

To what degree can an emotional response be manipulated by specific sound design and score accompanying a moving image?

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**To what degree can an emotional response be
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Abstract

The link between media and their applied soundtracks is often overlooked as a necessary component for their construction - humans often become emotionally involved with movies, or particularly adverts, but quite often only subliminally take in the sound stimuli associated with it. It would seem that with moving images and their associated emotional response within us is owed to the visual stimuli, as it takes dominance over all else, but quite often the emotional response associated with this has an equal amount of contribution from the audio and sound design. Over the last few decades, analysis into how we process stimuli and produce emotions has shifted between what is psychological, and what is biological, as the grey area between perception and scientific evidence struggles to be identified as one or the other.

I propose to investigate the fundamentals of how to stimulate a basic emotional palette through research and practice, and the associated techniques within. With the assistance of volunteer subjects, how accurately the emotions through music were perceived shall be provided through feedback, which in turn shall allow me to assess how effective the researched techniques and theories were.

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Introduction and Methodology:

The notion that music can be emotive, or display elements that are considered moving or heartwarming, is somewhat inaccurate - the composition of the music itself is engineered to evoke a response in the brain for us to trigger a certain emotion within ourselves. Of course, the basis of two simple techniques would be that of 'major' or 'minor' keys, which are associated with happiness and sadness respectively, but what of inspiration, of fear, tension, or perhaps joy, energy, or resolve? With the emergence of cinema and the wide array of emotional palettes explored by modern films, it would be assumed that compositions paired with these moving images would need to cooperate with what the eye is seeing, amplifying the emotional impact expressed by the actors, the themes, the setting, or perhaps to even juxtapose what the audience sees on the screen to better represent the activities through irony.

In terms of research, this investigation used secondary research as a fundamental to base my primary research in the later stage. As a product of the research was to create my own compositions based on the readings into emotional compositions and semantic cues, the third stage was critical to gauge how effective these practises were, in order to receive feedback and create more necessary data to benefit and conclude the project. As is the case with most art, one of the obstacles presented to any artist - be it music or any other creative pursuit - is the impact on the individual. A potentially infinite amount of factors affect how we receive art, and all of these can have a great effect on perception of themes, enjoyment and satisfaction, or even cognition of proposed techniques.

To combat these issues, one must distance themselves from their own creative instinct, and attempt to assume a 'neutral' stance when creating artefacts for projects such as these. Too much individual inspiration can distort the final product, and the motive and point of the creation is lost through personal involvement. As Watson discussed, one must be wary of their individualism's role in the creative arts:

"He is moulded by the social conditions of his time, by the thoughts, feelings and experiences of his contemporaries, but he, the individual, is the artist. He cannot passively assimilate and reproduce. He must actively transform his material. So, as it is by the interaction of the environment and the individual that the work of art is produced, the artist must understand the development and role of his own individuality as well as that of his social environment and take as conscious a part in its direction." (Watson, 1944)

The secondary research into the processes behind certain emotional motifs is essential to temporarily replace individual judgement and lay the foundations for the artefact, where personal involvement can then stem from the basis laid by the research.

My research will consist of three main phases. The first will consist of breaking down the emotional structure of the brain, exploring how we describe emotions socially and scientifically, which will

lead into the research of the current understanding of various forms of accompaniment music and its effect on human emotion. The second stage will consist of independent work, creating various musical scores, compositions, and sound design to accompany existing and edited media forms. I plan to have a sample playlist of various artefacts, which will then be used in the third phase of my project. The third stage will be primary research into how human volunteers respond to the accompanying tracks and sound design, which will be hosted online for viewers to watch in a realistic setting, such as at home, or in an environment they feel comfortable. I will collect data during my primary research phase through online feedback forms which will be linked to each participant to fill out during and after the viewing, and base my final outcome, and how successful I was, on this data.

Some of the research questions I wish to answer within this project include:

1. How can accompanying scores and sound design manipulate an emotional response within an audience?
2. How effective are researched semantic techniques when applied to arouse specific emotions?
3. With no prior contextual lucidity, is it possible to convey an emotional association with a moving image?

Participant population will consist of a wide range of individuals, but I will gain information about expertise via the feedback forms. I will have a range of individuals with a varying knowledge of musical composition and sound design, with some being fairly attuned to the terminology and process associated with it, and others with no prior lucid knowledge of the aforementioned work. I predict that those educated in music production will be more sensitive to the conveyed themes, but a wider range of participants provides more accurate (and interesting) feedback.

Section 1: Social and Scientific Emotional Categorisation

This section shall discuss the difference between scientific evidence and personal experience when viewing particular stimuli, and the difficult process of emotional categorisation, as the basis for the fundamentals of what makes an emotion covers a wide aspect of scientific and theoretical studies. Where the distinct difference between what makes an emotion, and what makes a mood, are fundamentally that an emotion requires some sort of trigger, “Many researchers think that emotions usually have an identifiable stimulus event, whereas moods do not.” (Juslin and Sloboda, 2001, p75.) the produced artefact will essentially be variable stimuli to the audience, the fundamentals behind the psychological, biological, and social effects of music and the moving image must be brought forward to be built upon in order to create the most effective soundtrack to stimulate each separate chosen emotion.

However, there are physical limitations to how deeply science can analyse the aforementioned effects - partly due to “the amygdala together with its dense connections with both prefrontal cortex and the brainstem” (Lerner, et al., 2009, p2.) proving to be difficult to analyse as individual components, as each need the other to function correctly as the emotional epicentre of the brain. Also, social and psychological aspects are shaped via individual upbringing and experiences.

“The perceived emotional intensity of stimuli can determine its assigned adaptive value by the individual. It has been acknowledged that perceived emotionality of stimuli is highly dependent on style of processing (e.g. focus of attention), perceptual context (e.g. the relatedness to environment) and task relevance, which together form the individual’s mental set.” (Lerner, et al., 2009, p1.)

Factors such as the environment in which music is listened to can also greatly effect how an individual reacts to it. A study was conducted in which participants listened to ‘positive’ and ‘negative’ soundtracks whilst closing their eyes, with the outcome indicating that brain activity shifted dramatically in both cases, with prominence in the amygdala array. (Ben-Simon et al., 2008 cited in Lerner, et al., 2009, p1.) In relation to this, further tests showed that music whilst viewed with an emotionally neutral moving form of media (e.g. a movie) showed that participants had higher amygdala activity, compared to when listening to the soundtrack alone. However, at the current stage of brain analysis, it is impossible to pinpoint whether the movie itself amplified the emotional impact of the music, or if the increased brain activity could be put down to ‘multi-modality’, which is simply the increase of stimuli from two sources (sound and image), over the increase of sensitivity to just one or the other. (Lerner, et al., 2009, p2.)

Whereas precisely measuring how the brain processes such abstract concepts may not yet be attainable by science, personal experience and self evaluation allows psychologists to represent emotions physically, theorising how our main emotions may be displayed, or visualised using models and charts. It can be argued that as emotions have such a wide effect on humans - not just

psychologically, but including biologically and socially - that the emotion itself is not just contained within the brain, with our actions as a byproduct, but as a whole unit, with Averill proposing that "emotions cannot be explained strictly on the basis of physiological or cognitive terms. Instead, he claimed that emotions are primarily social constructs; hence, a social level of analysis is necessary to truly understand the nature of emotion." (Averill, 1980 cited in Cambria, Livingstone and Hussain, 2012, p146.) However, this shows the more theoretical side of emotive research, as what defines an emotion as a unit can not be agreed, with emotions proving to be a rather abstract concept when expanded outside of electronic signals in brain cells and neurones. It would be more realistic to attempt to categorise each emotional 'experience' within a set of principles, associating each emotion and it's biological and social by-products with the name of that emotion itself. As the categorisation for each individual emotion may prove to be an unrealistically large task (with some emotions like anger and rage only having slight differences between them) Paul Ekman and Wallace V. Friesen proposed that all human emotions can be condensed into six main 'families', after studying the differences and similarities in human facial expressions. They proposed that these families should be considered as a metaphor, but still be used as a tool to tell different emotions apart, through containment under the collective families they belong to. "The 60 anger expressions, for example, that we have identified share certain core configurational properties, which distinguish them from the family of fear expressions, disgust expressions, and so forth." (Ekman and Friesen, 1978, cited in Ekman, 1993, p.386.) There are many ways to represent and organise emotions into categories. The primary descriptive feature would be whether the emotion can be aligned with positive or negative experiences, plotted against how active or passive this emotion is (for instance, where 'calmed' would be a passive emotion, 'enraged' would be active).

Graphical Representations of Emotional Categorisation:

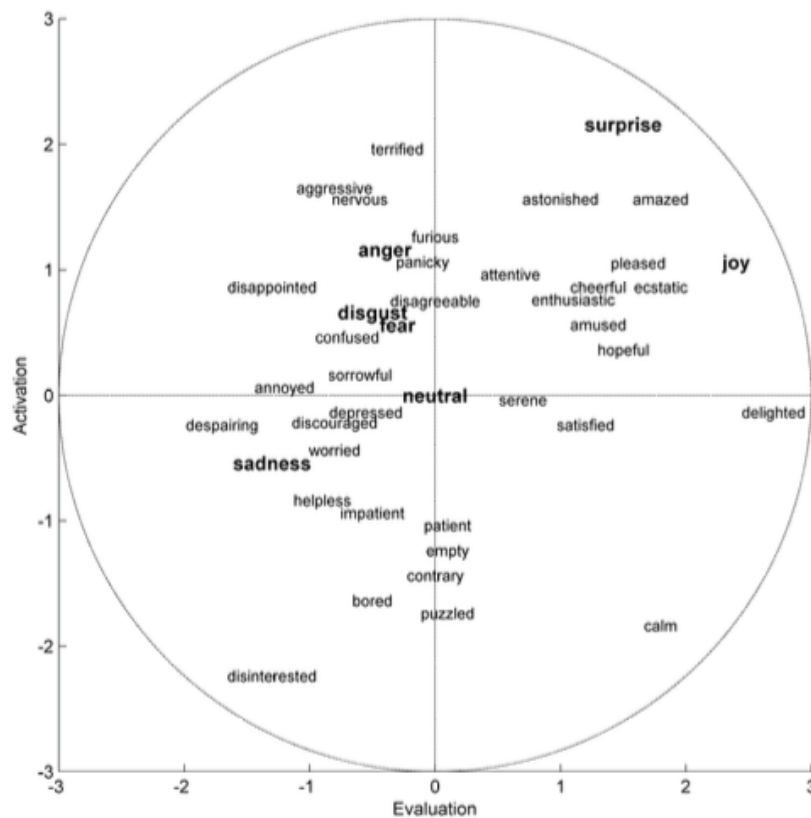


Fig. 1.1. Examples from Whissell's Dictionary of Affect in Language software arranged in a two-dimensional graph, plotting emotions and their positivity against their intensity, or lucidity. This, again, is a representation of how emotions feel to individuals, and is not necessarily a measure of how intense the amygdala array's activity is.

Persinger's software, based off an investigation performed by Whissell, where data collected from volunteers who were asked to evaluate the intensity and activity of certain words, is a tool best suited to the contextual analysis of language through individual assessment. (Persinger, 200?)

The plotting of emotions is charted via the association of such words and how they make participants feel, although it can be argued that other plotted charts and devices are more accurate by using fMRI scans. The Hourglass of Emotions, which utilised brain scan analysis to plot multiple variables of emotional intensity, included Pleasantness, Attention, Sensitivity and Aptitude, plotted in a three dimensional graph. This formed an hourglass shape displaying the four (eight, including the negative, arguably opposite) main tiers of emotional families. (Cambria, Livingstone and Hussain, 2012, p151.)

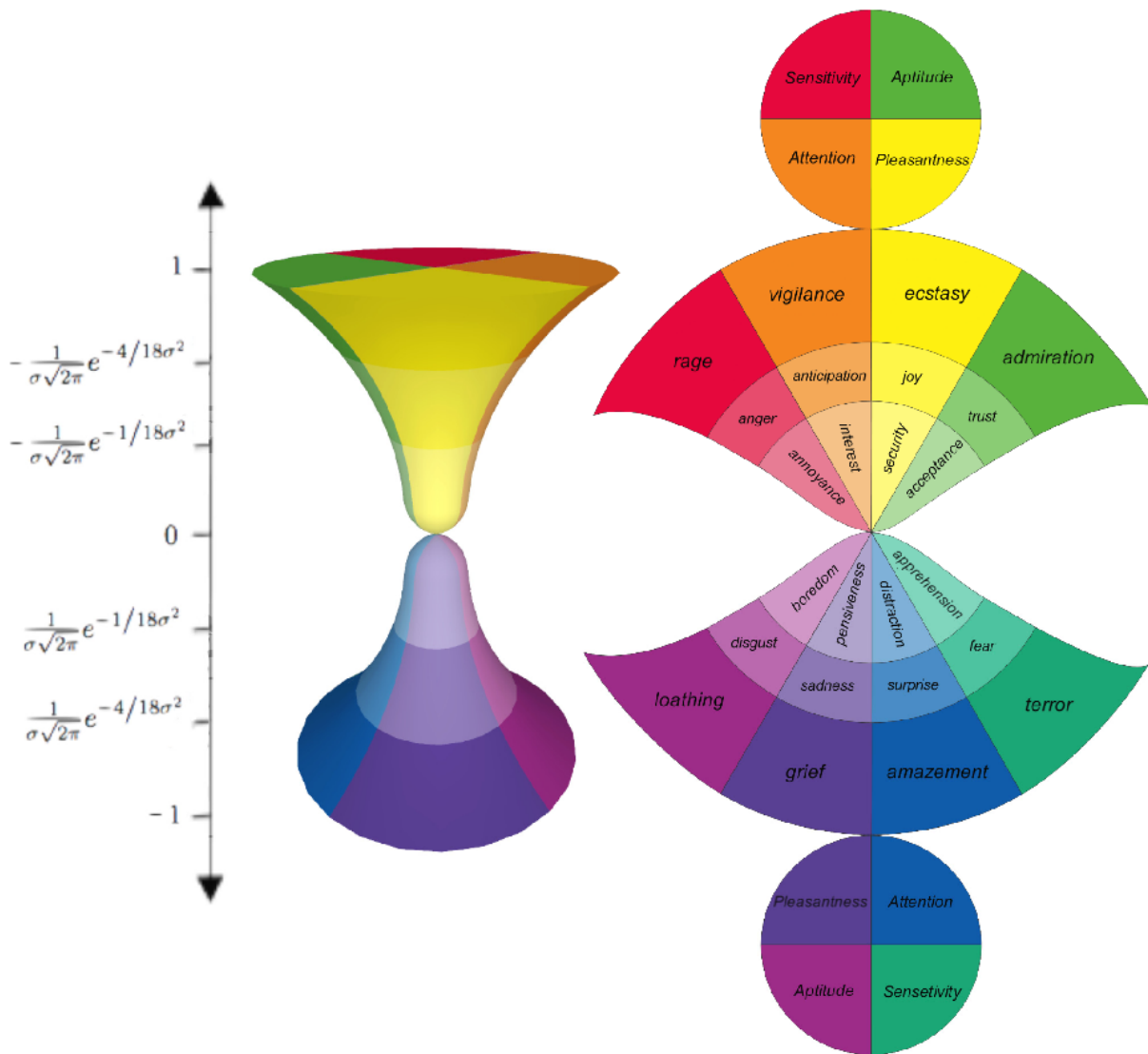


Fig 1.2. By plotting the measured data collected through brain analysis, and arranging it in a three-dimensional space against the discussed emotional families, The Hourglass Of Emotion could potentially be a reliable middle ground between the psychological and social discussion of emotional categorisation and scientific evidential measurements.

Through discussion of these methods of emotional categorisation, the comparisons between how each method plots different groups of feelings can be identified as polarity (positive and negative) against intensity. As seen in Whissell's partial arrangement of the Dictionary Of Affect In Language, Whissell places activation - representing whether the emotion is a lucid response to stimuli - versus evaluation, a variable on how pleasant the emotion is to the individual. Comparing this to The Hourglass Of Emotion, the evaluation is instead placed on the y-axis, with the circumference of the positive and negative 'bell shapes' that form each end of the Hourglass representing the activation variable. Using these variables, it is possible to form another categorical representation which falls

between what is psychological and what is scientific. A two dimensional model utilising the feedback analysis presented by Whissell, the scientific brainwave analysis presented by Cambria, Livingstone and Hussain, and the theory of categorical families suggested by Ekman and Friesen combines all three approaches to emotional measurement and categorisation to form four main categories, in which all emotions can be charted under their collective families.

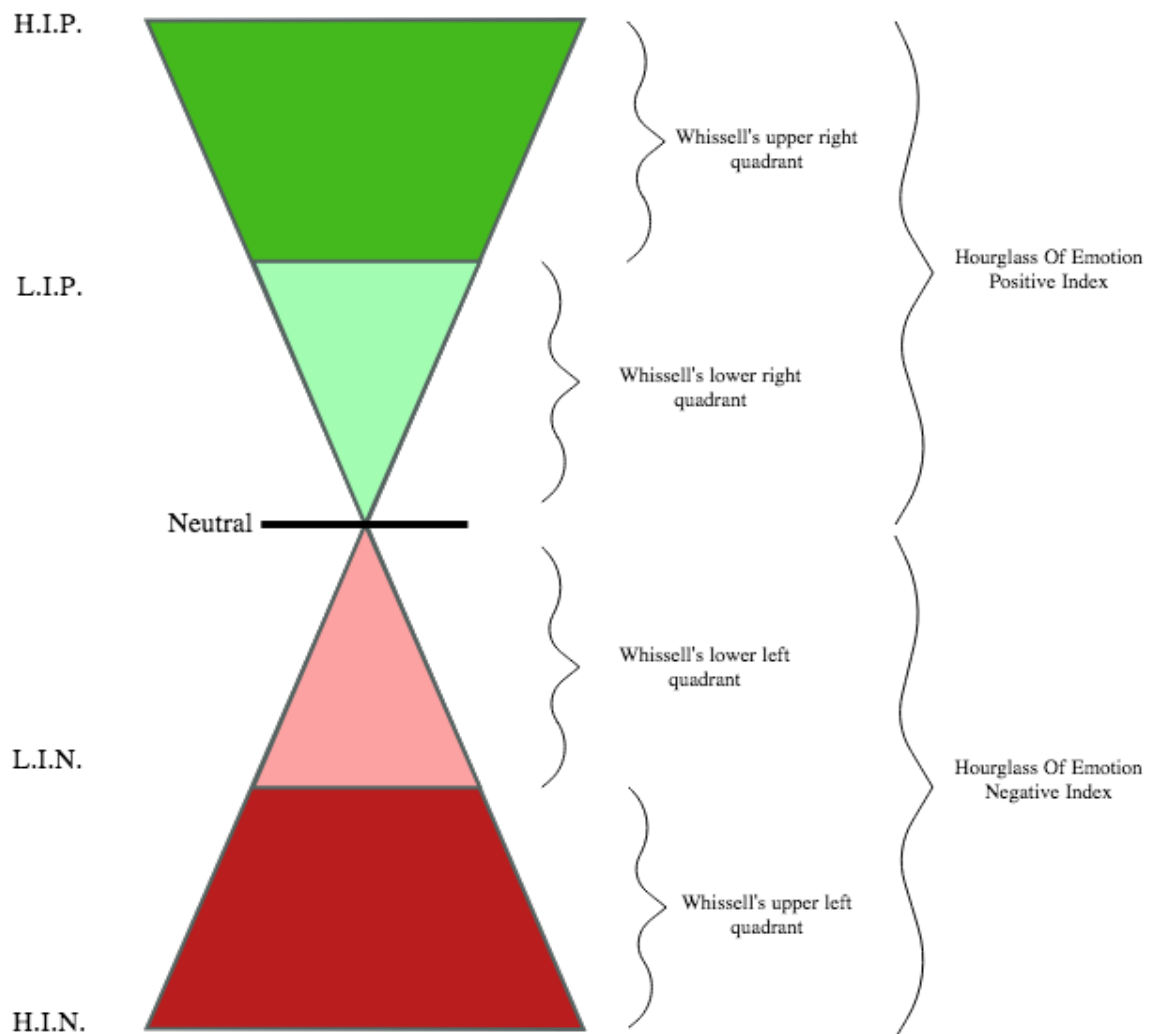


Fig 1.3. The two dimensional model draws on collectives to categorise emotions using several factors. Emotions included in the High Intensity Positive range fall into the upper right quadrant of Whissell's model, and also the Positive Index of the Hourglass Of Emotion. This includes the techniques used from both a scientific and feedback standpoint. The inclusion displayed on this model falls into four categories; High Intensity Positive, Low Intensity Positive, High Intensity Negative, and Low Intensity Negative. Polarity is determined by the original categorisation of the same variable in the Positive and Negative indexes displayed in the Hourglass Of Emotion model, where Intensity is determined by the Activation axis on Whissell's model.

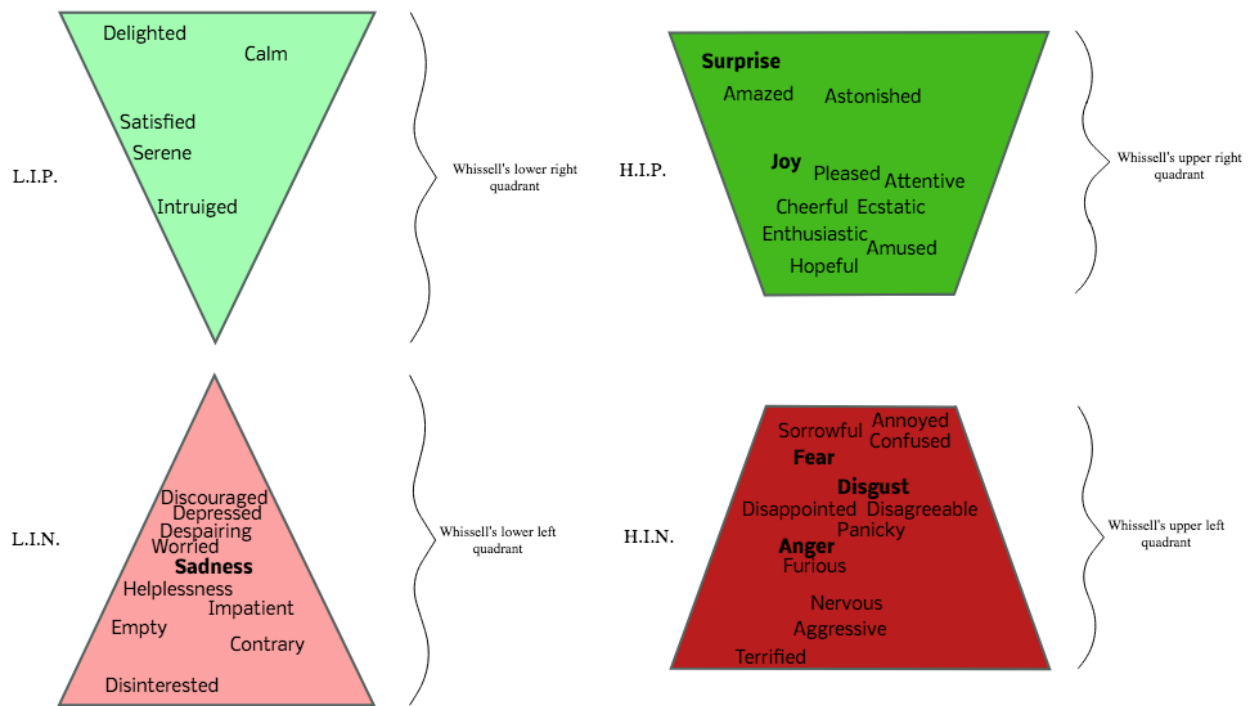


Fig 1.4. By separating the individual segments of the two dimensional model, four categories are presented in which most semantic cues and emotions can be categorised. This example also incorporates the emotional definitions set by Whissell's model.

By applying this model in preparation for composition of both composition and video collation, using the four main categories to represent each theme, or semantic cue included in compositions may allow composers to research various techniques associated with each area of the two dimensional model. Having a wider array of emotions included in each quadrant - with emotions contained within being linked through familial similarities - allows for a broader array of emotions for music to be directed at.

Review of Literature:

The main focus for this section would be that of Cambria, Livingstone and Hussain's endeavours into the scientific approach of how we could create a metaphor for the categorisation of emotional structures. The journal entry titled *"The Hourglass of Emotions"* incorporates the use of many previous feedback categorisations of emotions and applies real-world scientific proof to further deepen our understanding of the conceptual space that our emotions lie within. Whilst the journal itself contains a rich psycho-scientific approach to the categorisation process, aligning with the scientific nature of the Cognitive Behavioural Systems publications, it was necessary to read into the section discussing the inception of the Hourglass model, and the incorporation of Whissell's dictionary to the structure, albeit unorthodox as it was.

Section 2: Semantic Cues - Linking the Eye and Ear

Introduction and the Founding of Semantics in Cinema:

Techniques into communicating and incorporating semantic cues alongside a moving image date back to the early days of cinema, silent films and slides. In the late 19th century, and the founding days of cinema, “the cultural and commercial institutions of cinema did not yet exist to regulate its own sound practice.” (Buhler and Neumeyer, 2016, p.94.) As the purpose and meaning of film was not yet established, the location in which slides were watched would vary. At this point in history, one could have considered the music and the visual elements to be entirely separate entities, independent of one another. Contextually, cinema was an exciting new innovation, and audiences would gather to witness prerecorded material, but eventually filmmakers experimented with blending the visual and audio elements. A notable early example of direct composition for cinema would be the personal memoirs of Cecil Hepworth, in which he stated,

One of the series that was always met with great enthusiasm was ‘The Tempest’. It consisted of half a dozen slides and a short film. The first slide showed a calm sea; this was followed by slides of an increasingly stormy sea, culminating in the showing of the film: ‘splashing, crashing waves at the entrance to a cave. Hepworth’s sister accompanied all of this on the pianoforte: ‘soft, gentle music’ to start with, ending in ‘wild music’. (Larsen, 2005, p16.)

This may be one of the first recorded examples of accompaniment designed for a viewing. Hepworth and his sister would have had to write music and improvise a soundtrack for the ‘act’; according to their own interpretations of the semantics and emotional cues contained within, as there were no previous standards to guide them in providing a soundtrack, similar to how cinema was an emerging art itself. With Nickelodeon type theatres being built solely for the purpose of screening, movies became more and more ambitious in terms of the scenes and themes. With the extended length becoming more akin to modern day short films, the accompanying music, effects and sound design became an increasingly important aspect of the screening process. “As the films became more ambitious, theatre owners realized that audiences appeared more engaged when music and sound seemed attuned to the story.” (Buhler and Neumeyer, 2015, p.98.) At first, productions were paired with already existing music, which would be played alongside the screen to fit certain themes and situations. This would often be classical or operatic music, and certain arrangements would be selected to be played with certain films to convey emotive themes - however, categories of accompaniment music were chosen to convey moods, rather than emotions, which would suggest the music was initially meant to reinforce what the eye was seeing, rather than inspire emotions and thoughts independently. “every class embraces the most suitable

selections for its character and mood.” (True, 1914, p3.) Lyle C. True began to categorise existing music, bringing forth the subject of motif, which in turn associated certain genres of film with specific songs and orchestral arrangements (See appendix A).

This led to the realisation of semantic cues, and the importance of engaging audiences not only visually, but also through the ear. At the transition from the nickelodeon period to the use of multi-reel in the silent period, “some film companies went a step further and even tried distributing music along with the films” (Buhler and Neumeyer, 2015, p.106.), leading to the inception of original ‘special-scores’ which would require a larger orchestra hidden from the audience, and became just as much of a feature as the moving picture. The hybrid nature of compiling music and creating original scores would lead the way into the creation of entirely original soundtracks to accompany more specific emotive themes, and techniques for expressing certain emotional tones were gradually refined.

The introduction of musical non-diegesis allowed composers to bring forth storytelling and semantic context further into the consciousness of the audience. The idea that the diegetic created within a film cannot detect, or even be aware of music and sound design in the non-diegetic can create tension, joy, fear, or suggest themes to the viewers that are only available beyond the fourth wall. This effect applies to almost all genres of modern film, with perhaps the most well praised and referenced scene from Hitchcock’s *Psycho* and the use of non-diegetic sound. In this case, the non-diegetic takes dominance over the diegetic viewpoint the audience is offered - the claustrophobic nature of the shower is condensed into a shower head, the plughole, and the screaming face of the protagonist, yet the music allows the audience to subconsciously understand much more of what is occurring beyond what they are allowed to see:

Technically what happens is easy to explain: we have violins near the top of their register, playing upward glissandi. This is an unsettling sound in itself, like a knife being manically sharpened; but what makes it so extremely grating is that the violins have been recorded uncomfortably close, resulting in something much more animal than musical...those final, low sustained bass notes, then music reasserts itself: the notes are still attacked, the stabbing motion is still there; but now the energy is ebbing low, and finally is extinguished entirely. (Parker, 2008, p.5.)

The Fundamentals of Semantics in Music:

In a wider sense of cues and techniques of communicating an emotional response to the audience, attempts at categorising effective methods to achieve different outcomes can be used by composers to create a general ‘feel’, or atmosphere in their music. Whilst these techniques can be applied to all types of compositions, and not specifically films, the results from response studies have refined these charts over the years to better represent what can be considered the most studied basic emotions within music - “happiness, sadness, anger, fear, tenderness” (Parncutt and

McPherson, 2002, p.223.) “These emotions may represent a natural point of departure because all are regarded as typical emotions by laypeople” (Shields, 1984, cited in Parncutt and McPherson, 2002, p223.) Although most primary studies have not yet been definitive in precisely which factor of musical composition contributes the most heavily towards emotional cognition, most researchers can agree that the melody, tone, tempo, timbre, and texture are all contributing factors that alter to the overall emotional impact of a song. Although these characteristics have been argued to all contribute to the overall mood, experiments and assessments of how individuals responded to music with particular focus on specific areas of these fundamentals drew similar results. Rigg concluded that out of seven cues studied (tempo, mode, articulation, pitch level, loudness, rhythm patterns, and interval content) feedback indicated that tempo and mode were the most significant factors. Denver’s study incorporated six cues, (mode, tempo, pitch level, rhythm quality, harmonic complexity, and melodic direction) and concluded that mode, tempo and rhythm were the definitive factors for emotional response. (Rigg, 1964; Denver, 1935, 1937; cited in Eerola, Friberg and Bresin, 2013, p2.) However, within Parncutt and McPherson’s simplified chart of common techniques contained on genre music, emotional manipulation are traced back to techniques aligned with the fundamental categories of rhythm and metre, harmony and tonality, texture and melody, timbre and dynamics, and structure and form. (See Appendix B) I propose to utilise these techniques, as the Activity/Valence column can be aligned with the emotional categorisation models detailed previously, and associates with the two dimensional hourglass model - although particular detail may be owed to mode, tempo, and rhythm, as these areas have been discussed to be the main semantic cues that listeners detect. By applying these frameworks in addition to the proposed categorical model, the composition of the accompaniment music to the artefacts shall be dictated by the link between what is social, psychological, scientific, and the basis of musical theory and application itself.

Review of Literature:

As this section of research approached the components of semantic cues within musical composition, the main source of this section is inspired by the works of Eerola, Friberg and Bresin, particularly their journal entry titled *Emotional expression in music: contribution, linearity, and additivity of primary musical cues*. Whilst again, taking the approach from the school of psychology, the importance and scientific evidence proposed alongside musical theory, practises and frameworks was particularly interesting. The use of information from several similar studies performed by the likes of Rigg and Denver also translated with the works of Parncutt and McPherson’s (See Appendix B) table of cue utilisations, and provided a rich foundation on which I could begin to base my compositions on for the investigative stage of the project.

Section 3: Use of the Two-Dimensional Model for Emotional Encoding

Introduction

This section will attempt to further analyse the frameworks and categorical compositional techniques during the composition of the soundtracks for the primary investigation. By aligning the researched techniques and categorical models, a focal point and motive for each track associated with each quadrant should condense an emotional response from the audience, allowing the compositions to be created in the most efficient way possible, concentrating solely on the emotions associated within each separate quadrant.

High Intensity Positive (H.I.P.)

As this composition will be attempting to incorporate and generate the emotions included inside the two dimensional hourglass model's H.I.P. quadrant, the composition of both video and music will aim to exclusively highlight what is considered to be the more intense, positive side of the human emotional range.



Fig. 3.1. The uppermost quadrant of the two dimensional hourglass model, labelled with emotional keywords from Whissell.

As dictated within the cue utilisation chart (See Appendix B) happiness and a sense of pleasure is brought forward through rhythm in two ways - a steady, fast tempo is required with a regular time signature, and low variance in the aforementioned mediums. Further detail is provided by Wang, who stated that "Happy, exuberant, joyous, and lively emotions tend to be associated with fast tempi, major mode, loud dynamics, staccato articulations, simple harmonic structures, flowing rhythms, and higher pitches or wider pitch range." (Wang, 2014).

I will structure a driving beat around an acoustic drum kit, with a tempo varying between 125-135 BPM, to give a catchy and easy to identify feature that should be the main focus of the track.

In terms of harmony and tonality, consonance in a major key is necessary to mitigate any form of harmonic discomfort, as frequency alignment in what we consider to be consent chords or tones form what is known as “a simple harmonic series with a single fundamental frequency. [which] have a pleasant (consonant) sound.” (Plack, 2010, p.476.)

Low Intensity Positive (L.I.P.)

As identified previously, Whissel's classification of emotions that fall between the lowermost positive and the neutral part of our emotional evaluation, this composition was structured around a calming, more passive positive mindset.

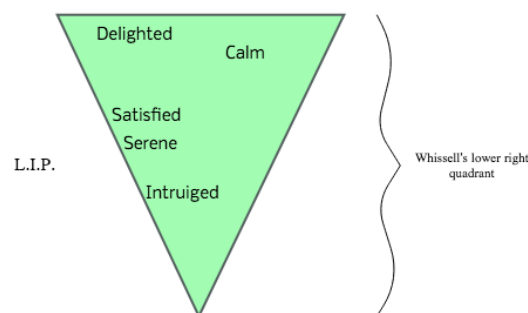


Fig. 3.2. The lower activation, positive quadrant of the two dimensional hourglass model, labelled with Whissel's keywords.

Following the activity and valence column in the cue utilisation chart (See Appendix B) , the low/ positive traits centre mainly around rhythm, texture, and dynamics. Specific detail is given to the tempo, and particularly the nature of sounds that are composed with the intent to relax - slow attacks on tones would give the overall sound a ‘dreamy’ or ‘lush’ texture, with sounds drawn out to be long and slow. The low variability in audio levels gives a flat dynamic range of noise, particularly when paired with the quiet nature of the music itself, and it would seem that the serenity of music composed in this way would be to assume a less dominant driving force, rather allowing the listener to focus more on the harmony and textures of the sound, with low energy and a low sense of movement in the track. The ‘final ritardando’ would also slow the track further at the end, which would mitigate an abrupt end to music pertaining to this criteria. It would appear that a slower tempi, accompanied by a simplistic, moderately static, but fairly high pitch in tracks associated with calmness plays a major role in the perceived tranquility of the experience:

Therapists suggested that the relaxing music selections had the tendency to have a tempo of approximately 60 beats per minute (bpm) with pitches centered around C5 (an octave above middle C or C4). They were also likely to be diatonic with one tonal center and have small dynamic changes throughout the music. In addition, music selections with very simple rhythms were perceived to be more relaxing. (Tan et al, 2012, cited in Wang, 2014, p.3.)

High Intensity Negative (H.I.N)

Although this quadrant has the widest array of emotions contained within that relate to Whissell's categorical model, I chose to centre the composition mainly around emotions that relate to the core fundamentals of fear, with elements of aggression and anger blended to compliment the tension in the accompaniment.



Fig. 3.3. The higher activation, negative quadrant of the two dimensional hourglass model, arranged with the widest palette of mood collations, based on Whissell's categorical model.

The H.I.N. quadrant of the two dimensional model contains similar emotions to the L.I.N. quadrant, yet extends to the more active and conscious emotive responses as opposed to the more discreet, passive emotions contained within the L.I.N.. In terms of compositional presence, “non-diegetic music appears to have a closer relationship to the horror genre” (Donnelly, 2005) and so emotional immersion can be formed more prominently through the use of sound. It may be argued that the emotions of “fear”, “nervousness”, “panic”, and “terrified” can be contained separately to akin to “sorrowful”, “disappointed”, “confused”, and “anger”, “fury”, and “aggression”, but this does not mean that elements from seemingly separate emotive families cannot be combined as an aesthetic emotion, by which intense emotions from a range of higher arousal are associated with one another. (Becker, 2004) The inclusion of dissonance in harmony (or lack of harmony) is a common technique used within music to provide an uneasy or ‘off’ feeling to the tone of the composition. The results from a study in which the amygdala responded to major, minor, and dissonant chords proposed substantial evidence to suggest that “dissonant chords, compared with major chords, reflect a mechanism that automatically interprets these chords as being potentially alarming stimuli.” (Pallesen, et al., 2005, p.452.)

Low Intensity Negative (L.I.N.):

With the sub-classifications of this quadrant being so clear, this arrangement was constructed around the techniques and archetypes of rich and intense feelings of sadness.

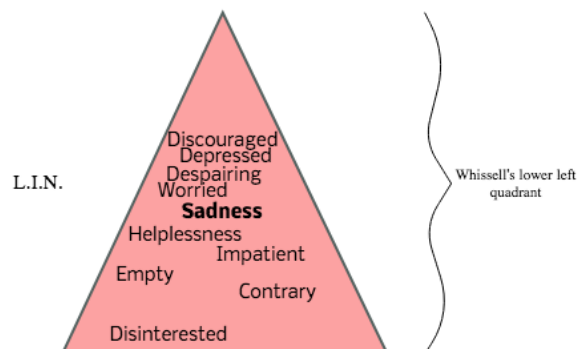


Fig. 3.4. The collation of Whissell's emotional feedback within the lower activation negative quadrant of the two dimensional hourglass model.

Unlike the previous quadrants, the emotional area of the L.I.N. gravitates around one main central feeling. Whilst emotions of “worry”, “depression”, “despair”, “emptiness” and “helplessness” are classified individually and can be experienced independently, they can all be associated with the central emotion of “sadness”. Reflecting on the Sadness row of the cue utilisation chart, low/negative semantic cues through technique mainly centre around tempo, texture, and dynamics, which also were found to be prominent themes within Wang's investigative research, in which he stated, “solemn emotions often correspond to slower tempi, minor mode, soft dynamics, legato articulations, complex harmonies” (Wang, 2014, p.2.)

Analysis of Collected Data:

In the practical part of this project, ten individuals were picked at random to view the four compositions alongside their moving image counterparts, whilst simultaneously selecting checkboxes on an online survey to highlight which emotions they felt were represented by the artefacts. Before the viewing, participants were asked to grade their musical knowledge on a scale of 1-10, with 1 representing 'little to no prior musical expertise', and 10 representing 'confident and capable musical expertise'.

Artefact 1 - H.I.P.

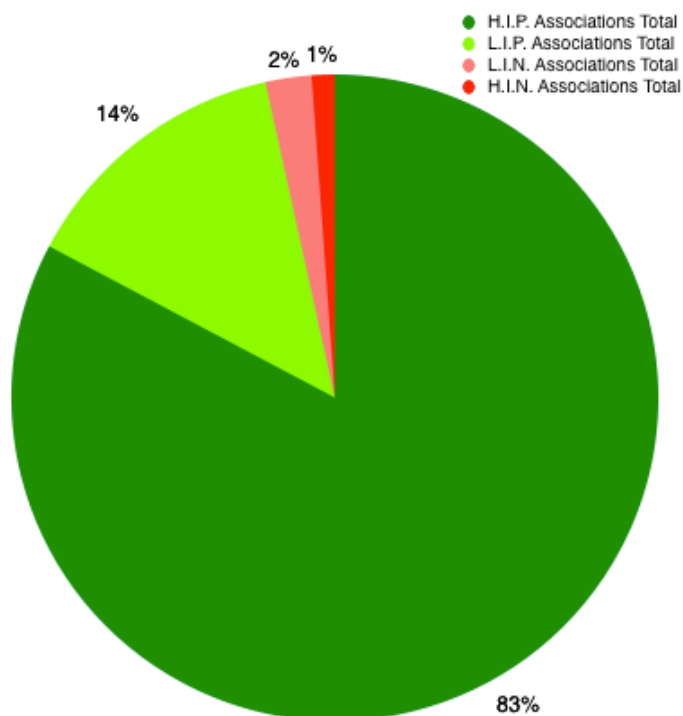


Fig. 3.5. A chart displaying the total responses from the audience from the entire spectrum of words within the two-dimensional model, after viewing Artefact 1.

The data collected from the audience after the viewing indicated that most individuals associated words within the H.I.P. quadrant to best represent their emotions. With 83% of selections falling within the uppermost category, it would seem that the semantic techniques associated with this quadrant appear to be actively communicated to the audience.

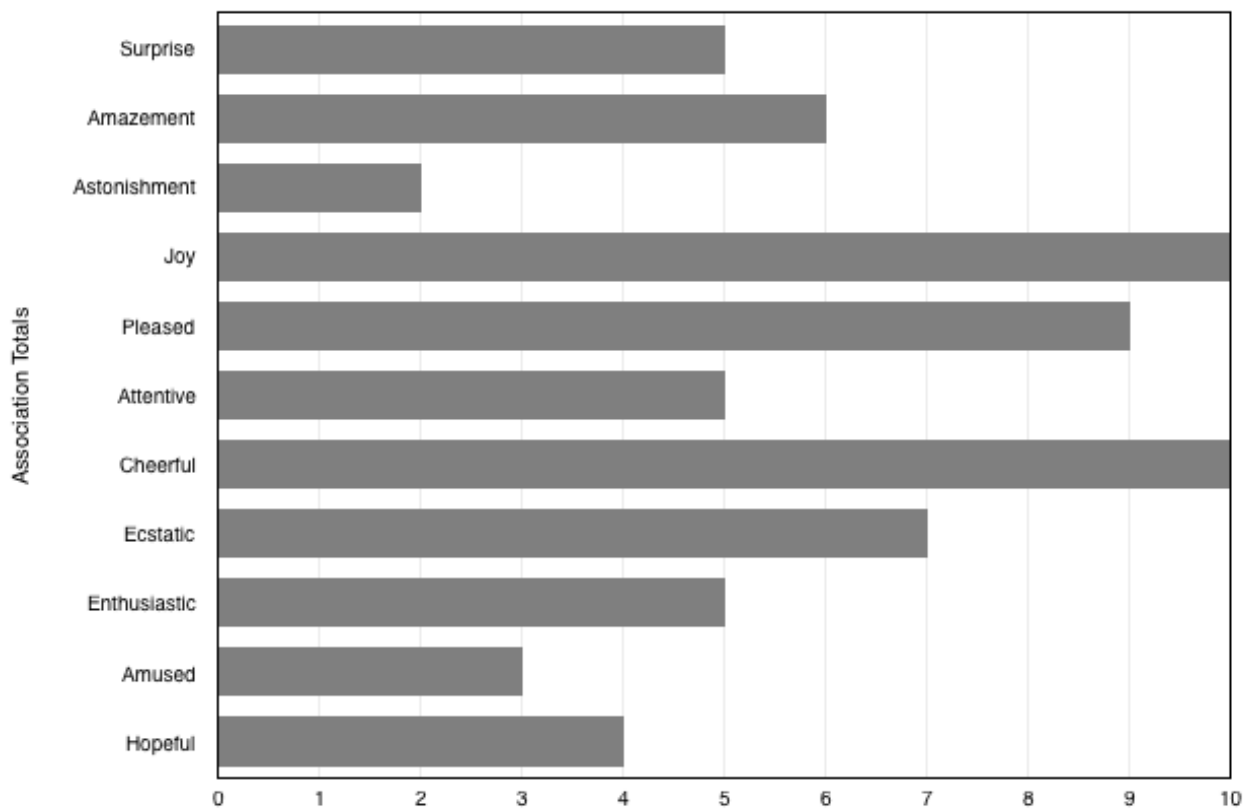


Fig.3.6. A bar graph showing the amount of times emotions within the H.I.P. quadrant were selected by participants.

When viewing the most popular emotions selected within the H.I.P. quadrant, all of the participants selected 'joy' and 'cheerful', suggesting that these two emotions were the most strongly represented within the artefact. However, 'astonishment' and 'amused' were not as well represented, as displayed by the low number of selections overall. Participants also made selections within the L.I.P. positive quadrant, including those of 'delighted', 'satisfied', and 'intruiged' - representing 14% of total selections - which displays that elements associated with these emotions were also translated by the audience. 3% of total selections also fell within L.I.N. and H.I.N. boundaries such as 'impatient' and 'panicky', which - whilst unintentional - could be a representation of the speed of the track or the timbre being disagreeable to some participants.

Artefact 2 - L.I.P.

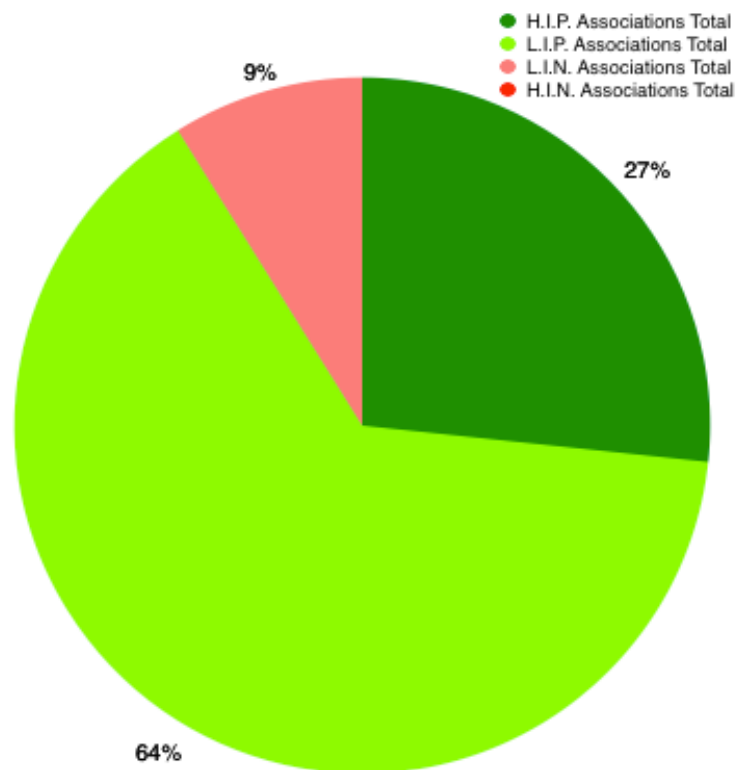


Fig.3.7. A chart displaying the total responses from the audience from the entire spectrum of words within the two-dimensional model, after viewing Artefact 2.

Words chosen by the participants in accordance with Artefact 2 had a wider range of selections across L.I.N., H.I.N., and L.I.P., respectively. Again, with a primary response in the positive axis of the model, participants still chose words associated with a lower activation index, but a higher percentage of selections in the H.I.N. range (27%) were still prominent in this composition via participant feedback.

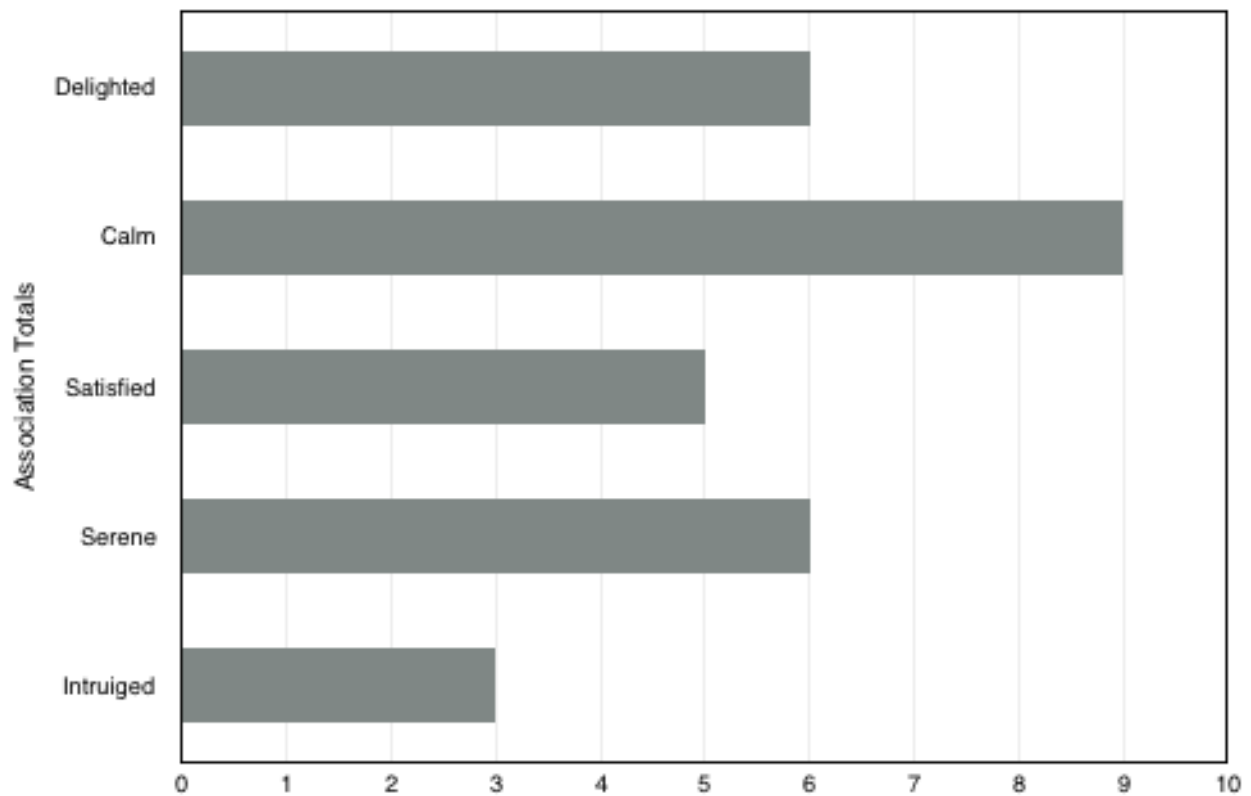


Fig.3.8. A bar graph showing the popularity of selected emotions by participants within the L.I.P. quadrant.

By viewing the popularity of selected words associated with emotions within the L.I.P. quadrant of the two dimensional model, most participants seemed to associate the artefact with 'calm', which was the basis of the artefact itself. 'Serene' was also a popular choice, which suggests that participants received the intended motif of the artefact successfully. However, selections within the L.I.N. quadrant included 'empty' and 'disinterested', which again could be referring to the timbre of the track. Another notable selection within this quadrant is that of 'sadness', which is a common feeling associated with ambient genres and a less prominent pulse.

Artefact 3 - H.I.N.

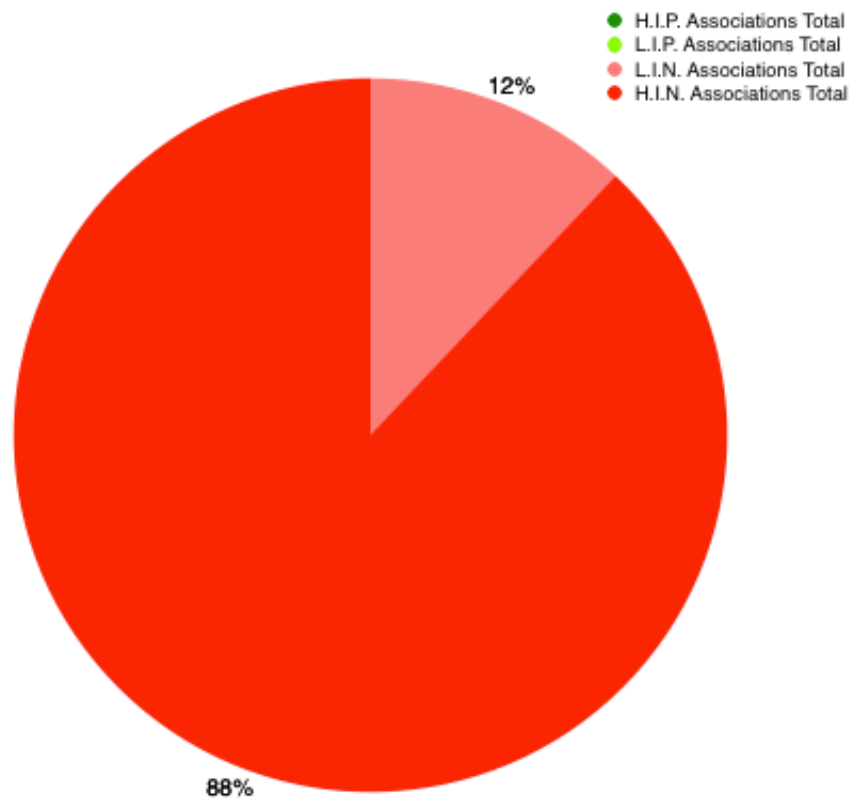


Fig.3.9. A chart displaying the total responses from the audience from the entire spectrum of words within the two-dimensional model, after viewing Artefact 3.

Unlike the two previous artefacts, the response from the participants in regards to Artefact 3 is entirely dominated by the negative axis of the two dimensional model, with particular emphasis given to the H.I.N. associated emotions. With no selections in the positive axis of the model, Artefact 3 was arguably the most successful composition of all four viewings, particularly with the audience's identification of H.I.N. associational emotions.

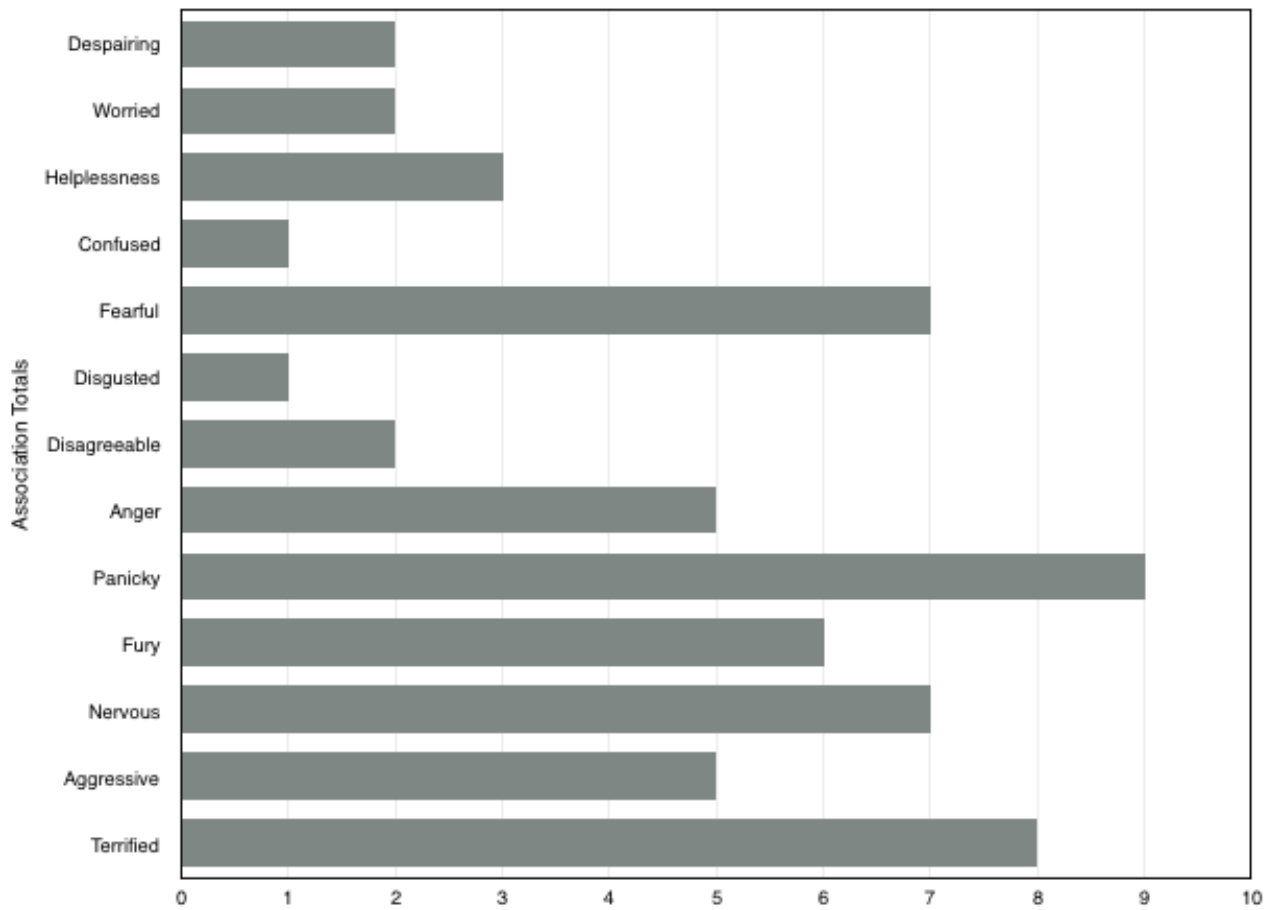


Fig.3.10. A bar chart displaying all emotive associations within the H.I.N. quadrant of the two dimensional model.

By analysing the data collected from selections within the H.I.N. quadrant, it is clear that the most popular choices for participants was that of ‘panicky’, ‘terrified’, and ‘fearful’, which were the main focal motifs for the composition of audio and video. The emotions selected which fell into the L.I.N. quadrant included ‘helplessness’, ‘worried’, and ‘despair’, which also pertain to the tension motif of the track and video, although by association they are deemed less active.

Artefact 4 - L.I.N.

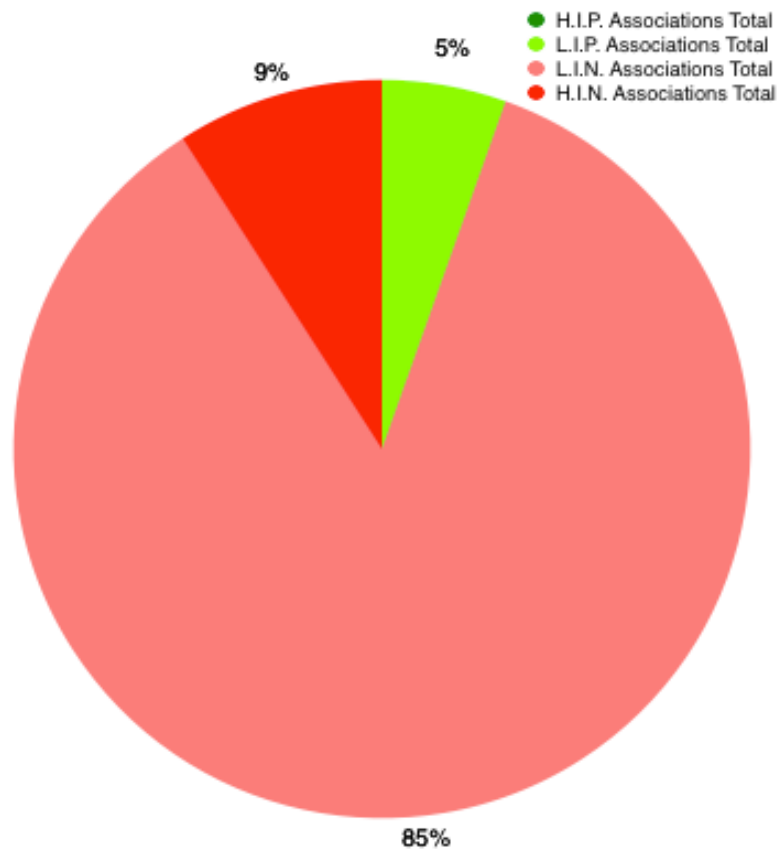


Fig.3.11. A chart displaying the total responses from the audience from the entire spectrum of words within the two-dimensional model, after viewing Artefact 4.

Similar to Artefact 3, Artefact 4's response via the audience is dominated mainly by associations within the target quadrant, but also includes some associations within the L.I.P. quadrant, which accounts for 5% of the overall feedback. With the L.I.N. and H.I.N. quadrants combined, the associations within the negative axis of the two dimensional model accounts for 94% of the overall selections.

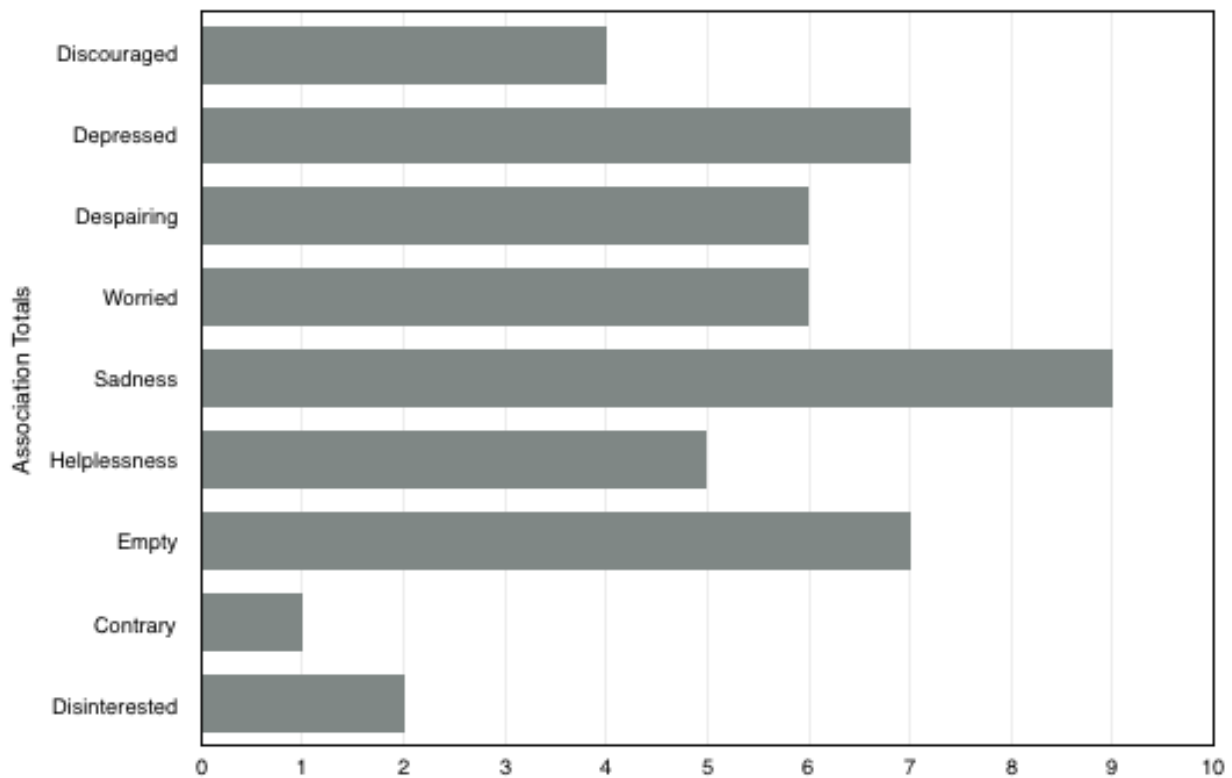


Fig.3.12. A bar chart representing the participants' selections within the L.I.N. range of the two dimensional model.

By assessing the feedback of selections that fall within the lower activation index in the negative quadrant of the two dimensional model, it would appear that selections associated mainly with 'sadness', such as 'depressed', 'despairing', and 'empty', were the most popular selections for the participants in regards to Artefact 4. As the motif for this composition was to create a bleak, depressing soundscape, this feedback would suggest that the translation of these moods to the audience was successful. Associations that fall inside other quadrants, such as those within the H.I.N. and L.I.N. include 'disappointment' and 'sorrowful', which in turn can be linked to the family of sadness, but curiously selections of 'calm' and 'serenity' were selected by some participants, which suggests an element of enjoyment for some.

Conclusion

To conclude this project, it would appear that even with best efforts, it is impossible to entirely manipulate a group into experiencing a single emotional category, or family. Instead, audiences still appear to have their own translation of how we experience emotive cues, be it with music, art, or even everyday situations. Through attempting to categorise emotions into four main groups, it can be seen that a general trend towards each specified group through detailed compositional techniques can be achieved, but with each artefact, some participants identified some of their emotions with those that resided inside other quadrants. This may be a result of how perceptions change through individual experience.

The human psyche is manipulated and moulded throughout its development. From the moment of birth, we experience an endless stream of stimuli that forms our emotional sensitivity. Through selecting a randomised group of individuals, each person will have had a varying degree of how acutely they can pick up on emotional and semantic cues, yet through trial and error of compositional techniques, it is clear that a general hint to certain emotions can stimulate a response in most people. In order to manipulate this further, investigations on how to stimulate the amygdala in a uniform fashion will continue to be researched, and yet the question of what actually composes an emotion remains to be an abstract concept.

Glossary

Dynamics - The range of expression and loudness within a musical composition.

fMRI - Functional Magnetic Resonance Imaging Scan; used to measure and map brain activity.

Motif - the idea or conception of themes within an artists work

Multi-Modality - the various forms of communication between two sources. In this context, this refers to the type of information received by the brain.

Musical Non-Diegesis - Music that accompanies a moving image, that is not made audible to the characters or world behind the fourth wall.

Melody - Single tones within a composition that is set apart from harmonies and rhythm.

Metre - The time signature and rhythm elements contained within a musical composition.

Semantic Cue - The meaning and motivational 'hints' behind certain elements of musical composition.

Tone - The frequency range in which a composition resides.

Timbre - The defining qualities of what distinguishes a sound.

Texture - The combined details of tempo, melody, and harmony, and their overall qualities.

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Appendices

Appendix A:

Lyle C. True's arranged catalogue on themes used in The Mystery Of The Hidden House. (True, 1914 cited in Buhler and Neumeyer 2015, p104.)

Very Dramatic or Agitated Scenes Heavy Drama

The Flight No. 24. Song without wd's	Mendelssohn	Wood
The Wanderer, No. 10	"	"
Le Cavalier Fantastique	Godard	C. F.
Chaconne	Durand	C. F.
Crescendo	Lasson	C. F.
Bedouin Love Song	Pinsuti	Cent.
Over the Steppes	Schytte	C. F.
Pensiero Lugubre	Coop	C. F.
I Love Thee. Song	Sobeski	D. Co.
1st Movement Sonata Pathetique	Beethoven	Cent.
Prelude, op. 2, B min.	Chopin	Cent.
Erl King	Schubert	Cent.
Brooklet in the Woods	Spindler	C. F.
Istoriella	Lack	C. F.
L'Automne	Niedermeyer	Sch.
Le Lac	"	Ash.
Marcel	Godard	C. F.
Czardas	Delibes	C. F.
Commotion op 47 No. 5	Heller	C. F.
Bolero de Concert	Vivien	C. F.
Non e ver	Mattei	C. F.
Polonaise, op. 26, No. 1	Chopin	Cent.
The Fleecy Cloud op 63 No. 2	Mendelssohn	Wood
Arabesque	Wrangell	C. F.
En Route op. 107, No. 12	Godard	C. F.
Sonata No. 16 a min.	Mozart	J. C. Co.
The Dream Melody	Herbert	Wit.
Agitation op. 53, No. 3	Mendelssohn	Wood
Les Reves	Bizet	C. F.
April op. 37, No. 4	Tschalkowsky	C. F.
Dreams	Wagner	C. F.
Regret No. 2. Songs Without Words	Mendelssohn	Wood
On the Sea op. 22, No. 6	Schytte	C. F.
Inflammatus Stabat Mater	Rossini-Herz	Sch.
Prelude op. 28, No. 15	Chopin	C. F.
Pomponette	Durand	C. F.
Lost Happiness Songs No. 14	Mendelssohn	Wood
Spinning Wheel op. 62	Thome	C. F.
Serenade in D	Chaminade	C. F.
No. 22 Songs Without Words	Mendelssohn	Wood
No. 17	"	"
Forsaken (Transcription) op No. 112	Kretschmer	C. F.
Rondo Capriccioso	Mendelssohn	Cent.
Rose's Honeymoon	Bratton	Wit.
Omnipotence. Song	Schubert	C. F.
Nodding Tulip	Trinkaus	Wit.
Delirium No. 39. Song without Words	Mendelssohn	Wood
Alone. Intermezzo	Ellenberg	C. F.
L'Adieu op. 18	Favarger	C. F.
Love Song op. 14	Ravina	C. F.
Erotikon op. 45, No. 5	Grieg	C. F.
Song Without Words	Holzel	C. F.
Chanson d'Amour	Behr	G. S.
Piece Romantique	Chaminade	G. S.
Impromptu op. 90, No. 12	Heller	C. F.
The Maiden's Lament op. 45, No. 14	"	C. F.
On The Death of a Youth op. 90, No. 16	"	C. F.
Postlude op. 45, No. 15	"	C. F.
To Spring	Grieg	C. F.
At the Spinning Wheel op. 24, No. 8	Wilm N. Von	C. F.
In the Garden (from the symphony "Rural Wedding")	Goldmark	C. F.
Ballade after the Scotch Ballad	"	"
"Edward," op. 10, No. 1	Brahms	C. F.
Spring's Awakening	E. Bach	C. F.

Plaintive or Romantic Music for Love Dramas

Placida. Tone Poem	Keiser	W. W.
Thou Art Like Unto a Flower. Song	Rubinstein	Cent.
Nachstück, op. 23, No. 4	Schumann	Cent.
Lost Melody	Bell	Wit.
Song of the Soul. Song	Breil	Chop.
On Wings of Love	T. Bendix	Witt
Cavatina	Raff	T. P.
It Was a Dream. Song	Lassen	Cent.
Prelude, op. 28, 3 and 4	Chopin	Cent.
Good Bye. Song	Tosti	Cent.
Still As The Night. Song	Bohm	Cent.
Traumerei & Little Romance	Schumann	Cent.
Serenade	Schubert-Heller	Wood
Farewell	"	G. S.
Ave Maria	"	G. S.
Warum (Why)	Schumann	Cent.
It Was Not Thus To Be. Song	Nessler	Cent.
Evening Hour	Kussner	K.
Don't You Mind The Sorrows. Song	Cowles	D. Co.
Au Matin'	Godard	Cent.
Solvejg's Song, op. 55, No. 4	Grieg	C. F.
Chanson de Florian	Godard	Cent.
Love Song	Henselt	Cent.
Prelude, op. 28, No. 7	Chopin	Cent.
Longing For Home	Jungmann	Cent.
Heart's Secrets	Ferber	Wit.
Wisteria	Logan	Wit.
I Hear You Calling Me. Song	Marshall	Boo.
Night You Told Me No. Song	Friedman	J. W. S.
Land of Romance	Hoschna	Wit.
Characteristic piece, op. 24, No. 4	Sinding	C. F.
May Morning. Song	Denza	Chap.
La Cinquantaine	Gabriel-Marie	Wood
Idillo	Lack	Cent.
Dying Poet	Gottschalk	Ecl.
Last Hope	"	Ecl.
Charme D'Amour	Kendall	Wit.
Berceuse	Schytte	C. F.
Un Peu D'Amour	Silesu	Chap.
My Gal Sal. Song	Dresser	J. W. S.
Forgotten. Song	Cowles	D. Co.
Teach Me To Pray. Song	Jewett	Wit.
Le Soir	Gounod	C. F.
Meditation, op. 75, No. 5	Raff	C. F.
Berceuse, op. 3, No. 1	Grieg	C. F.
Moon Fairy	Frantzen	Hav.
Life's Lullaby. Song	Lane	Ric.
Nocturne E min op. 37, No. 1	Chopin	Cent.
Angel's Dream	Ludovic	C. F.
Hope, op. 38, No. 4	Mendelssohn	Wood
Cabaletta	Lack	C. F.
Ashes of Love	Schmid	J. H. R.
Serenade	Drigo	C. F.
Confidences	Marti	Sch.
Confidence. Songs No. 94	Mendelssohn	C. F.
Consolation. Songs No. 9	"	C. F.
Consolation, op. 24, No. 4	"	C. F.
Daddy. Song	Wilm	Cent.
Kamenoi-Ostrow	Behrend	Cent.
In the Candle Light	Rubinstein	Cent.
Adagio (Sonata Pathetique)	Brown	Wit.
The Swan	Beethoven	Cent.
An Lili. op. 119 No. 16	Saint-Saens	C. F.
Reverie Du Soir. op. 60	Heller	C. F.
Love Song	Saint-Saens	C. F.
	Bohm	C. F.

Appendix B:

A cue utilisation chart for techniques centred around the five main emotions, based on Juslin's studies of human emotional response to music. (Parncutt and McPherson, 2002, p.223.)

Emotion	Cue Utilisation	Activity, Valence
Happiness	fast tempo, small tempo variability, <i>staccato</i> articulation, large articulation variability, high sound level, bright timbre, fast tone attacks, small timing variations, increased durational contrasts between long and short notes, rising microintonation, small vibrato extent	high, positive
Sadness	very slow tempo, <i>legato</i> articulation, small articulation variability, low sound level, dull timbre, large timing variations, reduced durational contrasts between long and short notes, slow tone attacks, flat or falling microintonation, slow vibrato, final <i>ritardando</i> , phrase <i>decelerando</i>	low, negative
Anger	high sound level, sharp timbre, spectral noise, fast tempo, <i>staccato</i> articulation, abrupt tone attacks, increased durational contrasts between long and short notes, no <i>ritardando</i> , sudden accents, accents on tonally unstable notes, <i>crescendo</i> , phase <i>accelerando</i> , large vibrato extent	high, negative
Tenderness	slow tempo, slow tone attacks, low sound level, small sound level variability, <i>legato</i> articulation, soft timbre, moderate timing variations, intense vibrato, reduced durational contrasts between long and short notes, final <i>ritardando</i> , accents on stable notes	low, positive
Fear	<i>staccato</i> articulation, very low sound level, large sound-level variability, very large timing variations, bright spectrum, fast, shallow, irregular vibrato, pauses between phrases, sudden syncopations	moderate, negative