Resonance is a wonderful skill, the ability to see the world, and even our own selves, through the eyes of another. By internalising perceptions of another, we invest our own self energy and turn “it” into “me”. If resonance were more practised, parents would understand children, teachers would understand students, and nations would understand one another.

- Watkins 2005:8

CHAPTER 1: BACKGROUND

1.1 Motivation for the study

When listening to music being performed, this researcher has often asked the following question: What factors make it favourable for some performers to freely express their emotions, seemingly nothing hindering their emotional intent and the realisation of this intent in their interpretations, while others have audibly much more difficulty in communicating their feelings through sound? In addition to the more obvious factors such as personality variables, quality of the musical education, emotional maturity, intellectual grasp of the music and performance experience, one factor that increasingly featured in the literature studied (Sacks 2007, Stein 2007 and Cutting 1997), as well as in narratives by musicians themselves, is the psychological impact of trauma.

Beaulieu (2003:28) describes a traumatic experience as “any event that leaves an imprint that continues to give rise to negative effects and recurrences in one or more of the sensory, emotional or cognitive systems.” Julie Sutton (2002:23) expands on traditional definitions of trauma by suggesting that it can be thought of as “something so far beyond the ordinary that it will overwhelm one’s resilience and defences. It becomes impossible to feel the full impact of the trauma, or to function as normal … One’s perception of the world changes irrevocably.” An interesting observation is the often very moving characteristics of performances by individuals known to have been exposed to trauma, possibly due to their greater emotional maturity developed by living through difficult experiences. However, the quality of these performances is frequently hampered by memory lapses caused by intrusive memories (Cutting 1997:6). It is important to investigate the influence of trauma, because an overwhelming traumatic event cannot be fully and meaningfully processed by the human brain without proper intervention and assistance. Due to the high level of arousal and elevations of stress hormones accompanying such events, traumatic memories can become more deeply engrained in neural pathways than
ordinary memories (Roth & Friedman 1998:12). This greatly increases the probability that a traumatic event, although it belongs to the past, will continue to have an influence on an individual and his or her music-making.

The question needs to be asked: How does being confronted with events beyond the ordinary have an impact on the inner world of the musician? Numerous groups of musicians from diverse cultures have been affected by abuse, violence and war throughout various stages of history. One need only think of musicians who survived the concentration camps of World War II or those who have been confronted with violent crime in South Africa, to mention but two scenarios. The abovementioned are given as examples, while the predominant feedback from respondents was from healthcare professionals and musicians who, although some might have lived and studied in various parts of the world, found themselves operating within the South African music environment at the time during which they responded to the research survey. Music performance is a personal activity, requiring sensitivity, imagination, the ability to draw on previous life experience as well as many other qualities, and as a result musicians are often known to be very sensitive individuals. This sensitivity could possibly play a role in increasing their vulnerability to being affected by trauma.

In everyday interaction with colleagues, this researcher became painfully aware that very often one of the factors motivating highly talented fellow students was not stable and happy families, but instead many seem to come from less than desirable circumstances. Some even emerge from previously disadvantaged communities. Potentially this could give rise to negative effects. Yet through dedication these musicians continue to improve and many become highly successful. However, many are not aware of the ways in which their experiences can affect their performance, and even fewer are aware of the possibilities that exist for facilitating recovery and healing. Many music teachers have no background in educational psychology and thus are unable to recognize warning signs indicating that a student might be having difficulties that could be related to the experience of trauma. Having to teach the technique of the instrument or voice and all the necessary skills, there is so much to take care of in guiding the development of a student that many teachers are not aware of, or are unlikely to admit, that traumas experienced can have an influence on their students. Yet if left untreated, progress can be adversely affected. One motivation for this study is to increase the awareness of music teachers.
The possibility of talent not being developed to its full capacity due to the inadequate knowledge of both teachers and performers in dealing with the effects of trauma is a reality that in my view is overlooked or even avoided by many musicians. If disorders such as Acute Stress Disorder (ASD) or Post-traumatic Stress Disorder (PTSD) may develop, the effects thereof can be debilitating. With various survival ‘coping strategies’, some severe traumas can remain hidden for many years until a subsequent event or events trigger memories of past trauma. Therefore it is not always initially evident which individuals may be affected.

1.2 Theoretical framework

From the aforementioned it is clear that there are many facets to trauma and many important factors influencing the trauma response. Therefore this thesis will be written from a holistic theoretical framework. The term ‘holism’ was coined by the South African statesman and philosopher, Jan Christiaan Smuts. He believed that matter and life consist of unit structures that group together in orderly ways to form wholes called bodies or organisms (Smuts 1926:85-7). He explained that, through evolution, holism is self-creative and in nature wholes are greater than the sum of their parts. Smuts emphasized that attempting to explain an organism should include reference to its past, its future as well as the present. Strauch (2003:454) explains that the conviction that defines holism is that “[t]he only way to understand a system is to understand that entire system”. He also writes that holism is a supposition of Individual Psychology, stating that this means that aspects of a person such as thinking, feeling and actions connect to other aspects of that person in orderly but also dynamic and changing ways. The psychological, psychosocial, as well as some medical factors associated with trauma will be investigated in this study. Many of the sources consulted were written by traditional allopathic medical practitioners who went on to adopt a more integrative approach with related disciplines.

The perspective from which the thesis is written is in alignment with aspects of the postmodern paradigm of thinking. The researcher’s approach has moved beyond the modern paradigm particularly in the sense that factors beyond those which can be measured exactly by scientific methods are taken into account and not discarded as inexplicable. The postmodern recognition by Hlynka and Yeaman (1992:3) that “if there are multiple ways of knowing then there must be multiple truths” is important for this study. Wilson (n.d.) writes that “[t]he goal of artist, or critic, is not so much to explain, predict, and control, but to create, appreciate and interpret meanings”. This should also be the attitude from which the researcher and participants in this study view
their contribution. It needs to be stated that most of the subjects from the population in which the field research was conducted are primarily living within the borders of South Africa.

The research was largely conducted in a qualitative manner. As described by Henwood and Pidgeon (1992:98-9,108), qualitative psychological research avoids the problem of inappropriately fixing meanings; it takes into account internal subjective meanings and allows the researcher to report on the contextual features of a study. However, these authors draw a distinction between the experimental method and the naturalistic or interpretative paradigm. Since this study investigated only reports of real-life events of the respondents, it was conducted from a naturalistic perspective. Research findings were in line with other goals of qualitative research as defined by the abovementioned source, namely results were interpreted from the perspective of the participant musicians and the meanings musicians gave to their experiences were discussed. In addition, the qualitative nature of the research remains true to the holistic framework of the study since phenomena are studied in their contexts.

1.3 Hypotheses

Dealing with music performance means dealing with translating motions into sound and into emotion (Sandor 1981:3-4). Therefore it can be hypothesized that trauma can affect this route of musical expression by influencing the emotional intent, emotional state, or capacity for expression of the performer as well as affecting his or her physical motions, both having an impact on the musical result. In view of the aforementioned, it is hypothesized that where various coping mechanisms come into play, trauma can also have a profound influence on a musician’s memory during music performance and study. It is also hypothesized that these effects can influence teachers as well as performers. Since the study is qualitative in nature, investigation of these hypotheses is seen as pertaining to the subject group of this study within the context set out for the research and should in no way be generalized to all musicians, healthcare providers or music teachers.

This study aims to investigate the above by attempting to answer the following: Do the findings of a literature survey, the answers given to circulated questionnaires, as well as the data collected from the case studies support the following two hypotheses:
Firstly, that a number of noticeable and/or observable signs exist, particularly manifesting in but not exclusively limited to their expression of emotion and memory during music performance, in individuals affected by trauma;

Secondly, that these signs are alleviated in musicians who have received treatment. Traumatized individuals considered for this study included those showing signs of acute and complex trauma.

1.4 Research questions

The main research question on which this study was based is the following:

**In what ways can trauma that also includes psychological sequelae influence musicians?**

This question gives rise to closely related sub-questions, namely:

1) In what ways can a musician’s capacity to express emotion be influenced by trauma?
2) In what ways can trauma influence a musician’s memory during music performance?
3) What are the warning signs of adverse influence caused by underlying trauma that teachers and performers should be aware of?
4) What treatment interventions did musicians participating in the study find to be effective for trauma?

1.5 Aims of the study

The aim of this study is to shed light on the impact of trauma on aspects of musicians’ music-making, particularly but not exclusively limited to its effects on memory during music performance and on emotional expression. Effects on musicians were considered, explicated and discussed in the light of the rapidly expanding body of knowledge about factors involved in the trauma response. The study aims to increase awareness in performers and teachers, and with the increased knowledge enable particularly teachers to refer students to appropriate healthcare services in ways not risking further traumatization of the individuals. Further study by researchers in the fields of psychology and music research can investigate whether the findings could be applicable to other subject groups living in different countries.
Much research is done in the discipline of Performing Arts Medicine on musicians’ physical injuries, the stress factors and psychological aspects that could have an influence on their performance. However, it is an aim of this study to increase interest in research on how trauma, with its associated psychological effect(s) not necessarily directly related to the instrument or voice itself, can have an influence on musicians, specifically affecting their careers.

1.6 Research method

The first phase of this study comprised a survey of relevant literature. Literature was consulted on emotion, the expression of emotion, memory, types of trauma, the interaction of biological and psychological factors in trauma, and the use of music by professionals working with individuals recovering from trauma. Thereafter questionnaires were sent to prominent healthcare professionals who indicated that they have worked with musicians. Their views and experiences were obtained of how trauma influences musicians’ expression of emotion and memory, as well as knowledge on which psychotherapeutic intervention strategies and other healing therapies proved most effective with the various types of traumas encountered. The experiences, symptoms and insights of four case study participants who were affected by trauma are discussed in order to gain greater insight into how musicians themselves interpreted the effects and outcomes of their experiences.

A supposition underlying this study is that it is possible for musicians and music teachers, provided that they possess the necessary awareness, to identify signs of trauma that are influencing their and their students’ performances and musical development. With increased awareness and more accurate detection of problems, possible solutions and early intervention can be sought. This is discussed in the light of the possibility that such musicians can, provided the right action is taken, ultimately emerge as better musicians and integrated individuals.

A more comprehensive description of the research methodology can be found in chapter 5.4.

1.7 Delimitation of the study

The scope of this study has been limited to musicians who have experienced trauma. While a few international responses were gleaned, specifically from Germany, the Netherlands and Poland,
the vast majority of musicians participating in this study were operating within the South African music context at the time when they kindly participated in the study. Any trauma that includes psychological sequelae can be taken into account in the research. To distinguish psychological from exclusively physical trauma, the 1973 definition given by Laplanche and Pontalis (1973:465) describes the type of trauma considered here: “an event in the subject’s life defined by its intensity, the subject’s incapacity to respond adequately to it, and by the upheaval and long-lasting effects that it brings about in the psychical organization”. This researcher agrees with more recent definitions of trauma that emphasize the effects on and experience of the individual (see definition by Beaulieu quoted on p. 1). Another definition to take note of is by Robert Scaer (2005:71). He defines trauma as “a disorder of the perception of time, of the body, and of the self”.

Healthcare professionals who have worked with musicians and/or assisted in the treatment of traumatized individuals were also invited to participate in the research survey. In addition, questionnaires were sent to music teachers. Four individuals over the age of 21 who were previously exposed to trauma were selected as case studies. They gave informed consent after full explanation of the nature of the study. The main focus of the semi-structured interviews was on these individuals’ own interpretations of how traumatic experiences affected their music-making.

1.8 Value of the study

The outcome of this study provides insight into how trauma can influence musicians. Light is shed on particularly its influence on expression of emotion and memory in their music-making. Increasing knowledge concerning signs of possible trauma sequelae as well as possibilities for treatment will assist teachers as well as performers to identify problems early on, obtain suitable treatment, investigate inter-disciplinary collaboration in the treatment process and facilitate steady progress on their instrument(s) or voice. It is shown throughout how important aspects of the trauma response, as generally discussed by experts in the field, can have particular effects on musicians due to the demands their profession places on them. Since the study presents its subject matter primarily from the perspective of musicians, healthcare professionals will benefit by gaining deeper insights into the experience of musicians. This in turn could assist healthcare professionals in developing creative intervention strategies. An awareness of how trauma can
influence musicians should inspire further research. During the study many areas warranting further research were identified and are discussed in the final chapter.

1.9 Discussion of contents

The first part of the study gives a thorough background on the matters central to this study, namely emotion, memory and trauma. In chapter 4 more direct correlations are drawn between music and trauma, influence on famous musicians of the past, the use of music and art in the recovery process and trauma and mental aspects of performance. Thereafter opinions and findings of healthcare professionals and music teachers as well as the case studies are discussed. Significant trends and considerations emerging from the research survey are discussed in chapter 7, followed by a comparison of the research results to available literature on the subject of trauma. The hypothesis and research questions are proven/disproven and discussed in chapter 8. The last section of this study is devoted to conclusions that can be drawn from research results, recommendations for further study and general recommendations.

1.10 Literature overview

In music therapy literature, much has been written on how music is used in the facilitation of healing from severe trauma. Ways in which individuals who have experienced trauma express their experiences in music therapy settings are documented in great detail (e.g. McClary 2007, Kellerman & Hudgins 2000 and Heal & Wigram 1993). However, very rarely do people, including teachers working most closely with performing musicians, ask the question as to how experiencing severe trauma influences the expression of emotion and memory during music performance in advanced students and professional musicians. It was clearly evident to the researcher that, while the research on trauma is very advanced, there is very little specifically written about the influence of trauma on musicians. Peretz (2001:106) also notes that the neuropsychological study of musical emotions lags behind other research on the emotions. In another article (Peretz & Hebert 1995:128) the authors also state that research and models on particular brain structures involved in music processing are lacking.

Music and art may even be used in recovery processes following exposure to traumatic events. Habboushe and Maranto (1991:201) refer to the possibility that the areas of Performing Arts
Medicine and Music Therapy may meet when musicians incorporate music as a healing modality in the treatment of their health problems.

The study of the consequences of traumatic experiences has been pursued by many great thinkers. Writings by famous psychologists and psychiatrists such as Sigmund Freud, Carl Jung and Victor Frankl have been consulted for their insights about trauma. The understanding of the subject today is built on work done by these and other professionals. However, for the purposes of this study the focus is on the most recent trauma research which sheds light on the research questions.

The standard texts in the fields of psychology and psychiatry have been consulted, most importantly the American Psychiatric Association’s *Diagnostic and Statistical Manual of Mental Disorders. Fourth Edition: Text Revision (DSM–IV-TR)* (APA 2000). Different sides of the debate on memory are mentioned in this study. Books and articles by musicians on emotion in music were consulted, such as Juslin and Sloboda’s 2001 *Music and Emotion: Theory and Research* and, from a different angle, Malcolm Budd’s 1992 *Music and the Emotions: The Philosophical Theories*.


### 1.11 Notes to the reader

At a basic level, music can be defined as ‘organised sound’ (Levitin 2006:111). The majority of musicians who participated in this study play Western art music, or what is also commonly known as ‘Classical music’. However, the concepts dealt with regarding...
trauma, emotion, memory, as well as additional aspects discussed are equally applicable to other genres of music. Elliott’s description of ‘musicing’ and ‘musicers’ is appropriate for this study (1995:49, 109). As depicted in the figure below, he (1995:40) describes music as a four-dimensional concept involving a doer which he calls a ‘musicer’, some kind of doing which he calls ‘musicing’, something done which he describes as music as well as the complete context in which these actions take place. His definition of ‘musicing’ includes all five forms of music-making which he lists as performing, improvising, composing, arranging and conducting.

Figure 1: Musicing: Four dimensions (Elliott 1995:40)

Musicians included in this study are not restricted to the ranks of elite performers only, but an inclusive definition of music, music-making and musicians is adopted. In the mission statement for the journal Musical Perspectives, Holmgren (2008/9) describes music performance and those involved with the process in a way that is applicable to this study:

Music performance is not so narrowly defined as to be simply a concert or a recital. It is an experience, encompassing teaching and learning, analysis and critique, and the combined experiences of those who interact in diverse ways with the processes and products of making music.

It is an unfortunate reality that the possibility of misapplication of this information or the honing in on vulnerabilities of traumatized musicians exists in a highly competitive environment such as the professional music scene. However, after thoughtful consideration the researcher became convinced that the potential benefits of this information to those who truly wish to ameliorate the challenges facing traumatized clients and students outweigh the potential risks of misapplication.
Readers without a background in psychology should take care not to impose metanarratives on individual cases of trauma. An example of such is the mistaken belief that all students who have experienced a certain type of trauma would react in a particular way. Responses from the research survey and the narrative quality of feedback from case studies served to emphasize the fact that individual reactions to trauma are determined by a great variety of factors and are unique to the individual. Therefore it should be accepted that both reactions and duration of recovery period cannot be accurately predicted by others. The personality attributes of empathetic understanding and imagination are most helpful to those wishing to understand a situation from the perspective of another.

The research survey presented great challenges insofar as obtaining responses from healthcare professionals was concerned. The researcher is deeply concerned about the apparent apathy of many healthcare professionals in giving special thought to how trauma affects musicians. At the same time she is very grateful to that minority of professionals who indeed responded to the survey, even when it was only to confirm that they have not worked with traumatized musicians in their practice. Seen against this practical experience obtained whilst conducting the survey, the researcher believes that comments regarding risks involved in treatment and advice regarding care that needs to be taken in making decisions regarding modes of intervention are justified. A possible consequence of the relatively low response rate from healthcare professionals could be that a certain type of individual, perhaps those more sympathetic towards either musicians or trauma victims, is likely to be disproportionately represented amongst the respondents. It is acknowledged that this could have implications for a degree of bias to be reflected in the research results.

The researcher is of the opinion that aspects that could have been of help to clients or patients are too often overlooked by practitioners who specialise in their particular field, in whichever of the healthcare professions they might have attained their qualifications. Since the researcher is not bound to any specific discipline, the liberty was taken to adopt a broad approach, in line with the holistic framework from which this thesis is written. Perhaps at times it may appear that many different viewpoints are upheld. However, in the end similarities found whilst investigating essentially the same phenomena from different angles could bring greater understanding and clarity to the subject of trauma.
The other motivation for this broad approach is respect for the different cultures that music students come from. Some may immigrate to and emigrate from different countries; others travel great distances to obtain high level tuition. Since trauma can affect anyone, the researcher believes that it is imperative that teachers have adequate knowledge of the wide variety of intervention strategies existing in different cultures in order to enable them to refer students to healthcare services with which they will feel comfortable and familiar.

Assurance is given that the research data is stored according to the regulations stipulated by the Ethics Committee of the University of Pretoria.

Regarding references, in cases where Internet sources did not have page numbers, only the date is given. Subject fields are referred to using capital letters.

Spelling of the names of composers is according to the *Suid-Afrikaanse Musiekwoordeboek/South African Music Dictionary*, second revised and enlarged edition (Otterman & Smit 2000).

In the concluding chapter there may be some overlap between recommendations for further research and general recommendations in the sense that some general recommendations could indeed be interpreted as warranting further study.

It is conceded that many concepts discussed are explained only briefly. In such instances the reader is referred to sources where more in-depth information can be found. This is particularly relevant to psychological theories and intervention strategies developed by professionals and referred to in this study.
Sound is a vehicle for emotion, which it can either reinforce or release.

- Frawley 1997:228

An effort, an emotion, can bring suddenly to consciousness words believed definitely lost. These facts, with many others, unite to prove that in such cases the brain’s function is to choose from the past, to diminish it, to simplify it, to utilize it, but not to preserve it. ... It is enough to be convinced once and for all that reality is change, that change is indivisible, and that in an indivisible change the past is one with the present.

- Bergson 1946:154-5

CHAPTER 2: EMOTION AND MEMORY

2.1 Introduction to the relationship between emotion and memory

Emotion and memory are discussed together in this chapter as they can sometimes be very closely related. The quotation by Frawley (1997:228) above (on p 13) serves to illustrate that sound and emotion are closely linked. In turn, the quotation by Bergson (1946:154-5) not only draws attention to the important link between emotion and memory but also reflects on the passing nature of experience as well as the processing, perception and memory thereof. By stating that “the past is one with the present” Bergson leaves the impression that he adopts a holistic perspective on cumulative experience not unlike that postulated by quantum mechanics nearly half a century later.

Not only are both emotion and memory processed by similar brain structures, but the emotional nature and associations of events play an important role in the way in which events are remembered or not. Adequate motivation, in itself also linked to the emotions, is needed for musicians to be successful and reach their goals. Both emotion and memory are integral parts of music performance. Fear is an emotion often encountered by performers in connection with the professional demands of public performance. It is argued that such performance anxiety may perhaps be more pronounced in previously traumatized individuals. Regardless of whether a performance is done entirely ‘from memory’, processes that involve highly specialized memory skills are utilised in any form of musical activity.
Firstly emotion is defined. Thereafter aspects related to emotion relevant to trauma and music are discussed in the first part of this chapter. Section 2.6 defines memory followed by discussions on various aspects of memory. The chapter concludes with a discussion of a section about performance from memory and stage fright.

2.2 Defining emotion

The first part of this chapter aims to highlight how emotion plays a central role in human existence and human motivation. In the field of music, the role of emotion and the subjective nature of the musical experience is perhaps more prominent than in most other careers. However, music can also have a profound influence on the emotional state of musicians and non-musicians alike. An appreciation for the complex nature of interacting factors in emotional responses especially to trauma and music is important.

Corsini (2002:324) defines emotion as “[a]ny mental state characterized by various degrees of feeling and usually accompanied by motor expressions, often quite intense.” In turn, Corsini (2002:371) defines feeling as “[t]he emotional aspects of an experience” while LeDoux (2002:225) describes a feeling as “the conscious experience of an emotion”. In addition, Mithen (2005:90) distinguishes between mood and emotion by pointing out that mood is a prolonged feeling while an emotion may be short-lived. Vocabulary associated with emotion and feeling plays an important role when reactions to and memories of traumatic events are described, as well as in the description of the subjective nature of experiencing or performing music. Concerning the identification of different types of emotion, Mithen (2005:86) distinguishes between basic emotions and complex emotions. He identifies variants of happiness, sadness, anger, fear and disgust as basic emotions, while he classifies shame, guilt, embarrassment, contempt and love as complex emotions. It is interesting that Zukav (1990:190) writes that the human emotional system can be broken down into the elements of love and fear, since according to Mithen’s distinction the former is a complex emotion while the latter is a basic emotion.

Emotion can also be defined on psycho-physiological levels. According to Spintge (1991:59), three levels, namely the cognitive-verbal, vegetative-physiological and nonverbal levels of emotion, can be objectively measured and quantified. The first determines thinking, processing of incoming stimuli, and verbal behaviour. The second can be measured through physiological
measurements such as hormone levels and skin resistance, while the third involves psychomotor behaviour such as facial expressions and fight-or-flight reactions. Spintge also refers to the aspects concerning emotion which cannot be measured but can only be described qualitatively. Both measureable and subjective experiences of emotion accompany the perception of music.

Mithen (2005:100) points out that emotions provide a guide to action and therefore are fundamentally important to thought and behaviour. He explains (2005:85-6) that academic attitudes have changed from viewing emotions as the antithesis of rationality toward placing them at the centre of human thought and mentality. In terms of how emotion guides people, John Bradshaw describes it as “the fuel that moves us to defend ourselves and get our basic needs met” (1990:13). He continues to define emotion as ‘energy in motion’ and describes various different emotions as the energies of anger, fear and sadness respectively. Savage (2002:108) classifies all expressions of human emotion as belonging to one of two primary emotional areas, namely love and fear. In the spectrum of what can be described as emotion as well as the purpose of emotion, much more subtle varieties can be discerned. Indeed every aspect of human living involves emotion on some level. Spintge (1991:61) asserts that there is no behaviour without emotion. This is supported by Jensen’s statement that most of our behaviours are influenced by peptides associated with emotion (1998:75).

Budd (1992:1) highlights three important questions that can be asked regarding emotion, namely what emotion is and what separates experience of emotion from other mental experiences; how emotions are distinguished from each other; and how different emotions are defined. In a more practical manner, Bradbury (2008:58) differentiates three constituent elements of an emotion: mental (‘feelings’), physiological (for example, heart rate and respiration), and behavioural (for example, posture and movement). He also explains that, through appraisal of any given situation, an emotion comes about. This is a valid explanation that relies heavily on the cognitive aspects associated with experiencing an emotion, involving the neo-cortex. Bradbury (2008:59) goes on to clarify this by distinguishing the slower routes along which nerves communicate information from sensory organs to the amygdala in the brain as being “via the conscious, wilful parts of the brain”, as opposed to the quicker routes via subcortical pathways. Radford (1989:75) points out that emotion can have many vectors and therefore has both magnitude and direction. He also explains that experiencing an emotion is not dependent on whether it is in actuality directed at an object (or at a situation or person).
Quotations from the work of the abovementioned authors give an overview of the philosophical and experiential complexities underlying emotions. Human emotion evolved from a primitive survival mechanism to being highly developed and refined. However, the major purpose of emotion is still to aid in our survival, and when conditioned responses become inappropriate to the situation of modern living, intervention is desirable. This can be deduced from Jensen’s description related to learned helplessness, one effect of trauma rewiring the brain, and his suggestion that intervention is necessary when a serious condition is present (Jensen 1998:58).

The biological basis of emotion will be discussed in the following section. The advances in current scientific knowledge about the working of these chemical messengers give the possibility to develop means of intervention when circumstances or experiences adversely influence emotional states. In cases where neurological associations were formed which can be detrimental to the optimal functioning of the organism, recent developments in medical knowledge make solutions possible.

2.3 Biological basis of emotions

As seen in the previous section, it can be a challenging pursuit to define emotions. However, on a biological level emotions can be understood in terms of chemical changes involving neurotransmitters, peptides, hormones and other substances (Jensen 1998:76-78). These are not only present in our brains but are transported throughout our bodies. As stated by Jensen (1998:75), emotions create ‘mind-body states’. He goes so far as to call the bloodstream “the body’s second nervous system”. Of importance to this study is only a basic explanation of the role of abovementioned chemical messengers, which will be linked in chapter 3 to their role played in trauma and resultant trauma manifestations.

Cory (2000:386-7) describes Paul MacLean’s concept of the ‘triune brain’ as consisting of the protoreptilian complex governing our ‘life-support operations’, the palleomammalian complex comprising the limbic system and the most recently developed neocortex or neomammalian complex. In addition he states that older brain parts became more complex when the neocortex evolved. This is important in this context since human emotional responses would therefore be more refined than those of animals. In Cory’s view (2000:406), MacLean’s triune brain concept is so important that he even sees it as providing the basis for the study of moral consciousness.
While the unconscious component of emotion involves the autonomic nervous system and the hypothalamus, the conscious component of emotion involves the cerebral cortex (Kandel 2006:342). However, not everybody agrees about the accuracy of the triune brain theory. More than ten years ago already, Jensen (1998:4) wrote that the triune brain theory as proposed by MacLean was outdated. The importance of the role of brain chemicals is currently the focus of most of the neuropsychological attempts at altering or improving the function of the brain. Spintge (1991:61) writes that neuro-hormones and stress hormones can be measured in the blood and cerebrospinal fluid. Amendolia (1998:1) states that affect and primitive memory or sensory input are processed in the limbic system. She explains that sensory input first reaches the thalamus, whereafter the amygdala determines the significance of the sensory data received. It is the role of the hippocampus to form a cognitive map of the input received, according to its significance.

The last brain structures to develop are the frontal lobes. In both humans and other animals, the subcortical brain structures are associated with the limbic system. However, Peretz (2001:106) points out that emotions also recruit portions of the frontal lobes. This means that the whole brain is involved in the processing of emotion and neurotransmitters associated with the emotions affect the whole brain as well as the body. Rose (1993:505) supports this contention:

As neuroscience now tells us, this is because of the way the central nervous system is constructed: affects, sensations, and memory functions are processed by the same or parallel neuroanatomical corticolimbic circuits and structures with interconnecting shunts. Theoretically, then, any one of the three can stimulate the other two.

Emotions (described above as affects and sensations) involved in music processing can also stimulate memory function and vice versa. Levitin writes about the importance of connections in the brain’s involvement with music (Levitin 2006:192):

It involves a precision choreography of neurochemical release and uptake between logical prediction systems and emotional reward systems. When we love a piece of music, it reminds us of other music we heard, and it activates memory traces of emotional times in our lives.

Specific neurotransmitters are linked to specific emotions. Discussed here are only those that play important roles in the trauma response, since a basic understanding of those is necessary to the understanding of certain concepts that will be discussed in chapter 3. Neurotransmitters and hormones associated with fear include adrenaline and noradrenaline. Holford (2007:51-3) notes that dopamine aids in dealing with stress, gaba-aminobutyric acid is linked to the modulation of
anxiety levels, while decreased serotonin levels could also be a cause of anxiety. Holford (2007:52) states that many other substances in the brain also act like neurotransmitters. This supports Jensen’s statement (1998:75) in connection with the influence of peptides on our behaviour, as referred to at the beginning of this section. It should also be noted that, in addition to the immediate biological reactions taking place in the brain, trauma and its aftermath can also deplete the body of amino acids necessary in the formation of vital neurotransmitters. Neurogenesis (n.d.:1) identifies dopamine, GABA, norepinephrine, enkephalin and endorphins as particular neurotransmitters, the availability of which is diminished by the effects of trauma. Sahley (2009:1) is of the opinion that amino acid therapy can rectify the situation. She also identifies magnesium as the first mineral to be depleted by trauma and recommends supplementation with magnesium chloride.

Emotional illnesses of a biological nature are prevalent among musicians and others in the creative arts, as writers such as Kay Redfield Jameson argue at length (Jameson 1993). Some authors attempt to fit creative artists into specific moulds. For instance, Hershman and Lieb (1998) hypothesize that creativity and manic depression (bipolar disorder) necessarily correlate. In their words (1998:11): “We claim that manic-depression (sic) is almost indispensable to genius because of the advantages it can supply, and that if there have been geniuses free from manic-depression, they have been a minority.” In addition they (1998:197) also write: “According to tradition, creative individuals must suffer beyond what ordinary mortals endure on the assumption that suffering is essential to creativity.” The researcher wants to state clearly that not only does she disagree with such limited approaches to the understanding of creativity, but also that this study does not attempt to and should not be erroneously interpreted to claim that trauma is either a necessity for musical maturation or that all musicians have experienced serious trauma. However, what could perhaps be learnt from the limitations of the abovementioned viewpoints of Hershman and Lieb is that trauma symptoms and the symptoms of mood disorders often overlap, and that many of the same neurotransmitters are implicated as the cause of symptoms in various manifestations of symptoms. Therefore care should be taken and scientific investigation pursued in distinguishing what the true causes are in every individual case, plus under what circumstances, in order to avoid serious diagnostic mistakes (for an example see chapter 6.4.2 and 7.5.7).
2.4 Emotion and motivation

As seen in section 2.2, it is evident that emotions influence behaviour. However, not all emotions or feelings are goal-directed. Sternberg (1998:541) elucidates that emotion and motivation are similar in many aspects, but also differ in essential ways. An important difference is that responses to emotions are inner-directed while responses to motives are goal-directed. Other differences that Sternberg points out include that the stimuli for motives are mostly unobserved while stimuli leading to the experience of emotions are often apparent. Motives are cyclical and energise, direct and sustain activity while emotions are not normally cyclical and may interfere with everyday activity. Motives are experienced as desires to attain goals and are active in contrast to emotions that are experienced as feelings and are passive.

From the above it is evident that emotion and motivation are not the same but are closely related. To succeed in the music profession people are required to be highly motivated and to persist with often solitary activities such as practising instruments. Potgieter (1997:6) distinguishes between intrinsic and extrinsic motivation, the former being derived from rewards gained from participation in an activity as such and the latter associated with external rewards such as social recognition, status, awards and money. Both intrinsic and extrinsic motivational factors are associated with participation in music. Whilst music itself can be intrinsically motivating, complexities may arise when traumas experienced influence the emotions and in turn have an effect on motivation. This can have a profound influence on how musicians function in their studies and careers. Perceived effects on professional functioning can be either positive or negative. However, so-called professional accomplishment is not always an accurate measure of happiness and contentedness in personal life, since for some work can become an escape from circumstances.

Gorrie (2000b:97) draws attention to the influence that a difficult past may have on performers. He makes it clear that it is a person’s conscious or subconscious decision whether their past will equal their future which is the decisive factor determining whether they break free from their past circumstances. He states that many of the greatest performers came from a background of poverty or some form of hardship and that this provided the intense motivation to make changes and work towards drastically different futures. Various motivations for the changes that he mentions include being dissatisfied with their current situation, the want to ensure a better future
for their children and the simple refusal to continue their current life situation. It can be seen that such appraisal incorporates elements of emotion experienced as a result of circumstances or situations that in turn become catalysts for instilling and sustaining the motivation to change.

The expectations of teachers and the way in which they treat students can have a profound impact on students’ motivation to achieve and persevere. Potgieter (1997:23) emphasizes that the expectations and levels of value that teachers and coaches hold of students influence their levels of motivation, pointing out that levels and tone of communication between them are interpreted as a measure of their value and potential.

For optimal performance in the music profession, emotional expression should be unhampered. In addition, musicians must be highly motivated to reach high levels of expertise. Traumatic experiences can interfere with both the emotions and motivation. Perhaps the emotional nature of music and opportunities it lends for creative expression are what makes it an intrinsically motivating activity. The relationship between emotions and motivation is relevant to this study to the extent that the directionality of emotions impact the professional functioning of musicians by having an influence on their levels of motivation. In the next section expression of emotion and perception of emotion in music are discussed.

### 2.5 Expression and perception of emotion in music performance and appreciation

Studying and defining expression of emotion in music, the mechanisms by which music is interpreted by the listener, and whether or not the message that is received resembles that which was intended, is a complex pursuit. Expression and perception of emotion in music are related but not the same and can be compared to other forms of communication where there is exchange of ideas and intent. The following two sections of this chapter discuss these aspects of the experience of music.

#### 2.5.1 Expression of emotion in music performance

It is perhaps challenging to satisfactorily describe music and its effect on people by means of language. However, people such as Budd (1992), the author of a monograph about the philosophical theories behind music and the emotions, have consciously given careful thought to
music and the emotions. He (Budd 1992:175-6) concludes his study with the contention that he has not yet come across a clearly satisfactory theory of music. He is of the opinion that such a theory should not be as monolithic as the ones he has rejected. Various other opinions, some of a more practical than philosophical nature, were encountered in the literature, as discussed below.

It cannot be denied that it is expected of professional musicians and music students alike to possess some innate ability. Music training generally includes further developing both skills of appropriate expression of emotions in music and fine-tuning of perception skills. Perhaps consciously considering how others have grappled to define these processes could be helpful in enhancing the verbal vocabulary used for teaching and guiding students, including traumatized students in whom these mechanisms may temporarily be affected.

Mithen (2005:100) writes that all people intuitively understand music to be the ‘language of emotion’. He also states that, not only can music express our emotions, but it can also be used to manipulate the emotions and even the behaviour of others. These elements of communication will be referred to in various contexts in this thesis. The great piano pedagogue György Sándor (1912-2005) aptly describes the role of music in communicating emotions in the following words (1981:198):

> We cannot use it to communicate facts or convey ideas. What music can do is generate and communicate moods – the emotional responses that accompany facts and ideas ... Music will circumvent events, communications and information, and will evoke emotional responses by direct aural contact, whether they are stimulating, soothing or depressing. Unquestionably sound alone can represent and affect the entire human emotional gamut.

When we think of music, the expression of different moods and atmospheres comes to mind. It is the performer’s role to communicate to the listener by means of sound. Therefore during both practice and performance such individuals have to experience emotions more frequently than is the case with people not involved in music performance. This is alluded to by Mithen (2005:94) who writes that although it might be difficult to test formally, music induces emotional states in both performers and listeners. In addition, the mood that a particular section in a given piece of music requires is most likely not the state of emotion the individuals themselves are naturally experiencing at the given point in time. Therefore associations have to be made to past events and feeling states more frequently than would be the case for individuals not involved in music performance and teaching. When their own internal emotional state has been interfered with by
trauma, these continuous emotional demands made on the person when practising and performing on the instrument (including voice) can become a problem in some cases. In other cases it could possibly become a necessary and beneficial outlet of emotion. Responses to the research questionnaire sent to music teachers as well as the case studies shed more light on these possibilities. These are discussed in chapter 6.2, 6.3 and 6.4. It should be added that, in part, the outcome and particular way chosen to ‘deal with’ these emotions may depend on how the situation is managed by those supporting the student or artist.

Gestures form an important aspect of a performer’s possibilities of conveying the meaning of the music to the audience. Altenmüller, Bangert, Liebert and Gruhn (2000:103) state that the complex movement patterns required from musicians are closely linked to the emotions. These authors draw attention to the difficulties that may arise when a musician wants to communicate feelings but at the same time may be afraid to make mistakes. Strains of professional musicianship include what they refer to as this ‘double linkage’ to the emotions and the reward-punishment system. Much is required of the professional musician in terms of the expectations and emotional demands of the career. It follows that trauma could further add complexities to the equation. An example of how altered bodily motions in a traumatized musician could interfere with musical expression, as observed by Alice Miller (1997:12), is cited in chapter 4.1.

In attempting to explain how music exerts its emotional effects on people, Radford (1989:74) writes that “perhaps, sad music echoes the rhythms, cadences, intonations of the voices, movements, and demeanor of persons who are sad.” He considers himself to be an ‘emotivist’ and contrasts his view with what he calls the ‘cognitivists’ who he says reject the emotivists’ assertion that listening to music that is intended to express sadness can make listeners feel sad. The researcher cannot help but feel that this philosophical attempt to describe emotions and music fails to adequately explain what Radford sets out to do. Perhaps the reason for this is that it fails to mention anything about the essence of sound vibration and how it travels, influences and is perceived by listeners. Skar (2002:632) does point out that music is movement in the same way as sound is vibration, observing that feelings move and transform. In some instances music’s potential function as a medium for conveying emotions is intuitively understood, even without finding scientific theories and proof necessary.

Writers from traditions outside Western art music also grapple with the question as to what the role of music and the arts in the expression of emotion entails. As Gold and Brinner (2007:678)
refer to, the Rasa theory of Southeast Asian Tantric readings holds that the performing arts express one or more of the nine Rasas. When communicated in music, the Rasas are considered as emotions or qualities inherent in the performed work. According to this view, music functions as a medium for conveying emotions.

An important consideration is music’s ability to bypass the conscious mind. McClary (2007:159) describes this ability of music as providing a direct pathway to emotional and unconscious material. In connection with William Shakespeare’s use of the concept of creative sound and his manipulation of ‘combinations of sound frequencies’, Wooldridge (2007:2) writes that “[Shakespeare] was aware that music as tone bypasses the intellectual guards and filters and goes straight to the heart of the matter.” It can therefore be asked how much we do indeed express and/or perceive consciously and to what extent the expression and/or perception of music involves unconscious processes.

Regarding brain damage and observed changes in the emotions, Sacks (2007:302-304) refers to a case where the patient lost the ability to feel and express emotion entirely except for when he sang. This man’s frontal lobes were damaged by a brain aneurysm. He states that the right hemisphere was more extensively damaged than the left, and the man became severely emotionally impaired. However, when this man sang, Sacks and others treating and caring for him observed that he showed every emotion appropriate to the music. Sacks writes (2007:303): “It was as if music, its intentionality and feeling, could ‘unlock’ him or serve as a sort of substitute or prosthesis for his frontal lobes and provide the emotional mechanisms he seemingly lacked.”

Notwithstanding the differences of opinion as to exactly how music communicates emotion, it cannot be denied that music’s central role in society is inherent in all cultures. The truth in this statement can be illustrated by analyzing the concept of the archetype of music. Jung (1959:3-4) described what he termed the ‘collective unconscious’ as a universal phenomenon consisting of modes of behaviour and content, indeed the themes inherent to human life, shared in similar forms by all people. He calls the ‘collective unconscious’ a “common psychic substrate of a suprapersonal nature”. Archetypes are related to this, but Jung (1959:5) explains that they are not unconscious but are indeed collective psychic experiences that have become conscious. He adds that esoteric teaching and fairytales are ways in which archetypes are transmitted. McClary (2007:156) explains that inherited archetypes cause individuals to tend to experience things in
certain ways. She refers to the ‘archetype of music’, thereby implying that music is a universal experience that is transmitted from generation to generation. She (2007:156) further explains the origins of music as efforts of humans to take audible sounds and silences from the environment and organise them into musical form. In all cultures, music is a means of communicating and it forms a vital part of some of the most important ceremonies and institutions in cultures, such as religious ceremonies, marriages, healing rituals, entertainment and art. However, Marshman (2003:27) draws attention to the fact that specific genres of music, such as Western art music, are not necessarily universal, but that the underlying values in various forms of music are indeed universal.

2.5.2 Perception of emotion in music appreciation

In order for communication to occur it is essential that an intended message is received by another. In this process, many variables determine whether this is the same as was intended. However, even if erroneous, if a message was transmitted and received, some form of communication has indeed occurred. This pertains to all life forms, but for the purposes of this study is limited to that of human beings. Budd (1992:151) argues that just as linguistic utterances can be miscomprehended, so can a musical work. Juslin (2005:87) describes the necessary aspects for music to communicate, the minimum requirement being acoustic performance perceived by a listener. When the listener’s affective response matches the composer’s expressive intention, maximal artistic expression or communication is achieved. Juslin illustrated this spectrum by means of the following figure:

![Figure 2: Different aspects of the chain of musical communication of emotion (Juslin 2005:87)](image-url)
In order for a listener to perceive emotion in music, composers and performers make use of an infinite number of communicative devices. Levitin (2006:111) elucidates that knowing what our expectations are and controlling when those will and will not be met is the means that composers use to communicate emotion. He writes: “The thrills, chills, and tears we experience from music are the result of having our expectations artfully manipulated by a skilled composer and the musicians who interpret that music.”

Stein (2007:444) construes the interaction between music and auditor as an ‘object relation’ in which the inter-relationship consists of psychical operatives such as the phenomena of projection and transference. According to this viewpoint, the subjective nature of musical experience is paramount and past experiences play a formidable role in the way in which music is perceived. Stein states that in describing music’s effect within us we are focused on the subject’s internal psychological world. Perception of music is a subjective process for yet another reason, namely that, as Lathom-Radocy and Radocy (1996:69) point out, human information processing is required to create music from incoming aural stimuli.

Responses of subjects in Thompson and Robitaille’s study (1992:88) on whether composers can convey emotions through music showed a clear positive correlation in identifying the emotions of joy, sorrow, excitement, dullness, anger and peace. Resnicow, Salovey and Repp (2004:145) state that music is a form of non-verbal communication to which individuals may be differentially receptive. A study by these authors found that there is a connection between identification of emotions in music performance and emotional intelligence.

Maranto (1993:158-159) describes the capacity of music to elicit responses in humans as including, but not limited to, eliciting physiological, psychological and cognitive responses. Music may also cause physiological and/or psychological entrainment such as synchronising heart and respiration rates to the pulse of a piece of music. This underscores what powerful influences music has on the physiological as well as psychological aspects of human emotions. In support of this, Spintge (1991:61) states that music is a very complex stimulus, influencing conscious brain functions as well as autonomic and unconscious cerebral processes in various ways.
Bharuca (1999:435) proposes a model of neural nets to explain a possible way in which the brain may be wired. This is consistent with how the brain forms associations between bits of related information and has significance to how traumatic memories may impact other brain systems involved in music-making. As pertains to the brain structures underlying the perception of music, research focuses on locating neurons that respond selectively to the basic elements of music. Weinberger (1999:60) affirms that no single approach can provide a full account of the brain mechanisms underlying the perception of music. The complexity of processing music involves many different structures in the brain. Research by Peretz (2001:118) indicates that emotional judgements of music can remain unimpaired even after the occurrence of injuries resulting in severe deficits in perceptual processing. This suggests, in her view, a specialized cortical arrangement for musical emotions. In addition, the possibility of music to stir the emotions is more fundamental than memory for music. Sacks came to the following conclusion (2007:346): “The perception of music and the emotions it can stir is not solely dependent on memory, and music does not have to be familiar to exert its emotional power.”

Bearing all the above in mind, perhaps considering neurochemical reactions, brain structures, object relations and archetypal material are in and of themselves insufficient to explain the mechanisms by which emotion is expressed and perceived in music. Mithen (2005:278) indeed concludes that words are inadequate to describe the nature of music, including its influence on our minds and bodies. Schwartz and Begley (2002:37-39) argue that the totality of our neurochemical reactions does not provide an adequate explanation for feeling, attention and memory, but that mind and volition interact with and influence the purely biological side of such experience. In the context dealt with in this study, this viewpoint would imply that we are not at the mercy of our emotions. Seen in this light, both trauma victims and musicians have greater control over their own experiences.

2.6 Defining memory

Eric Kandel, winner of the Nobel Prize in Physiology or Medicine in 2000, describes memory as “a form of mental time travel; it frees us from the constraints of time and space and allows us to move freely along completely different dimensions” (Kandel 2006:3). It is important to distinguish between the process of remembering and memory as a representation of past experience or of the external world previously experienced through the senses and stored in the
central nervous system, available for retrieval. Corsini (2002:581) defines memory firstly as the “[a]bility to revive past experience, based on the mental processes of learning or registration, retention, recall or retrieval, and recognition; the total body of remembered experience” and secondly as “[a] specific past experience recalled”.

LeDoux states (2002:134) that most neuroscientists now believe that alterations in synaptic connectivity are necessary for learning to take place, and that memory of learnt material constitutes the stabilization and maintenance of these changes over time. For instance, at a given point in time a musician can be playing a piece of music ‘from memory’, or in other words, be recalling the music, while many other pieces may be stored in memory, available for future recall. The degree of accuracy of recall may vary depending on the solidity of consolidation processes and relative recency of past revision of material, but the music is indeed stored in various memory systems and available for retrieval.

Perry (1999:1) defines memory as “the capacity to bring elements of an experience from one moment in time to another.” He draws attention to the fact that this capacity is unique to all life forms. Perry continues by describing this capacity to carry aspects of previous experience forward in time as the basis of the immune, the neuromuscular and neuroendocrine systems. He acknowledges that the human nervous system is the most sophisticated biological system to store representations of both the external and internal worlds. This illustrates the importance and complexity of memory of various systems in the human body and underlines that, even in relation to music, a purely cognitive explanation of memory cannot account for all aspects involved.

Scaer (2005:38) states that we acquire skills necessary for survival primarily through a process of trial and error, constituting learning, which in turn requires memory. It can be deduced that we depend on our acquired memories for our very survival.

### 2.7 Types of memory

The aim of this discussion of different types of memory is to clarify concepts that will again be referred to throughout this study where the impact of trauma on musicians’ memory processes is discussed.
Perhaps the most important types of memory to distinguish between are explicit or declarative memory as opposed to implicit or procedural memory. Things remembered and learned, in other words memory utilised in the “specific process of conscious learning” (Scaer 2005:38), is called explicit or declarative memory. Scaer (2005:38) distinguishes between episodic and semantic declarative memory. According to him, we use the former to guide our immediate activities and the latter to learn or gather information. LeDoux (2002:116) explains that implicit memory operates without our awareness and is reflected in many aspects of our outward behaviour and inner life. Scaer (2005:40) states that nondeclarative or procedural memory is intrinsically unconscious and mostly stored in the midbrain, cerebellum and brainstem. Procedural memory is employed to acquire sensorimotor skills such as the technique of playing a music instrument. Memory used in learning and performing music requires implicit and explicit memory. What was learned by using declarative memory later becomes automatic, or in other words, part of procedural memory. However, a musician is conscious of and can perhaps later recall many or even most aspects of the performance that was previously contained in working memory (also known as short-term memory). Corsini (2002:1076) makes it clear that working memory is involved in holding items briefly before they are either stored in long-term memory or forgotten. Working memory is also responsible for retrieving previously stored information for a specific purpose. Such information is held in working memory while it is used. Weber, Clark, McFarlane, Moores, Morris and Egan (2005) illustrated abnormalities in the functioning of working memory in patients with PTSD (see section 2.8.4). This will be highlighted later as relevant to musicians and their specific trauma responses.

Scaer (2005:39) identifies the area of the brain that processes declarative memory as the hippocampus. A crucial consideration relating to matters discussed later in this study is that, according to LeDoux (2002:131), the hippocampus makes awareness possible. He writes that the hippocampus is synaptically connected in a manner ensuring availability of its activity to brain systems that mediate conscious awareness while this is not the case with the connection of implicit systems. LeDoux (2002:123) also states that the amygdala is involved in implicit learning and as a result we only become consciously aware of an emotional stimulus when it is being processed by working memory. A basic understanding of these different memory systems is important to facilitate an attempt to understand how memory for music and memory of trauma could mutually influence (or interfere with) each other.
Memory systems often referred to in relation to music are visual, acoustic (or aural), kinaesthetic, motoric and analytical (see section 2.9, Sándor 1981:192-197, Ahrens & Atkinson 1955:80-83). Jensen (1996:205) categorises retrieval systems slightly differently, namely as categorical/semantic, procedural, contextual/episodic, and sensory and synaesthetic memory. Synaesthesia is defined by Corsini (2002:972) as “[a]n experience in which stimulation of one sensory modality also arouses sensations in another; for example, words or sounds (and sometimes tastes and odors) may be experienced as colors. Musical notes may yield specific colors. Or numbers are experienced as sounds.” Some music teachers actually cultivate synaesthetic memory to enhance creative possibilities for interpretation. Aiello (2001:393) found that concert pianists participating in her study seemed to have developed more precise cognitive plans for memorising a new piece, while participant students tended to learn by rote. In terms of the above discussion about memory systems, the former method employs more memory systems, particularly making fuller use of explicit memory systems than the latter which makes use mostly of motoric or procedural memory.

Kandel (2006:218) states that short-term memory results from functional change and long-term memory from anatomical change. In addition, learning changes ‘cortical maps’. He also identifies plasticity as the mechanism underlying learning and states that the architecture of each person’s brain is unique. Both short-term and long-term memory are required by music performance and teaching. However, changes in short-term memory (also referred to as ‘working memory’) could be more directly observable and play a very important role in both learning and performing music.

All technical passages as well as interpretative aspects have to be executed in real time when performing a musical composition. For lack of a better term this could be described as ‘time-based sequential memory’. The relentless expectations for exact renditions of previously consolidated material are what distinguish memory required of performing artists from memory for other kinds of previously learnt information. Perhaps this contributes to the influence of phenomena such as concentration deficits due to trauma being more destructive to and noticeable in the performing arts than in other occupations.

Teachers may work with students and artists from all cultures. Therefore it is important to recognize that some traditions such as Ayurveda, a system of traditional medicine native to India, view memory differently from the definitions as set out in section 2.2. More specifically,
the Ayurvedic and Buddhist understandings of memory tend to be more multi-dimensional, described by Tiwari (1995:39) as “[c]ontaining the truth of the entire universe”. Some ‘alternative’ practitioners maintain that people indeed have access to memories extending over a longer period of time in the existence of life forms than is generally accepted in allopathic medicine. Ayurvedic practitioners distinguish between what they call cosmic, cognitive and experiential memory (Tiwari 1995:39-40). Tiwari defines ‘cosmic memory’ as “the complete recollection of the entire universe from the beginning of time”. According to her, ‘cognitive memory’ holds our past knowledge, while ‘experiential memory’ is our recollections of experiences through the mind, body and senses. Perhaps the concept closest to this description that is accepted in Western thought is the notion of ‘DNA memory’, as described by Hammons (2006), focusing on genetic memories encoded in the DNA helix. He raises the question as to whether it is possible that the DNA helix holds memories of our ancestors and argues that acquired experience necessary for survival of a species could be saved as ‘unconscious genetic memory’. These phenomena of which our understanding is limited could all potentially impact a musician’s memory for music. However, they require highly specialized investigation and therefore are beyond the scope of this particular study where the emphasis will be on more clearly definable and observable characteristics of memory.

2.8 Emotion, memory and trauma

Reactions to trauma involve emotional responses and can also include alterations in the normal functioning of memory. Therefore emotion, memory and trauma must all be discussed to form the foundation for later explaining how a complex interaction of these processes can affect traumatized musicians and their music-making. Section 2.8.4 particularly describes some effects of trauma on memory for music.

2.8.1 Processing of emotion during traumatic situations

There are many opinions regarding the processing of emotion during traumatic situations (for example see Scaer 2005, Nijenhuis et al. 2004, Beaulieu 2003). However, most sources agree that during a traumatic situation, sensory overload occurs, survival is the primary goal, and emotions cannot be processed fully. The various reactions possible are the fight, flight, or freeze responses, and secretion of peptides and hormones in the body during the traumatic event prepares the body and provides the energy needed for any one of these responses. The reaction to
trauma is a two-way process, since according to LeDoux (2002:228) once alarm-related behaviours are elicited, the brain begins to receive feedback from bodily responses. These include sensory messages from internal organs or muscles as well as feedback from hormones and peptides released in the body which again reach the brain. He states (2002:228): “[It] is likely that working memory has access to this information in one form or another.”

There are medical explanations for the processes, symptoms and individual differences associated with the trauma response. Intense emotions experienced and the inability of the brain to process and integrate the overwhelming amount of incoming information can lead to trauma symptoms, most notably dissociative symptoms (Nijenhuis et al. 2004). In addition, according to Levine (1997:99-100), the failure to discharge the frozen energy accumulated during the immobility or freeze response, due to the neo-cortex overriding the instinctual responses, leads to traumatization and the symptoms associated therewith.

In addition to differences between individuals, differences exist in how people of different ages react to and remember the same events. Van der Kolk and Saporta (1991:199) state that the biological effects of trauma at different times in human development can be different. According to research results published by the Society for Neuroscience (2008:1), it is possible that fears unlearned at an early enough age can, in fact, be erased. However, as structures close to the amygdala develop, their role in the formation of fear memories increases and it becomes virtually impossible to erase such memories.

Scaer (2005:51-52) explains that during a threatening situation the frontal and central areas of the right cerebral hemisphere attend to incoming information and the brain’s response thereto. He states that the primary senses first warn us of danger and this information is then sent to the locus ceruleus. Thereafter messages are sent to the amygdala from where they are further sent to the hippocampus as well as other brain regions. Kandel (2006:342) states that the amygdala is involved in both the conscious experience of feeling and bodily expressions of emotion. Next the information is sent to the orbitofrontal cortex which Scaer (2005:52) calls “the master regulator of survival behaviour, both conscious and unconscious”. Information is then sent to other parts of the brain responsible for initiating behaviour patterns to assist in survival. The orbitofrontal cortex also activates the hypothalamic/pituitary/adrenal (HPA) axis which is responsible for the endocrine response, activating the sympathetic nervous system. Scaer continues by explaining that the pituitary stimulates the adrenal glands to produce cortisol,
lowering norepinephrine levels which modulate the remainder of the brain’s arousal response. This aids in managing ongoing stress with the aim of restoring homeostasis.

According to Huopainen (2002:103), modern neurobiological research underscores Jean-Martin Charcot’s hypothesis that traumatic experiences impair the brain’s ability to process emotions. It follows that impaired ability to process emotions will inevitably have a negative effect on musicians for whom an integral part of their job is processing and communicating diverse emotions. In this, working memory plays an important role. Regarding integration of sensory information, particularly pertaining to fear reactions, LeDoux (2002:229) explains the processes involved as follows:

working memory integrates sensory information about the immediately present physical stimulus with memories from past experiences with such stimuli and with the current emotional consequences of those stimuli.

The aftermath of a traumatic event can bring with it a host of confusing and overwhelming emotions or it can leave feelings of apathy. Unique to humans is the ability to appraise and evaluate our own emotions (or lack thereof) as well as those of others or those of animals. The famous late violin pedagogue Dorothy De Lay (1917-2002) is quoted by Sand (2000:69) on planning and the meaning of discipline:

There has to be a transition point where we realize that our own reactions have validity. We have to realize that our own thoughts, our own ideas, our own emotions, really are all we’ve got. But because we are intelligent people, they are reliable, very valuable, very interesting.

These observations are as valid to the processing of traumatic situations as they are to planning and to discipline. Unlike animals, we can reflect and come to understand why we have responded in one way and not in another.

Those coming into close contact with traumatized individuals can bear the burden of secondary traumatization. In the long term, processing negative emotions can take its toll in various aspects of their existence. The protection and well-being of researchers in the field of trauma currently is their own responsibility. Exposure to secondary traumatization is high in this group of individuals, as well as in healthcare workers and perhaps even in teachers. After it came to the attention of the researcher that a South African psychologist who had recently made a very valuable contribution in the field of trauma had been diagnosed with advanced cancer, certain questions emerged. Although professionals are advised to be regularly debriefed, it is not so
often considered to what extent long-term secondary exposure to trauma, which takes its toll on the emotions, can also be detrimental to the physical well-being of healthcare professionals. Perhaps a more important question is simply: What can be done to assist them to remain healthy? Dharmananda (1999) writes that, in contrast to the view of allopathic medicine of linking changes in the DNA to the development of cancer, Traditional Chinese medicine views the emotions as a principle cause in cancer aetiology. It should be asked to what extent emotional influences contribute to physical illness in cases such as that mentioned above. Such enquiry may lead to a conclusion amongst open-minded individuals that interdisciplinary collaboration may be necessary to lessen the risk to those investing their energy and resources to help others.

2.8.2 Traumatic memories

The previous section concerned the processing of emotion during traumatic situations. The last paragraph illustrated how the burden of processing traumatic memories can take its toll on the body when the traces and memories of such events and emotions become embedded in our being. However, the cognitive memories themselves and encoding thereof should also be discussed. The topic of the difference between encoding of ordinary memories and that of traumatic memories is a topic of great scientific interest, and in some cases also of forensic interest. Huopainen (2002:94) writes that traumatic memories are chiefly encoded as sensory, experiential and emotional fragments unlike what is usually the case with everyday memories. Therefore it is the role of treatment to facilitate cognitive processing of these fragmentary memories.

Humans tend to remember events that elicited a greater emotional response more clearly than neutral events. The results of a study conducted by Canli, Zhao, Brewer, Gabrieli and Cahill (2000:1) confirmed that greater amygdala activation and therefore higher emotional arousal during encoding correlated with increased recall of events. Although emotionally charged events are better remembered than events with less emotional significance, Roth and Friedman (1998:12) state that in cases of extreme arousal, attention can be limited so much that little memory of the event is retained. Mechanisms offered as explanation for this phenomenon by the same authors include failure to encode, dissociation, simple forgetting, repression, conditional extinction, state-dependent learning and long-term depression.

Dissociation is commonly employed as a psychological defence mechanism to mentally survive devastating events and is associated with the freeze response. Risk for this is greatest when the
victim is unable to fight or flee. According to Huopainen (2002:103), dissociation could be explained as a block between the amygdala and the hippocampus. In the case of a traumatized musician, if instead of entering the optimal concentration zone, which is in itself similar to the dissociative state, the musician enters a pathological dissociative state on stage, memory and emotion arguably disintegrate. Partial diversion into such a condition can lead to confusion.

From the above there seem to be significant differences in the way traumatic memories are stored in the brain as compared to how ordinary memories are stored. However, our ‘memories’ as we define them cannot function normally if we retrieve interfering or irrelevant information. Beck (2008) discusses the importance of forgetting in daily life. She quotes neuro-researchers Gayatri Devi, James McGaugh and Anthony Wagner as explaining that without forgetting we would be overwhelmed by extraneous information and that this would interfere with our ability to function in our daily lives. The negative impact of traumatic memories on the individual will be discussed later in this chapter as primarily pertaining to malfunctioning of what should be within the normal boundaries of not remembering. The mechanisms involved in forgetting traumatic memories tend to be either a pathological type of suppression as defence mechanism, or failure to forget. Ways in which the forgetting of traumatic memories are different from forgetting ordinary memories include the complete forgetting of memories, the use of dissociative mechanisms (including the forgetting aspect of dissociation) as a survival strategy, and the disproportionately strong memories caused by trauma that fails to be erased or modified even when this is desired.

2.8.3 Biological basis of traumatic memories

The hippocampus is the brain structure responsible for organizing memory storage and retrieval (Spiegel 2008). This brain structure is part of the limbic system and memory and emotions therefore mutually influence each other. The amygdala is primarily associated with the processing of emotions, but together with the hippocampus it also plays an important role in emotional memories. Burdick (2001:1) states that conscious memory is mediated by the hippocampus while the amygdala is implicated in emotional memory. Although these structures involuntarily process emotional stimuli, a person can utilise other brain structures to exert control over emotional reactions. However, according to Robertson (1999:212) these structures respond more slowly than the amygdala and also developed later in the evolution of the brain. Robertson (1999:212) identifies the frontal lobes, located in the cerebral cortex, as structures that can exert control over emotional reactions. He explains that connecting fibres from the frontal
lobes to the amygdala can either dampen its excitability or initiate action when the cortex detects a complex or subtle threat. This detection will most likely be determined by sifting through past memories of fear-inducing or traumatic situations.

During a traumatic situation, secretion of massive amounts of endogenous stress hormones is responsible for formation of deeply engrained memory, except in cases where overload is such that formation of memory is interfered with. The reality is that trauma can lead to extremes both of retention and of forgetting (Van der Kolk 1996b:282). The hormone most closely associated with the strength of memories is norepinephrine (Van der Kolk 1996b:291). Robertson (1999:233) explains that exhausting hypervigilence results when the locus ceruleus in the brain stem continues to pump noradrenaline into the brain.

The hippocampus is noted to be smaller in sufferers of trauma-related disorders. Spiegel (2008) states that a smaller hippocampus would likely have a limiting influence on a person’s capacity to encode, store and retrieve memories and to manage associated emotions. Numerous other authors also refer to changes in hippocampal volume associated with trauma and especially with complex trauma (e.g. Scaer 2005:75, Bremner 2002:60-2, Robertson 1999:236). This researcher can only wonder how much this can or does influence the memory of the musician, including studying new pieces of music, recalling and length of time taken to relearn works performed previously, and performance from memory. The phrase “performance from memory” refers to playing a music instrument or singing in public without sheet music. It is conventional amongst especially professional pianists and singers, as well as amongst some other instrumentalists. As discussed above, since it seems that more brain structures are involved in processing memory of music than in many other memory tasks, it may be expected that compensatory mechanisms may spring into action in the brains of traumatized musicians and their music skills may appear to be less affected than other previously learned skills. This is certainly an area which warrants further research and perhaps even laboratory research.

The fact that traumatic memories have a biological basis also led scientists to investigate whether it is possible to erase such memories. It is reported in the journal Neuron that researchers had rapidly and selectively erased traumatic memories in mice by injection of a specific enzyme at the time of recall (Cao, Wang, Mei, An, Yin, Wang & Tsien 2008:353). This

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2 Also known as norepinephrine (Corsini 2002:649).
team of researchers claim that “recall-induced erasure of fear memories is highly restricted to the memory being retrieved while leaving other memories intact”. They propose that this technique could be developed to the extent that it could be used in humans suffering from traumatic memories and phobias. In addition, Carey (2009:5) writes about a similar technique being developed by Dr Todd C. Sacktor and his team, also with the objective of using it in future to erase traumatic memory, amongst other undesirable forms of memory. It was conceded in Carey’s article that the possibility of losing other painful memories in the process, not targeted by the treatment, exists.

Some scholars have come to believe that we are not as much a product of our biological processes, our circumstances and our experience as neuroscientists have sometimes claimed. Schwartz and Begley (2002:371) write that the mind has the power to change the brain and to direct attention in ways that can alter the brain. They (2002:370) also state that the mind chooses to which aspect of experience, the content of which is determined by the brain, it directs its attention. Perhaps this may be more difficult in cases where trauma had a powerful impact on biological and developmental aspects of a person’s existence, but it is still a valid and powerful viewpoint.

The following quotation from Schwartz and Begley (2002:373) should serve as a warning against overestimating the power of biological processes, perhaps altered by traumatic experience, in our lives:

> It is the brain’s astonishing power to learn and unlearn, to adapt and change, to carry with it the inscriptions of our experiences, that allows us to throw off the shackles of biological materialism, for it is the life we lead that creates the brain we have.

### 2.8.4 The effects of trauma on memory for music

As will be mentioned in chapter 3, trauma can trigger a response of avoiding memories of the account. In the *DSM IV-TR* (APA 2000:468) this is described as efforts to avoid thoughts, feelings, people, places, etcetera. associated with the trauma. Memory may be altered by an inability to recall aspects of the trauma.

It is also possible for intrusive memories to appear. The *DSM IV-TR* (APA 2000:468) describes these in the following manner: “recurrent and intrusive distressing recollections of the event, including images, thoughts, or perceptions”, “recurrent distressing dreams of the event” and
“acting or feeling as if the traumatic event were recurring (includes a sense of reliving the experience, illusions, hallucinations, and dissociative flashback episodes, including those that occur on awakening or when intoxicated”. These descriptions make it clear that the trauma has been ingrained permanently in the memory, due to high levels of arousal accompanying the event.

Weber et al. (2005) demonstrated abnormal function in brain networks associated with working memory in patients with PTSD. They (2005:41) linked these abnormalities to common PTSD symptoms and demonstrated that, even when presented with trauma-neutral words, patients experienced difficulty attending to new information and integrating this into working memory. Working memory is crucial for musicians both whilst practising and integrating material and during performance. The extents of abnormal functioning of working memory could therefore have far-reaching effects on musicians: this an area that warrants further study.

Complicating the situation for musicians who were previously traumatized is the fact that, when performing, the brain is in a hyper-aroused state and adrenaline is coursing through the veins. This is nearer to the state in which traumatic memories were encoded than the normal state. It therefore elevates the chances of unwanted flashbacks, particularly during performance. This effect is more pronounced in individuals with PTSD, since it is a chronic condition and memories are constantly either being suppressed or re-experienced.

Linda Katherine Cutting’s autobiographical portrait, Memory Slips (Cutting 1997), is a personal testimony of a way in which traumatic memories can interfere with performance on stage. Cutting experienced severe incest during childhood and adolescence, perpetrated by her father while she received no protection from her mother. As a result of growing up in this dysfunctional family, her two brothers had both committed suicide. Shortly after the suicide of her second brother she attempted to take her own life and was admitted to the National Center for Treatment of Trauma and Dissociation where she received treatment for one month (Cutting 1997:14). Of value here is her account of what she calls the fourth type of memory slip, the type she does not tell her students about. Cutting (1997:6) describes this as “when one memory slips, another intrudes, and you don’t find your way back for a very long time”. This can be called a flashback.

Cutting (1997:12) writes that “time is never strictly chronological in the way that it is lived” and also states that musicians specifically know this. This is an acknowledgement of how the past of
a trauma survivor can haunt the person in the present, but also an interesting analogy of how meaning can become associated with music at various points in time, affecting the individual’s perception thereof. Throughout her book it is clear how pieces of music can become associated with life events in the minds of the musicians. Particularly her accounts of playing pieces from Schumann’s *Kinderszenen* for her fellow patients in the hospital are a moving statement of the personal nature of memories associated with a piece, and the value attached to a particular piece by a select group of listeners. The emotional meaning she derived from the particular situation served to help her remember the pieces although she had not practised in a long time.

Another example of how the memory of events and dates could bring new meanings to abstract music for the individual performer or listener is Stein’s explanation for Szpilman’s choice of composition when asked to present proof of his occupation to a German guard who thereafter helped him to survive. Władysław Szpilman was playing Chopin’s posthumous Nocturne in C-sharp minor as part of a recital for a radio broadcast on the first day of German attacks on Warsaw, 31 August 1939 (Szpilman 1999:22, 217). The first attacks took place during the early morning hours, he went for his last pre-war day of work, played the complete recital which was broadcast live, but had to wait before returning home. The emotional significance of the situation assisted Szpilman to remember a piece of music when discovered by a German guard years later although he had not practised in years and his physical strength was tapped by extreme circumstances he encountered in the war. He himself summed the situation up as follows (1999:177-8): “So this time, for a change, I had to buy my life by playing the piano!”

Apart from the obvious restrictions of choice due to his physical condition at the time and lack of practice, Stein proposes a possible explanation for Szpilman’s motivation behind choosing the abovementioned Chopin Nocturne as a “reparative act, the attempted continuation of a life-giving dialogue that had been precipitously and catastrophically interrupted” (Stein 2007:452). Szpilman yet again confirmed the significance the piece had for him by also choosing this as the first piece he would play when he opened the broadcast service after the war (Szpilman 1999:217). It seems plausible that he attached great value and special memories to this piece for

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3 Szpilman is referred to at various places in this thesis, as his written account of his experiences made such referencing possible. However, the researcher would like to acknowledge that, as had been pointed out by other Polish survivors of WWII, many others could possibly describe similar experiences, if not worse, not to mention those who have been silenced forever.
the reasons Stein pointed out, but also perhaps because there was a shared fate between Chopin and Szpilman: the former lived in Paris at a time when Polish territory was conquered by Austria, Prussia and Russia, while the latter settled in re-established Poland as a Jew, faced WW II there, and rejoiced when after much suffering he could return to his job, albeit having lost his family and most of his friends.

Some traumatic memories may be retrieved only when a person is in the same state as when the memories were encoded in the first place. Roth and Friedman (1998:13) refer to this as a mechanism called ‘state-dependent learning’. Perry (1999:15) writes: “Indeed, it is likely that many ‘states’ of distress are activated by accessing state or affect memories without any clear cognitive or narrative associations to a specific trauma or experience.” Again it is seen that by accessing the same affect experienced during trauma, residues of and associations to distressing memories can be unwittingly activated.

It is the role of the unconscious\textsuperscript{4} mind to protect us from danger, keep us alive and store and process everything that we experience in our lives with our five senses (Gray 2009). Any situation perceived as threatening will elicit a fight, flight or freeze reaction (Scaer 2005:28). The term ‘fight or flight’ was first coined by Walter Cannon in 1929 (Cannon 1929:195-7, Bracha, Ralston, Matsukawa, Matsunaga, Williams & Bracha 2004:448). Bracha \textit{et al.} (2004:679) build the argument that the correct sequence of reactions to threat is ‘freeze, flight, fight or fright’. Bracha (2004:679,684) even proposes a ‘freeze, flight, fight, fright, faint’ sequence as a more complete description of the human response to stress. According to him the ‘faint’ response is an adaptive measure which aims to compensate for the dangers associated with lowered blood pressure when blood loss is experienced.

If musicians experience problems that can be traced to a maladaptive stress response cycle, it may be useful to investigate in which sequence reactions appear and to determine whether the freeze response does indeed precede other reactions. Since the stress response was defined as a response initiated by the unconscious mind, it is imperative that observers such as teachers, coaches or therapists, and not the performers themselves, determine the sequence of these reactions.

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\textsuperscript{4} Term in some sources used interchangeably with subconscious mind, defined by Corsini (2002:956) as “[a]n aspect of the mind not in immediate awareness, but which affects behavior, and is available to consciousness under a variety of circumstances.”
Hartman (2009a) describes the unconscious mind as the core of the personality, the deep self and ‘inner fountain of resources’. According to him, ‘gut feelings’ and the ‘sixth sense’ are all phenomena associated with communication received from the unconscious mind. When certain parts of a piece of music for any reason become associated with a traumatic event, the unconscious mind may want to avoid re-experiencing such a threatening situation and might want to avoid that part of the music by means of a flight reaction. However, since the person should not leave the stage, a freeze response may take place and cause the experience commonly known as ‘striking a blank’ on stage. It then depends on the tenacity of the individual to overcome this challenge, or succumb to it.

Other factors could also cause this type of memory slip, such as the fear of public performance and associated criticism. A particularly important factor for sensitive individuals is the situation where they are aware that others whom they might associate with their trauma, such as parents or teachers, are present in the audience. Southcott and Simmons (2008:32) indeed identified the performer’s perception of the audience as particularly significant in determining the subject in their case study’s levels of performance anxiety. Maladaptive as a memory slip might seem, it could in some cases be an effort of the unconscious mind to protect the individual against perceived danger.

2.8.5 The recovered memory debate
In a discussion about the effects trauma has on memory, it is important to mention the controversy about recovered memories. Although a detailed discussion is beyond the scope of this thesis, a few facts will be mentioned below. Advocates of ‘recovered memory’ and of the ‘false memory syndrome’ stand in vehement opposition to each other. After much reading it became evident that both sides of the debate could be valid, depending on the circumstances. It cannot be argued that imprints of all situations encountered in a life-time are left on the brain. Having said this, research and experience also illustrate that memory is not a fixed phenomenon. It is malleable and can be influenced by subsequent events as well as the opinions, statements or suggestions by others and by news reports. Even the article ‘The Reality of Repressed Memories’ (1993) by Elizabeth Loftus, a woman associated with questioning the validity of repressed memories in court, takes the stand of admitting that the repression of traumatic memories is a reality in many cases, but warns about the possibility of altering or even fabricating memories.
Roth and Friedman (1998:8) state that memory is reconstructive and imperfect. It cannot be overemphasized that great care should be taken when working with memory, so as not to implant false suggestions but also to believe those who deserve to be believed. Every adverse symptom that presents in a client cannot merely be assumed to be the result of repressed trauma, while sufficient evidence pointing to the possibility has to be investigated. McFarlane and Van der Kolk (1996:567) write: “The ‘false memory debate’ is, at least in part, a product of the adversarial environment of the courtroom.” They criticise participants in the debate for paying selective attention to one side of the argument and for neglecting to acknowledge the complexity of the issues involved.

Regarding the retrieval of ordinary memories, Beck (2008) quotes neuro-psychiatrist Dr Gayatri Devi as stating: “Each time you retrieve a memory, you're reconstructing a puzzle very quickly and breaking it down again. Some of the pieces get put back in different places.” Indeed, Dobbs (2009:2) writes that memory is unreliable and that people, details, settings and actions are added and subtracted from memories regularly: he calls these processes conflating, inventing and editing. These viewpoints seem to support the argument that retrieved memories are not always exact renditions of past events. Research by Cao et al. (2008) on the possibility of erasing traumatic memories shows how malleable memory can indeed be when there is a resort to chemical intervention (see chapter 2.8.3). This could encourage one to admit that, seeing as such drastic erasure of memories is possible, we cannot always measure the extent of the effect which even environmental conditions and toxins could have on our neural functioning.

Roth and Friedman (1998:12) postulate that traumatic memories may differ from ‘ordinary’ memories in some respects. Potential differences include that traumatic situations activate implicit and explicit memories to a greater extent than non-traumatic situations, and elevations in stress hormone levels may facilitate memory formation. However, they also attest that in cases of extreme levels of arousal a number of mechanisms may interfere with encoding. Mechanisms responsible for forgetting may include the failure to encode, dissociation, simple forgetting, repression, conditioned extinction, state dependent learning and long-term repression (1998:13).
2.9 Performance from memory and stage fright

The exact nature of memory for music is not completely understood. Many writers refer to the importance of involving all memory systems, namely visual, acoustic (or aural), kinaesthetic, motoric and analytical, in the memorization of music (see for example Sándor 1981:192-197 and Ahrens and Atkinson 1955:80-83). The complexity and overlapping of the memory systems involved in memory for music may be a reason why research results have demonstrated that in some cases neural pathways involving the memory for music show capabilities not expected to be still retained in individuals, based on observed and measured deterioration in their other memory capacities such as procedural memory and that for language (Sacks 2007:346-7). The important work and observations of Sacks (2007: 335-47) show and describe how in some cases people with severe memory disturbances such as advanced Alzheimer’s disease retain their memory for music and even retain the ability to memorize new music. However, on a basic level memory for the auditory sensation of music, one of the most important memory systems used by performers and teachers, is not unlike the memory processes for any other sensory perception (Bartlett 1996:177).

Fear can interfere with the function of memory. Kandel (2006:339) distinguishes between instinctive and learned fear. He adds that instinctive anxiety can be pathological when it paralyzes action and learned anxiety becomes pathological when provoked by stimuli that do not present real threat. Defensive responses to fear are set out in figure 3 below.

![Defensive responses to fear](image)

**Figure 3: Defensive responses to fear that have been conserved through evolution (Kandel 2006:339)**

For many musicians, performance from memory or any type of public performance brings up the issue of stage fright. In an exaggerated form, Southcott and Simmons (2008:32) call stage fright performance anxiety and contend that it can be incapacitating. When one part of the brain is occupied by fear, the capacity of the rest of the brain to function normally is greatly inhibited.
this fear becomes a constant state, a marked decrease in functionality can be expected. Kandel (2006:343) classifies stage fright as a form of anticipatory anxiety, which he describes as a future event becoming associated with the expectation of something going wrong.

Fear is an emotion that involves neurotransmitters and hormones. Bradbury (2008:58) classifies stage fright as ‘an emotion of fear’. In the previous chapter it was mentioned that emotion can have many vectors (Radford 1989:75). However, it was also discussed that not every emotion experienced can be rationalized as caused by a particular object or situation. Therefore it can be argued that in the event of stage fright the perceived experience of fear can become linked, perhaps even unconsciously, to other experiences of fear in the past of the musician. The context of and occasion when fear was previously experienced can thus in reality influence the musician’s interpretation and handling of that fear. More particular examples of how trauma-related symptoms - including maladaptive fear responses - can influence music performance are discussed in chapter 4.1 and 4.4.

Levine (1997:128) explains that trauma victims have a strong distrust of the arousal cycle, as associated with the perception of danger. He explains that for them arousal became associated with the overwhelming experience of being immobilised by fear. He further predicts that a traumatized person will prevent the completion of the arousal cycle and remain within a cycle of fear. At the very least, the implications for the performing musician will be a very negative perception of the experience of nervousness preceding and during public performance. More serious consequences are also possible, perhaps even panic, as well as distrust and uncertainty about one’s ability to perform under pressure. Certainly traumatized musicians who find themselves in a cycle of fear will not be able to play or sing to the best of their ability. Healthy nervousness accompanying public performance or competition enables not only musicians but actors, dancers and athletes alike to perform to the best of their ability. Correctly channelled, this can even give them an edge to transcend their previous ‘best performance’.

Not all nervousness is healthy, however. Gorrie (2009b:209) writes that levels of performance arousal can be controlled; he distinguishes between negative performance arousal manifesting as anxiety and positive performance arousal presenting as excitement. He provides a graphic explanation of this as depicted in figure 4 below:
Figure 4: Model for positive and negative manifestation of performance arousal (Gorrie 2009b:208)

It can be seen from Gorrie’s model that both anxiety and excitement consist of state and trait components and that individuals tend towards certain states. In addition the cognitive and somatic components are important for performers to the extent that Gorrie (2009b:40) advocates that performers can gain control over their degrees and types of performance arousal by rating them on a scale from negative 5 to positive 5. He explains that different levels of optimal performance arousal are appropriate for different situations and suggests that the optimal level for the activity participated in should be determined in order to arrive at a mental estimation of change required to move from the experienced level to the optimal level. For instance, he fixes the most suitable level at positive 2 for a violinist playing a solo recital (Gorrie 2009b: 210). This is where cognitive components play an important role. It can be argued that, deduced from the above, severe traumatic experience or the absence thereof may be a factor influencing whether an individual seems predisposed towards exhibiting positive or negative types of performance arousal. In addition, any trauma sequelae that have interfering cognitive effects or somatic residues could also play a role in this process, creating a challenging and complex situation for traumatized performers.

This chapter’s discussion may indeed sound as if the odds are against traumatized people aiming to perform at their best under pressure. However, according to Levine (1997:128) healing will
begin when a person can trust the arousal cycle and (again) become able to flow with it. Levine advocates that the healing process requires becoming aware of physical and mental signs of arousal, acknowledging them, letting them peak and thereafter diminish and resolve. To the researcher it is obvious that to facilitate this it will be necessary that such individuals create adequate mock, practice or informal performance situations (or what may be better known as ‘dress rehearsals’) to allow them adequate time for the completion of this perhaps unpredictable process. In addition, both cognitive as well as somatic aspects would need to be taken into account. When this process is completed, individuals may find that they are more frequently able to perform at their optimal level. Levine calls this ‘flow’ while it is the same as Gorrie’s description of the ‘zone’ defined by him as follows (Gorrie 2009b:21):

The Zone is intangible. It is that mind state where everything clicks, everything is easy, where your actions are effortless, and when your results are up to or even exceed your previous expectations. The Zone is quite simply being in the perfect state of mind for a given performing situation, resulting in optimal level of performance.

When an individual performer is identified as having been exposed to trauma, it seems that the first important step to take to prevent this from negatively impacting performance under stress is to ascertain in what ways this individual responds to fear, including stage fright. After determining if the individual primarily uses the fight, flight or freeze response to anxiety-provoking situations, it can be ascertained to what extent he or she resorts to such reaction when performing on the instrument in public. Thereafter interventions can be sought to minimize the negative impact of the maladaptive response, if such indeed exists. It should be noted that Montello (n.d.:2) identifies unresolved early trauma as usually being at the root of severe manifestations of performance anxiety. She empowers her students by encouraging them to use their own music in exploring and transforming traumatic feeling states which cause their excessive anxiety and inhibit expression. In essence, they have to face their fears in order to transcend and overcome them. This is similar to Levine’s advice described in the previous paragraph.

Subsequently the focus will shift to trauma. After comprehensively defining trauma, types and dynamics, related diseases and disorders, effects and treatment thereof will be discussed. The

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5 Farmer writes in “‘Flow’ and Mihaly Csikszentmihalyi” (1999:1): “Csikszentmihalyi accounted for this feeling of being consciously outside of the creation as due to the psychological limits of consciousness, that at higher levels of consciousness the more mundane aspects become subconscious in order to restrict conscious attention to the number of items it can manage. So a pianist described not noticing the room, his hands, the keys, the score, but rather being conscious of only ‘being one with the music and expressing emotion’.‘”
current chapter’s illustration of the relationship between emotion and memory is highly relevant to the following chapter on trauma, as it will again be seen that emotion, emotional reactions, memory and associations are integral aspects of the experience of traumatic encounters.