted and sequenced to form a new, low register, Nylon guitar passage. Wooden percussion elements, imported from Organ and Percussion session, are added to form short percussive interruptions. These new percussion sounds have reverb added. New drones, constructed with processing of Nylon guitar decays, coincide with these percussive interruptions, somewhat thickening them up and adding another tonal element.

This Yamaha Nylon guitar passage is followed by another interlude constructed from gong sounds and wooden percussion sounds present in some previous sections. During this interlude the percussion textures are featured more prominently than the accompanying gong sounds. Out of this new interlude appears a sub-mix of the original one-minute form of Steel String guitar.
Bass drum strikes added to bar beginnings and other events within the Yamaha Nylon string and the first Steel String guitar passages to enhance a folky feel and alleviate the repetitive nature of these. Other panning, textural percussion events added to punctuate Yamaha Nylon string, then reverb added to this percussion.

Two passages of soft tinkling bells added across selected passages of first Steel String guitar theme. All these percussion additions designed to augment the overall “folky” feel.

The Gong interludes between Mini Maton and Nylon 16 are radically altered with pitch-shifted replicas of individual sounds added, then mix and stereo placement adjustments made. The Gong interlude between Nylon 16 and Organ and Percussion has it’s level lowered and has tinkling bell sounds added to transform it into more of a textural break. The stereo placement of the gongs through this interlude also adjusted.

Dronal tail of Mini Maton has a distant, reverb saturated, bell texture added and one gong strike added to pre-empt the subsequent gong interludes.

At this point rough form is:

Replaced final reprise of Steel String guitar with a sub-mix of just the accompanying atmospheric elements of the same. Added further textural atmosphere constructed and borrowed from Nylon guitar. Further reverb drenched texture added.

Largely, but not completely, removed longer gong interlude following Mini Maton. Over remaining fragments superimposed complex new textures that reiterate atmospheric elements of Mini Maton creating an elongated, decaying tail to Mini Maton theme. Two short textural bell passages added to start and end of this tail to provide variety to this whole textural passage.

Gong interlude between Nylon 16 and Organ and Percussion removed. These now butt-join each other following long Mini Maton tail section. Organ and Percussion still leads directly into Yamaha Nylon.

During final mastering session, some reverb was added at compositional points of change to smooth transitions. Also, slight volume adjustments made from section to section to keep peak levels similar. Compression added to raise overall volume comparative to Phil Samartzis’ field recording piece.