# Black Onyx
## Emotional Responses to Music and Sounds

**By**

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BA (Hons., Music) Middlesex University, 2012

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Requirements for the Degree of
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# Approval

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## Abstract

Black Onyx is a musical concert work for flute, cello and piano with electronics. The piece has five sections of music and sounds targeting five human emotions: Anger, Sadness, Surprise, Contempt and Fear. Some sections are written in reference to memory and the practice of music therapy. The entire work is based on research of music psychology including the psychological Circumplex model developed by James A. Russell. The work invites the attention of the listener to the auditory world of mental illness and human sufferings to create atmospheres of negative emotional responses. By the end of the performance, the psychological atmosphere shifts to positivity.

The five human emotions are the primary focus of this project, both in terms of induction and perception. The individual listening experiences, such as feelings of tension and calm are left to the listener.



**Keywords:** Music composition, Music Psychology, Electro-Acoustic, Flute, Piano, Cello, Human emotions

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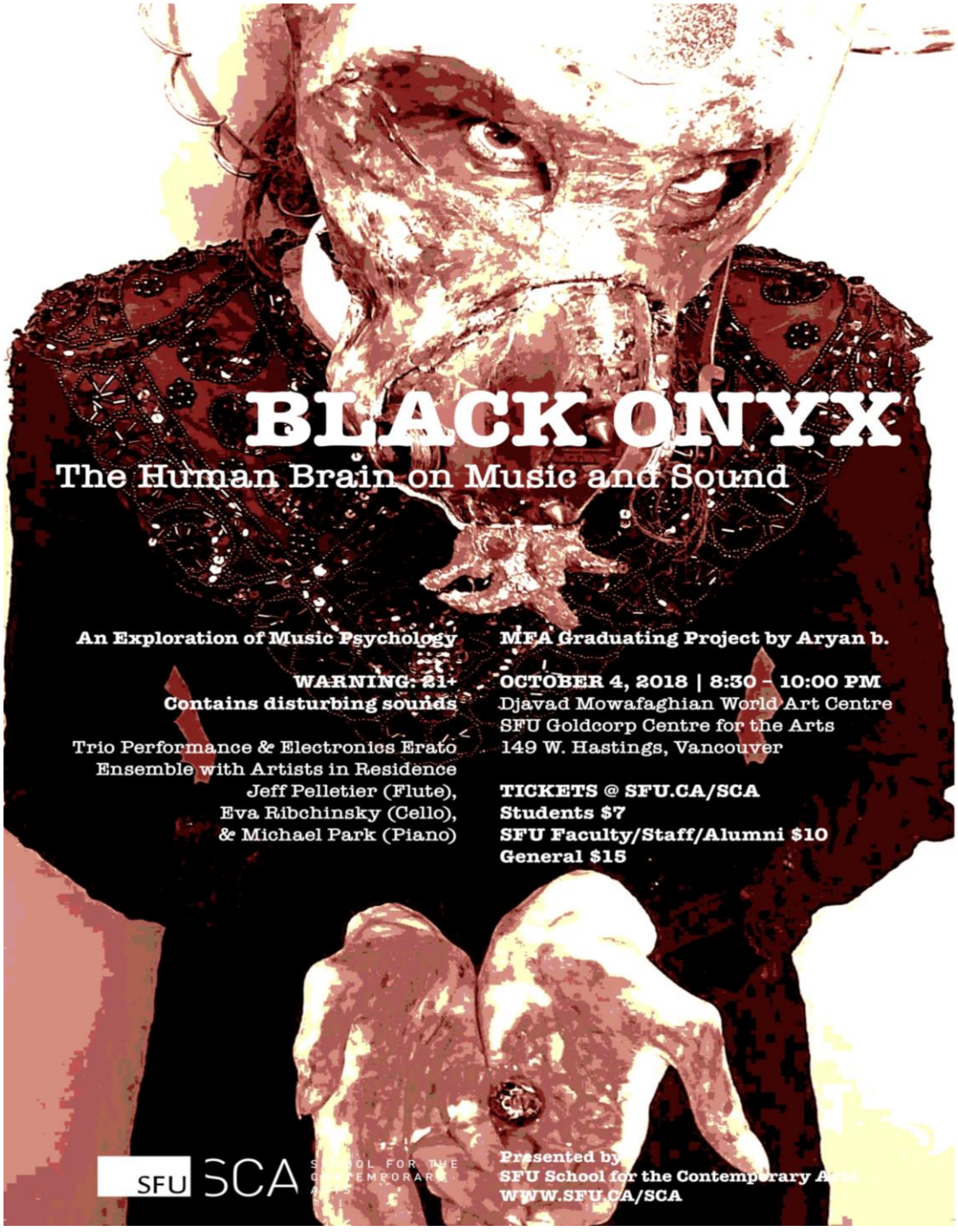
# Table of Contents


BLACK ONYX
The Human Brain on Music and Sound
An Exploration of Music Psychology
WARNING: 21+
Contains disturbing sounds
Trio Performance & Electronics Erato Ensemble with Artists in Residence
Jeff Pelletier (Flute),
Eva Ribchinsky (Cello),
& Michael Park (Piano)
MFA Graduating Project by Aryan b.
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# Chapter 1.

# Introduction

Black Onyx is the title taken from the same name of the gemstone believed to have spiritual healing properties; and no, these stones are not magical, but we make them so by believing they are. As a child, I started collecting these stones, believing that they would protect against evil. Over the years my precious stones proved less effective especially during times of great stress and personal problems, maybe because I was losing faith in these stones and I was starting to build a darker world view for myself. During my early secondary school years, I started looking for alternatives and without knowing, something was actually working to offer mental relief from a serious health disease I was suffering from.

Looking back, what helped me the most with the social isolation I experienced was listening to my favorite heavy metal bands in my old cassette player. The distorted guitar tones and the dark lyrical contents expressed emotions which I could relate to in my own personal life.

The acoustics of music is not in the realm of superstition nor magic but simply a law of physics where sound waves travel from the source through vibrations into our ears and then our eardrums and finally into our inner ear. That is when our brains perceive these sound frequencies and make them musical. To this day, more than twenty years later, music has not lost its healing effects on me and I do not intend to lose my faith in music any time soon.

These past personal experiences have fascinated me and urged me to explore the psychological concepts of musical cognition and perception during my time as a graduate student at Simon Fraser University.

I have focused in my recent work on writing music attempting to offer mental relief to other listeners, bringing attention towards certain concepts and awareness, evoking

desired emotions or amplifying already existing ones. My first composition on this concept of using music as a tool was titled Elapse, a piano quartet focusing on memory. The piece referenced sound frequencies, melodic motions and rhythmic gestures of my past, bringing back personal life events which evoked pleasant memories, and helped me as a remedy for nicotine withdrawal. Was it successful? Did this piece actually help me deal with addiction? Or did my brain believe it so much so that it worked like magic? There are likely no definite answers to these questions and ways of knowing the truth. I believe, in the end, that the music I wrote to serve a purpose for myself worked for me therapeutically.

Musical cognition: we have musical abilities since birth, it is in our systems naturally. Babies react to music and sounds and use it as a language before they gain the ability to speak. This is known as Infant Directed Speech, (IDS). In IDS, calm and happy intonations and usually high-pitched sounds are perceived as something positive and ensure safety for the child. A mother humming her baby to sleep is another example that comes to mind, using music as a tool for sleep aid or to prevent children from crying.

Valence is the measurement of positive and negative emotions. For example, happiness and pleasure will have high valence and sadness and anger will have low valence (Russell 1980).

The opening electronics in Black Onyx are based on sound samples and field recordings. The section lasts about 9-10 minutes, and has a musical form, motifs, harmony, melodic motions, rhythms and developments just like any acoustic composition would. Many of the sounds heard during the opening section are loud, low frequencies, played back in ways which imply warnings and danger, creating a negative atmosphere in the physical space and evoking the emotion of fear.

Did we all perceive the piece and the various sections in the same way? Did we have different cognitions of the sounds we received? Was the music an acquired taste or was it enjoyable to the untrained musical ear? In the process of writing, I wanted to make sure there was variety in the composition, ranging from pleasant tonal gravity,

consonance and clear rhythmic pulse to chaotic chromatic melodic motifs, free time and highly dissonant colors.

In the opening electronics, I placed hidden musical elements. Behind the cluster of sound samples which were played simultaneously, two note minor second clusters were added which were disguised as sounds of heart rate monitors. In addition, there were hidden melodies layered on top of certain sounds, and a chord progression added during the tornado warning sounds. I wanted to challenge the listener to find these subtle hidden musical events on top of the dominating nonmusical sound effects. The idea was to make it difficult for the listener to perceive these blended musical elements in the opening electronics. I would guess some people with highly sensitive and musically trained ears, could pin-point these hidden messages.

In terms of music cognition, I believe that every listener has a different listening experience. Some sounds might have triggered memories in some people, or some sounds might have evoked distressing body activity such as high heart rates in others. As for me, this opening evoked personal memories and I was the only one in the room who knew what each of those sounds meant in terms of real life events.

Human emotions: Human emotions in the work represent a three-way transition – from me, to the performer and then finally to the audience. For me, the only way to make sure these messages stayed potent throughout, was to create fictional characters. In my compositional process, I found that the characterization made the expression of the music more accurate with respect to what I was trying to convey. All five emotions had individual character creation except for surprise. In addition, an additional character based on a real person was also depicted. During my undergraduate studies in London, one of my close friends was diagnosed with Psychosis, which eventually led him to drop out of the music degree and retreat to a hospital under mental health care. Not only did I feel for him, but it also led to my own isolation, and discomfort in my own mental state. My friend used to describe to me what he was experiencing throughout the illness, including hearing multiple voices, auditory and visual hallucinations, depression and

suicidal tendencies. Some of the things he mentioned were put into the opening electronics along with sounds representing my own personal life memories.

Composition Process with Character Creations: The characters were meticulously written prior to most of the acoustic music. For each of the fictional characters, I created a storyline along with fictional life events which surround that story. After the characters were written down, I attempted to get inside each of their headspaces to feel their individual emotions as realistically as I could. After this pre-compositional characterization, I started the process of writing the music for each of the corresponding sections.

# Chapter 2.

## The Circumplex Model

My psychological exploration for the project was mainly based on James A. Russell's Circumplex Model, which measures human emotions with a 2-dimensional valence and arousal. This model also represents how emotions of pleasant and unpleasant valence are inter-related in a systematic way; for example: emotions of anger can evoke fear and sadness, while emotions of happiness can evoke feelings of calm and hope. According to a lecture given at a Polish Conference titled: The Emotional Brain: From the Humanities to Neuroscience and Back Again Russell explains how valence is the first emotional category developed in us since infancy. Childhood recognition of facial expressions signals a universal meaning, and this seems to develop later in early teens into adulthood into the ability to recognize more complex emotions such as disgust and contempt. However, my question is how the valence recognition in sounds and music gets developed over a lifetime, is it the same way as facial expressions? Children surely can recognize happy music with an upbeat pulse, but how about a soundtrack from a horror or a tragedy film? Will children react the same way as we do as adults? As adults we surely can tell the difference between anger and sadness in music, therefore I conclude that the ability to perceive complex sounds in children develops over time. I intend to explore these questions in music and sound in my future works.

This brings me towards the technique of combination or juxtaposition in this project, in other words, the ways I combined more than one emotion to amplify an overall emotional message (See Attention and Mozart Effect pg-20). Mixing calm passages with chaotic ones, mixing dissonance with consonance, mixing happy facial expressions with sad passages, mixing the energy of metal music with chamber music, mixing happy memories with horrific sounds.

The process of producing and receiving emotions involves synchronization (Justin & Scherer 2005). Psychological responses to music are more or less synchronized[1] which include: cognitive changes, subjective feelings, expressive behavior and action tendencies. We can rule out action tendencies because according to Justin and Scherer, “musical events are rarely followed by direct, external responses of a goal-oriented nature.” Indeed, we rarely see purposive or goal-oriented action arise in response to chamber or orchestral music performances, with the rare exception of some events such as the riot during Stravinsky’s Rite of Spring world première. However, in the case of the performance of Black Onyx, based upon anecdotal feedback from some of the listeners, there was a drastic behavioral change in the audience from first entering the room and hearing the first opening electronics to the emotions at the end of the piece. I was told that some of the audience were moving their bodies in an uneasy way in response to some of the disturbing sounds in the opening section. In contrast, at the end during the group bow, there was humor and sounds of happiness. This was a compositional goal and represents in general the trajectory of emotions I was trying to portray.

Cognitive changes experienced by individuals in response to music will vary. In my research on this piece, I sought to estimate subjective emotional responses through sending some of the compositional materials to a group of five individuals with no musical training. I sent MIDI audio files of a few chords, melodic passages, rhythmic ideas and the entire section of the opening electronics and surveyed their response to the most felt emotion (both perception and induction). Most of the times the emotion I implied was in fact identified by the test group. However, some results were rather surprising, disturbing sounds such as a woman gasping for air, the sound of a hanging noose and sounds of mentally ill patients were received by the responders with humor, while the intended emotions were fear and distress.

These surprising and seemingly contradictory responses are likely because the participants were not children but grown up adults.

[1] Handbook of Music and Emotion – Juslin Patrick N.

The concept of subjective perception is clearly complex and requires significant study and sophisticated interpretation. In linguistics, emotions are categorized into cultures. Different cultures will perceive emotional signals differently. Was this a factor in my small survey group? Do we need a common ground? Does this mean that the universal recognition is impaired, or does the concept of intended emotional responses in the music need to be thought out more carefully according to who will be in the audience. My study provided mixed answers, most probably because of the small numbers of participants.

My compositional work in Black Onyx primarily revolves around the 2-dimensional model, introducing one emotion at a time and increasing or decreasing the arousal rate as desired (with dynamics, articulations, tempo etc.) or while combining multiple emotions on both sides of the valence system to automatically increase the intensity.

# Chapter 3.

## Project Roadmap

Opening Electronics: It is a scientific fact that our brains stay active for a few minutes after clinical death; and during this phase, it is hypothesized that human beings go through the hallucinatory near-death experience of afterlife. I am interested in how music and sound reference life memories which are otherwise blurred in the back of our minds. This introduction is the auditory representation and my imagination of afterlife experience and negative life experiences I have had to this point. My goal is to cause intensive emotional responses from the listener.

I can represent the intended audience experience of this section as:

Concept: Memory and Awareness
Primary Emotion: Fear
Valence: Low
Arousal: Very High

Compositional process: The desire to induce fear on the listener was the primary goal in this opening section. I sent the audio file to the five participants and they were instructed to listen to the file with headphones at a high volume during bedtime with eyes closed.

Most of the participants were induced with the emotions surprise and fear, and on the other hand they perceived emotions such as sadness and contempt. Since I was satisfied with the subjective emotional responses, the opening electronics had little re-working done.

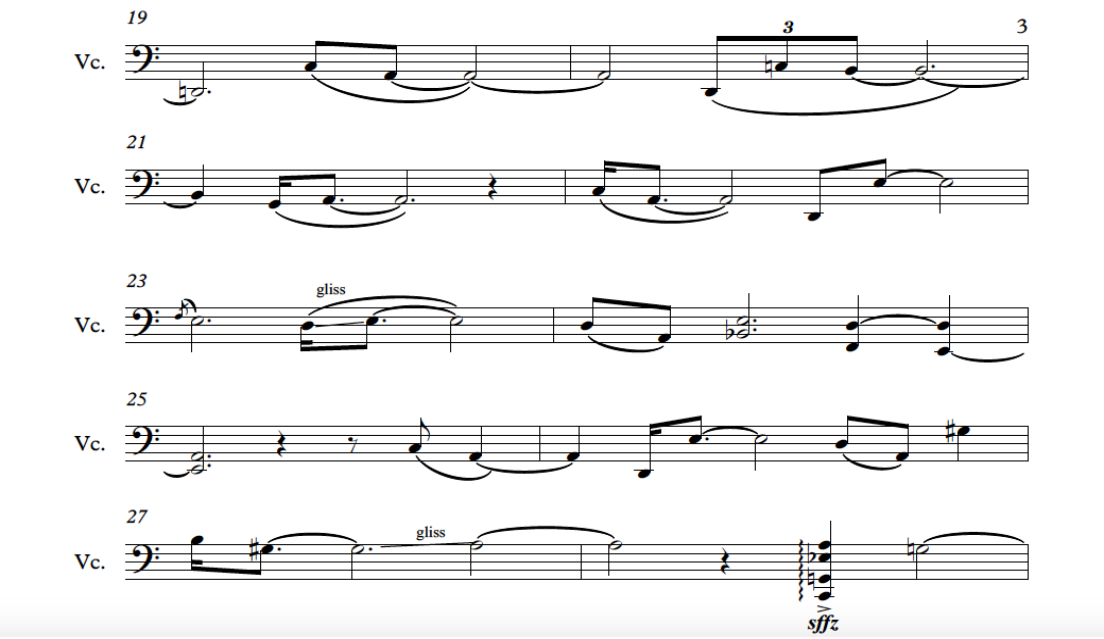
The disturbing low-pitched loud sounds with mysterious noises were played back mainly to induce feelings of fear and danger; the listener thus becoming the subject, experiencing what it is like being inside the mind of someone other than themselves, and perhaps evoking memories of the listener's own life experiences. The participants were given a list

of the five negative emotions to choose from, as well as another category named “other”, to give an open ended added choice. Of course, it is possible that the sounds which evoke bad memories for me are capable of evoking the opposite effect for the listener. The sounds universally stamped with the emotion fear may be received with confusion and humor as occurred with some individuals in the survey I conducted. I would predict that no one had the same emotional response during the performance. Likely, some people did find it humorous, but if so, only briefly. My primary idea was to bring awareness towards mental illness in this opening, inflicting the mental experience on the listener.

Prelude (Solo Cello and Electronics): Consisting of melodies based on fictional characters, specifically created for this composition, the performer plays the role of the character in the music, reversing the after- effects of the electronic introduction. I attempted in this section to alleviate the psychological negative intensity introduced through the opening electronics.

Concept: Character Lore
Primary Emotion: Sadness
Valence: Low
Arousal: High

I created this character before the music. Background electronics with a drone and sound of crows were related to the character’s lore, aside from the instructions on the score, the player was further instructed to play the theme as the character would.



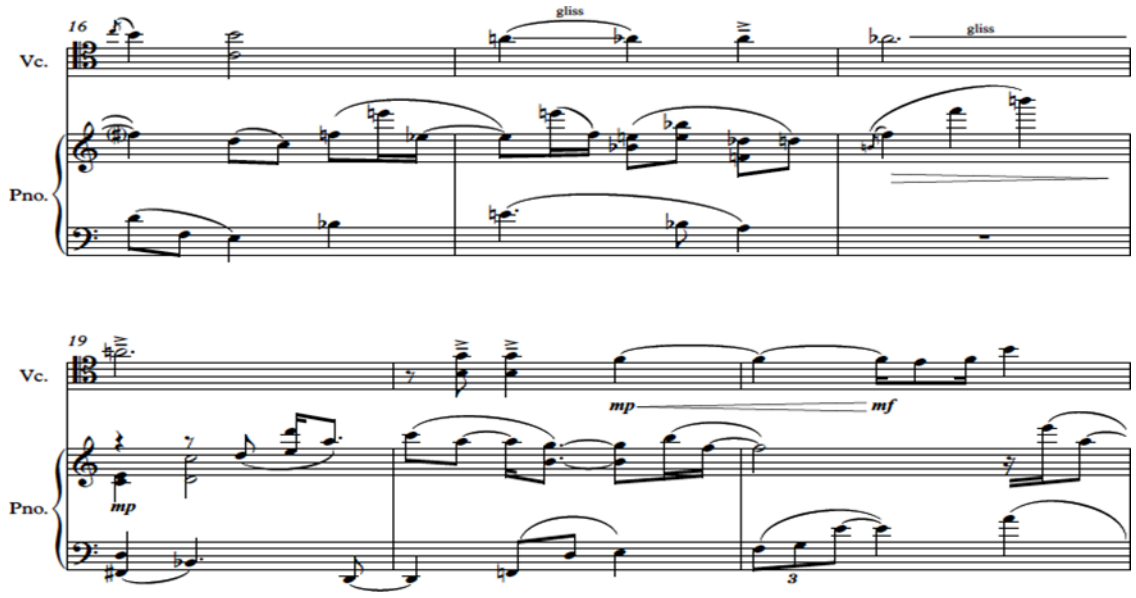

**The main theme for this character starts on measure 19 (and also makes its appearance in the cello and piano movement.)**

Compositional process: The desire to induce sadness in the listener was the primary goal in this cello solo. I found that it was not easy to induce this emotion on the participants. The first sent file had a no induction from the listener, and I kept re-working until I had two out of the five participants admitting to feel slightly sad from the written tune. However, inducing a calm and relaxing experience was not a difficult task.

Cello and Piano Duo and Electronics: Composed to reverse negative emotions and trigger our primary motor cortex on our brains to imply movements based on lyrical rhythmic writings, a common therapeutic remedy for patients suffering from diseases which limit physical movements.

Concept: Character Lore and Memory
Primary Emotion(s): Sadness, Surprise and Fear
Valence: Low to Medium
Arousal: Low to Moderate

In Music Therapy, (and according to an interview with a therapist[2]) the patients improve when they take part in musical activities. This can include: learning an instrument, listening to rhythmic structures with a clear pulse to help with physical movements and hearing different timbres to improve moods. However, I was clearly warned that patients with more serious mental health problems upon hearing certain sounds or music in the negative side of the valence chart could further cause mental damage requiring medications and intensive care to recover. With that in mind, I attached a warning label on my graduation project poster, having no control over the audience demography.




Compositional process: Induction of the emotion fear and surprise on the listener was comparatively easier than the solo cello prelude. Both emotions were induced in the participants. My instructions were to listen in a pitch black room with eyes closed.

<u>Flute, Cello and Piano Trio and Electronics:</u> Contains musical materials written for the acoustic instruments to bring the emotional state of mind towards the atmosphere and intensity of metal music, expected to evoke emotions of low valence with high arousal. Also consists of sections depicting uncontrollability and detachment from reality caused by

[2] Richmond Hospital Mental Health Services – Therapist name: Lenny Tan

mental illness such as Psychosis and Schizophrenia. This section also touches the field of Criminology, and the musical representation of crimes committed in certain music cultures such as Scandinavian Black Metal.

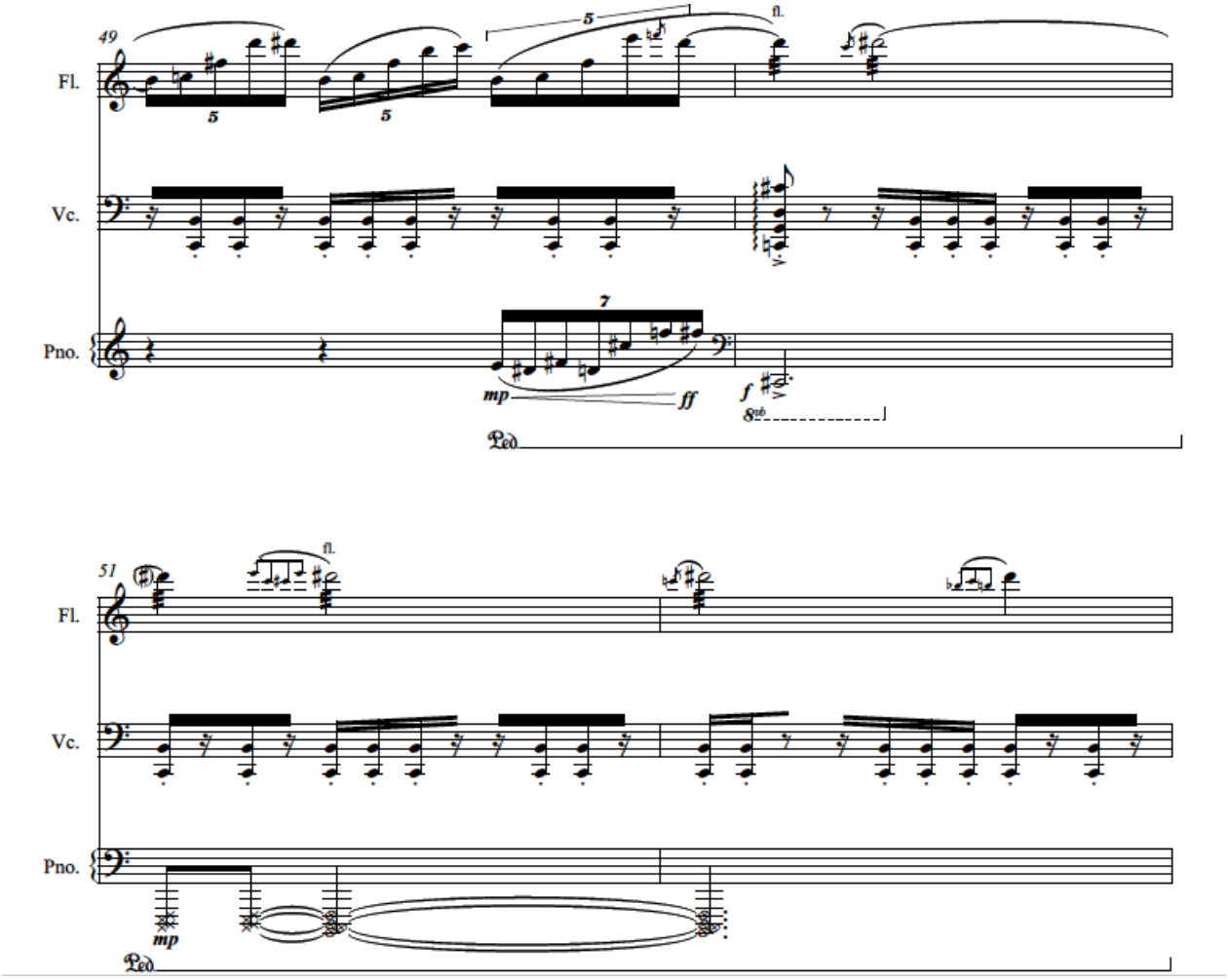
Concept: Character Lore and Awareness
Primary Emotion(s): Anger, Contempt and Surprise
Valence: Low to Medium
Arousal: Very High

Previously we discussed the concept of cultures, universal and subjective emotional perception. Having grown up in the metal music culture myself, I have a keen interest in criminology and police works, and the darkest sub-genre of metal known as Black Metal music. This sub-genre has the most violent and the darkest world view, ranging from Anti-Christianity and white supremacist ideologies to first degree murders and suicides. I have oddly in my own experience used this sub-genre as a tool for improving moods and isolations. Paradoxically, Black Metal has primarily helped in blocking out intrusive and bad memories from my mind.

The goal was about conveying the messages in this genre, not the music itself. These messages in this trio performance were introduced from measure 101 until 140 which included: one criminal case of church burnings, one case of second degree murder and one case of suicide. The electronics played back audio files of real news reports from these cases on top of the acoustic elements. These musical ideas were written for real life events and not based on any fictional characters, thus it can be said that this concept of writing for this music culture and the criminal cases associated with it, was parallel to the notion of character creation.

Even though some of the overly used melodic motifs and chord progressions in Black Metal were subtly implied, the focus was to recreate that intensity and atmosphere we usually get from this genre of music. Moreover, in terms of the compositional aspects, I did end up using some ideas from another sub-genre of progressive metal known as Djent. This genre is more focused on syncopated heavy rhythms with low tuned guitars; this sub-

genre of metal music creates a very unique timbre and overall atmosphere. Most of the contemporary Djent bands now-a-days use techniques such as one-chord rhythmic motifs on the guitars on top of a keyboard melody. In other words, harmony is so overlooked that much of the music has an extremely strong tonal gravity and rarely modulates to a new tonal center. This idea was used in this movement, while the cello plays a one-chord rhythmic motif over a melodic flute passage along with the free and ambiguous tonal harmonic progression on the piano. The cello's timbre was written in a way to implicate the sound of palm muted distorted guitars, with techniques such as martele and heavy staccato.



Compositional process: The participants found it easy to perceive the primary emotions in this movement, although the induction was non-existent, especially for the emotions anger and fear. After much rework of certain sections, inducing the emotion anger was still minimally perceived by the participants.

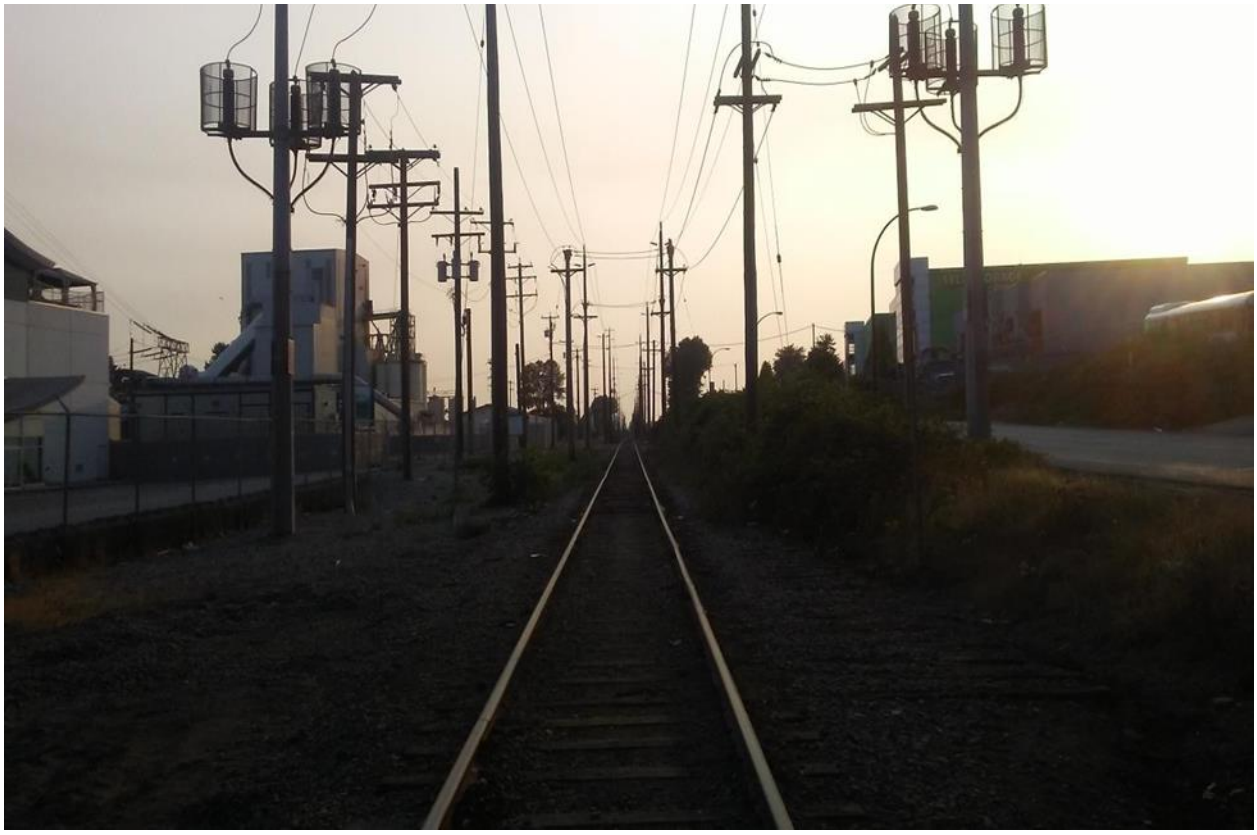
I disclosed the message behind the music and the characters' lore to the five participants after the last few attempts on the musical materials. The emotions sadness and surprise were then induced more effectively. On the other hand, the emotion of anger was not as potent, although now perceived with little to no difficulty. (I will explain this further in Perception and Induction – The Cultural Universality: (The Listener) pg 16).

Outro (Electronics): Soundscape music expected to bring emotions of the highest valence with a balanced arousal level. Creating a psychological head space of relaxation and tranquility.

Concept: Experiences
Methodology: Increasing valence to reverse all previous psychological responses
Valence: Very High
Arousal: Moderate

The goal was to bring everyone (including the performers and listeners) towards the positive side of the valence scale and strip off all negativity created prior to this section. There is no particular emotion that was given priority, rather the overall listening experience was given priority. An opposite concept from the opening electronics, this section consisted of sounds that included sea waves, wind chimes and children playing. The overall intention was to relax and comfort the listeners, a common remedy used in the practice of music therapy.

(The composition process was intuitive and this outro was not sent in the survey.)



**The approximate location where the field recording of the children playing sounds was recorded. Vancouver BC 2018.**

# Chapter 4.

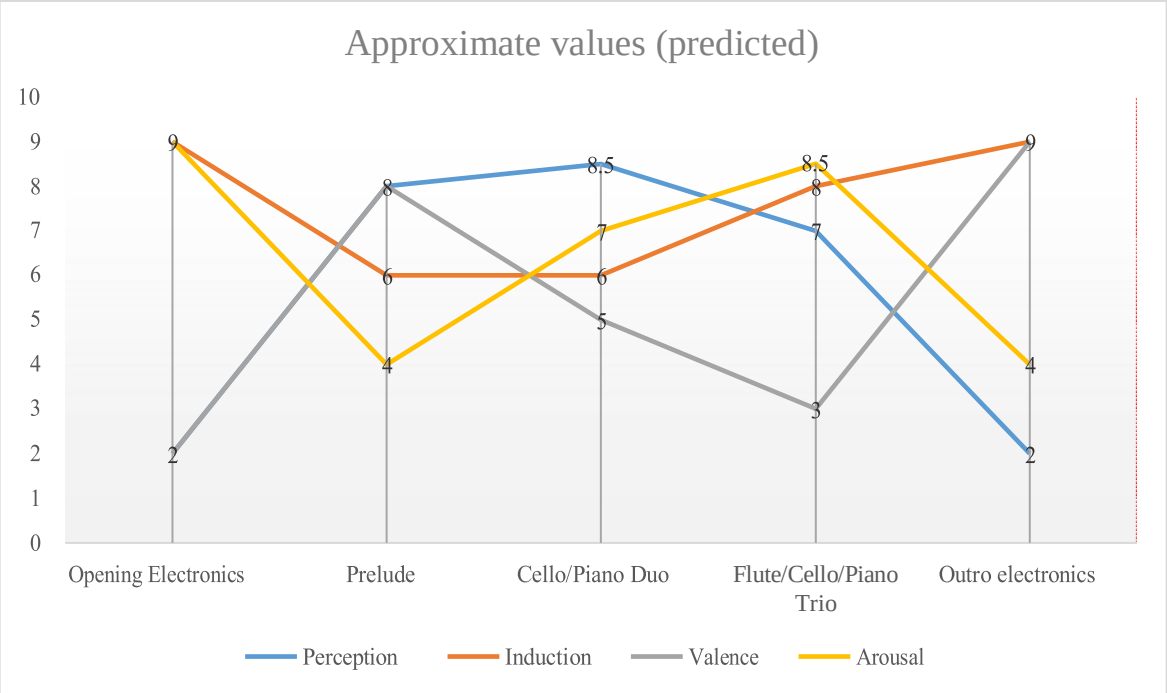
## Perception and Induction – The Cultural Universality: (The Listener)

During the process of writing the music, all five emotions were conveyed to the performers. The performers were strictly instructed to be emotionally induced by the music. According to Zentner, Grandjean and Schere (2008) inducing peaceful and soothing listening experiences were more effective than inducing negative human emotions such as anger or sadness which were on the side of perception rather than induction.

The opening electronics and much of the acoustic music, I believe, was successful in inducing certain emotions such as Fear and Surprise, and creating experiences such as Tension and Calm.

Emotions such as anger or contempt were perceived and most likely induced other experiences on the listener such as feeling uneasy or excited. People from different cultures will react differently to the same piece of music or sounds, which brings me to the question of universality. If I wanted the same response from a wider demography of audience, what are the ways I could achieve a common perception and/or induction? I feel that disclosing the message (See concept of triggering below) could be one way of cognitive unification from the listeners.

This can be further explored using the affect theory. This theory defines how a person interacts with the world, how they think and how prone they are to experience both sides of the valence chart, depends on the person's personality. Furthermore, The Laymen's Conceptualization of Affect (See Russell A Circumplex Model of Affect 1980) explains how people react to other people's moods and emotions and how some moods and emotions can be contagious. This is a useful theory when it comes to unification of the desired atmosphere. This theory was proved true during the opening electronics.



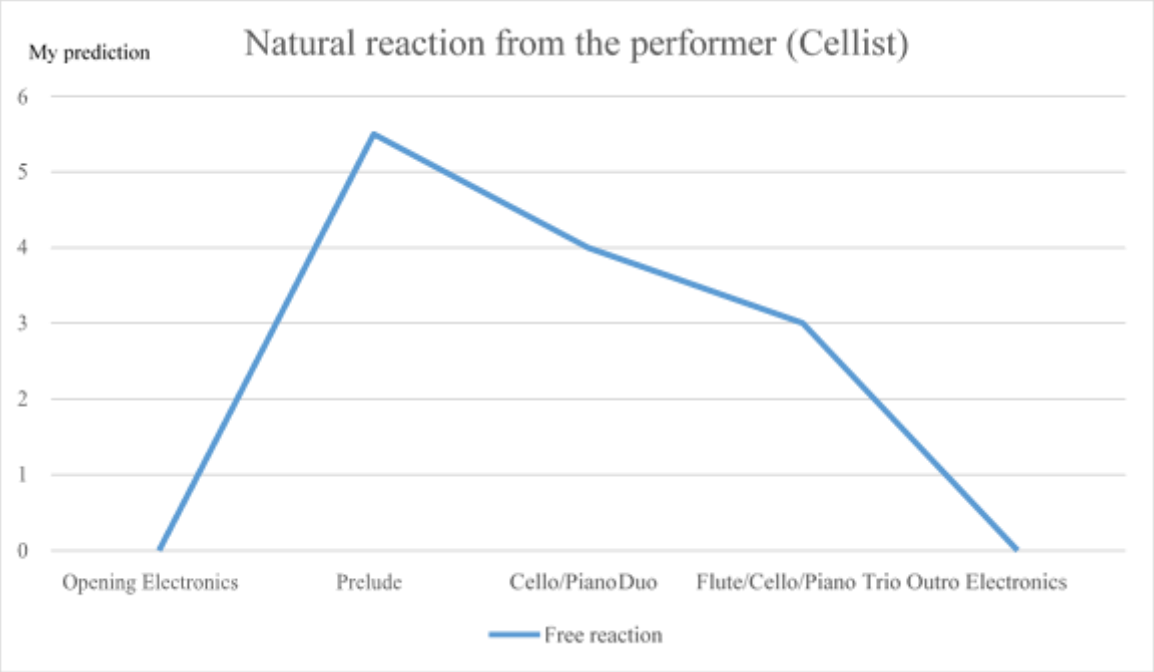

**The piece was also designed in a way to amplify already existing emotions on the listener. While there was no pre-concert questionnaire researching what those existing emotions were, the psychological messages which were conveyed through the music were approximately on the same emotional sides of the valence system.**

# Chapter 5.

## Facial expressions and body movements: (The Performers)

In certain sections of the piece, the performers were instructed to create facial expressions and make physical movements with the upper part of the body. Gently moving with the pulse and reacting naturally to certain sounds produced from their instruments. These were applied from the therapeutic practices in music therapy, especially for patients suffering from illness which impairs their ability to react naturally to their environments and limits body movements.

Results: Due to the difficulties of performance, this concept was mostly ignored in order to give priority to the actual playing of the music. Upon reviewing the video footage, the Cellist was reacting with facial expressions during the process. Some of the reactions were instructed while some were naturally produced. The interesting outcomes were the ones where she was reacting freely, making happy facial expressions during sad phrases or being humorous in certain parts of the music. These were opposite emotional responses to the intended nature of the music and I was intrigued by the results.

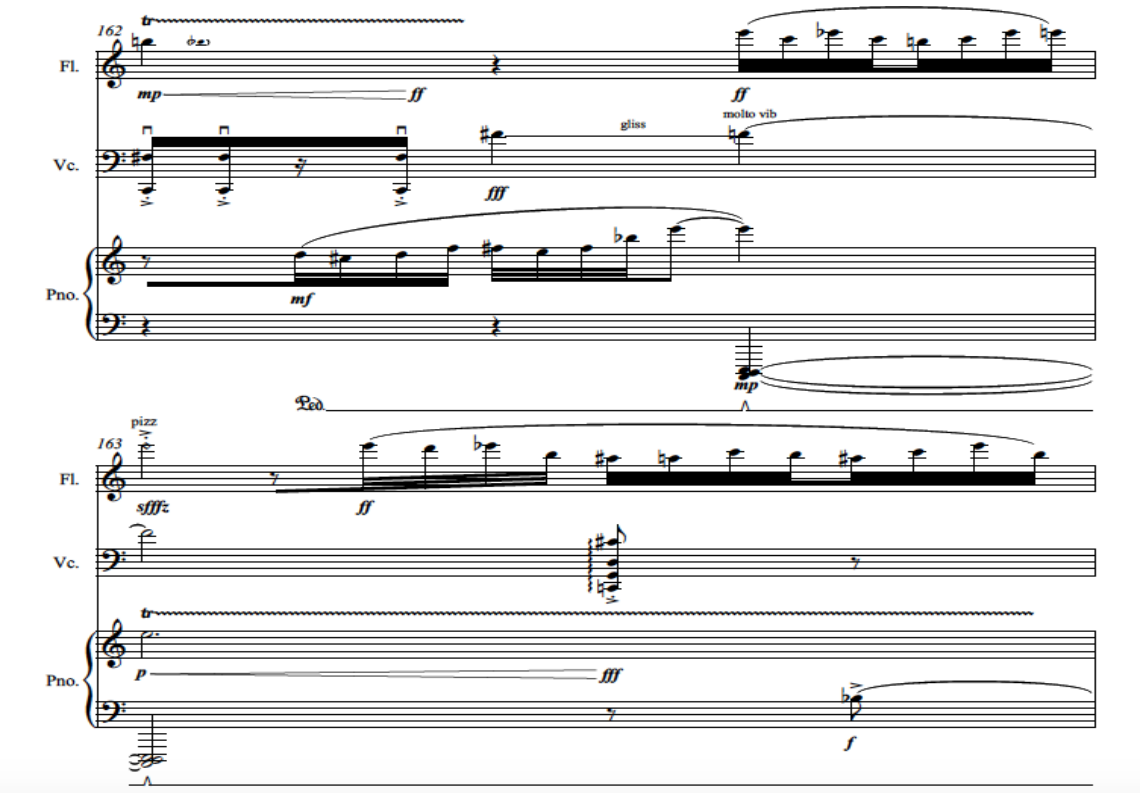



**The above chart roughly represents the free facial expressions from the Cellist. The higher the value is, the more accurately she felt the targeted emotions while playing the music.**

# Chapter 6.

## Memory

The project contained many sounds and melodies that represent my past such as: the sounds of whales, sirens, spoken words, bird songs, guitar riffs, gunshots and telephone rings to name a few. Unfortunately, during the early weeks in the process of composition, this triggered a serious post-traumatic stress disorder. As a result of the P.T.S. D. personal experiences, and my treatment, I worked with the combination techniques mentioned earlier in order to juxtapose melodic phrases triggering happy memories against the darker gestures or memories.




This technique of juxtaposition was mostly used in the ending of the trio movement (see above). The melody on the Cello here represents the bird songs

from my childhood and is underlined with darker motifs from both the Flute and Piano.

As a result of the trauma, every sound and note from the opening until the outro is derived from personal mental suffering. High valences were not honest to my experience, and did not come out on paper in any shape or form, hence the primary five human emotions were on the negative side of the valence.

# Chapter 7.

## Concept of Triggering (Music and Sounds)

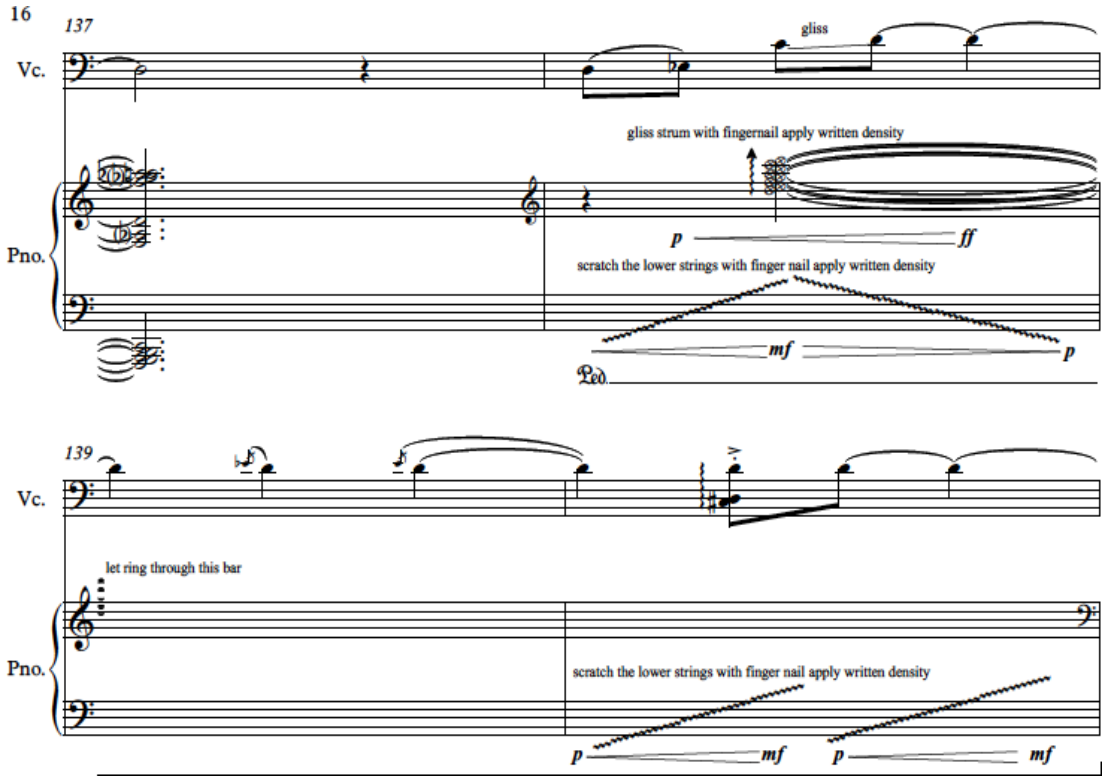
In films, especially in the genre of horror or thriller, there's a technique used to build up tension from events on-screen. An event will trigger the background score and the following music will be related to that event. I am interested in how we can do the same thing in music without the visuals.

I applied this concept in reverse; non-musical sounds (representation of events) are triggered from musical sounds. Examples are during the first Cello/Piano duo where the event (Sounds of telephone rings) gets triggered right after the loud piano strings sound. Another example is in the trio movement where the sounds of police radios and news reports are triggered after the musical gestures.

I am interested in combining non-musical sounds with musical materials and exploring how music can be brought in the foreground and be the focus of attention. This project focuses on this reversed technique and experiments with narration without visuals, while playing with non-musical electronic sounds as a background.

Usually in music compositions, the music is left to be interpreted and the composer hides the message and sends subliminal signals to the listener. This piece attempts to be more literal in certain sections and discloses many messages behind the music and what the music is about. If the listener is not sure, the performer is aware. I have done this to be more consistent in evoking the targeted emotional responses and attempting to leave little to no room for interpretation. This approach is inspired by screen-writing, and the psychological responses in films that are portrayed in musical soundtracks.

Likely, this methodology did not succeed entirely, because the listener was not aware of the character stories and profiles as well as some of the meanings behind the nonmusical sounds (events).




**Cello/Piano Duo – Electronics (events) starts from the second beat on measure 138**

# Chapter 8.

## Attention and Mozart effect

How do we respond to music? Do we have the same response when we hear a pop track in the background of a coffee shop? Is it the same when we spend our money to see a performance at a concert? The answer is quite obvious; the responses, emotional or otherwise will be radically different.

Music in context will contribute to people's unity. National anthems, for example, represent patriotic unifications and Sea Shanties inspire unification of workers.

Unity also includes emotional responses, and in this theory, I would look into my own music culture; Heavy Metal. This genre usually attracts a wider audience of rebellious nature and has a darker world view. The same song or instrumental track will not have the same emotional effect on a person who prefers other genres of music and has a different personality. Since elements and atmospheres of metal music were heavily implied, especially in the trio movement, I wanted every listener to pay attention to what was happening sonically around them, heavy metal listener or otherwise. Maintaining attention, I believe, results in similar if not identical emotional responses.

Attention was held by considering the following factors:

a) This is a professional performance

b) The audience paid to see this performance

c) There are gestures in the instruments which prevents the loss of concentration from the listener such as loud dissonant chords or the use of the jet whistle on the flute.

d) Applying the Mozart Effect

Keeping the attention stable and the level of concentration at a fairly high level was one of the goals of this performance, mostly using the emotion of surprise,

when the unexpected happens. Writing gestures which are to be played violently and loudly suddenly in a quiet passage was an effective way to induce surprise and preserve the sustainability of attention from the audience.

The “Mozart Effect” was another way to increase concentration on what was happening in the acoustic instruments. This was done by playing calm and relaxing ambient chords from the electronics on top of complicated acoustic parts which were playing intense music. This was not only effective on the listener but also the players, they were able to read more clearly and calmly because of the electronics. (upon feedbacks and opinions received from the players.) Not only was this approach used as a tool but it also helped to create one atmosphere by combining both intense and calm passages together at once.

I always use relaxing music to study, and it helps me concentrate more. And yes, this can be labelled as background music. The electronics were the background in all the acoustic movements, serving as a backbone to the structure of the prelude, duo and trio movements.

Conclusion:

I wish to continue this research and explore ways to challenge the universal concept of perception, while focusing more on induction. I also would like to investigate how to more accurately control psychological responses in my music. Controlling and manipulating the Circumplex, evoking emotions of sadness or fear in happy music, evoking happiness in disturbing sounds, evoking tranquility in chaotic music and inducing negative emotions from music are some of the specific strategies I would like to develop.

This project was a journey into many different headspaces and it demonstrates how music can be used in both a positive and negative way.

The trauma this project has triggered has inspired me to pursue this research further and to base all my future compositions as an artist on music psychology.

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# Appendix A.

# “Black Onyx”: Video Documentation

**Videographer:** Krystal Coughlin

**Editor**: Aryan B

**File Names:** Black Onyx – The Human Brain on Music and Sound

**Online Youtube Link:** https://www.youtube.com/watch?v=hh330hpj5EQ

**Description:** Documentation of the performance

**Date:** October 4th, 2018

**Location:** Simon Fraser University, School for the Contemporary Arts, Vancouver, British Columbia

# Appendix B.

# “Black Onyx”: Music Score

**Composer:** Aryan B

**File Names:** etd20031-aryan-borboruah-Score.pdf

**Description:** Music score for the project

**Date:** October 4th, 2018

**Location:** Simon Fraser University, School for the Contemporary Arts, Vancouver, British Columbia.