Using Ambience as an Emotional Tool in Film

By

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ABSTRACT

Although there are existing examples of ambient tracks being used in films to elicit an emotional response there is very little research or information on how best to write them. In this thesis a study is undertaken to find whether a selection of ambient sounds: Traffic, construction, birdsongs, crow squawks, sea and rain, all found to be best suited for a number of different film environments, can be manipulated and edited to, firstly, evoke an emotional response and secondly, to see whether this response can be affected through the changing of variables within the ambient sound. A number of variables were established for the selected ambiences; these were chosen to give the greatest chance of changing the emotional response of the ambient sound through their manipulation. These variables include delay times and density as well as some others specific to each ambience. A number of tests were carried out to discover the type of emotions being evoked from the different ambiences as well as the strength of the perceived emotion. The results show that all of the selected ambiences evoke a number of emotions, with the ambience of Sea creating the strongest feedback as well as the largest variation of type and strengths over the different variable edits. The ambiences of Squawks and rain were found to be much less efficient at eliciting emotions however there was some variation in the levels as the variables were changed. The ambience of birdsongs was found to be the least efficient with very little variation in the emotional response; it does however show that using real birdsongs elicits a much higher emotional reaction than manmade or edited birdsongs. A number of interesting results have been gained through this research, particularly in showing the emotional impact that ambiences can achieve, and has helped in opening an area of research yet to be properly looked into.

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I would also like to thank my brother Matthew Bovill who created the website used for many of the tests. Without his help I would not have had such an efficient way to undertake the tests and would have had a much harder time because of it, for this and all the help and support he's given over the year I am extremely grateful.

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Chapter 1

1.1 *Introduction*

There are many elements that contribute to the emotional impact of a film: the story, the music, the image and the sound. When compared to the other elements the latter of this list is largely overlooked. An area of emerging interest in sound design (an area that has very little research) is that of the production of ambient sounds. The ambient track has a very specific and technical purpose and one that is very rarely deviated from. Some authors however have shown that there are more abstract and artistic uses for ambient sounds, David Sonnenschein and Michel Chion have noted techniques used by sound designers such as Ben Burt, Walter Murch and Gary Rydstrom which utilise the ambient track to create or increase the emotional reaction to a film's scene, a number of examples have been presented in this thesis as well as in the afore mentioned authors' books.

Much of sound design is a personal affair with the sound designers creating and using sounds that feel right to them. It is because of this that there is very little information on these techniques as no scientific approach was undertaken when utilising them, with no rules or directions it becomes difficult to replicate their effect. It is because of the evident emotional effect that these ambient techniques have coupled with the lack of information as to how they be best used that led to this project. The question that has been raised from this information is whether the ambient track, and more specifically the type of sounds found in the track, can have a set of rules placed on them so they can be manipulated in an easily replicable way and in doing so induce a certain emotional response regardless of the genre or scene of the film that they are utilised in. A number of steps have been taken within this project to achieve an answer to this question; these consist of the selection of the ambient sounds, the variables that could be manipulated within each of these so as to achieve the highest chance of affecting the emotional response, the recording and editing of these sounds and finally their being tested.

The ambient sounds selected for their emotional poignancy within this project have been selected through studies carried out both by the author as well as past work undertaken by *R. Murray Schaffer*, who set up a worldwide survey covering four cities, through the categorisation of frequently heard ambient sounds and the participation of hundreds of people he was able to determine whether over 50 different ambient sounds were deemed to be either *Pleasant* or *Unpleasant*. Further studies have been undertaken by the author in order to affirm the findings of Schaffer's work.

From these studies a short list of, what have been deemed to be, emotionally poignant ambient sounds have been selected; Bird calls, traffic, rain, construction and the sea. Each of these ambient tracks have been explored to select a small number of variables for each which can be manipulated so as to change the overall sonic identity of the ambient sounds and in doing so change the emotional reaction, all whilst having maximum control over them. With the use of the *Geneva Emotion Wheel*, a testing model used for the selection of perceived emotions during a listening test, these ambient sounds have been tested and analysed showing the most effective techniques and variables for each of the ambient sounds.

By answering the question of whether the different ambient sounds can have a set of rules applied to them a wider area of sound design could be opened up allowing for the sound tracks to have an increased role in the overall impact of a film.

Chapter 2 – Understanding Emotion

2.1 *Understanding Emotion*

As this project is looking into emotional reactions to sound it is important to understand what emotions actually are, and how they are induced. Scherer defined an emotion as "[...]an episode of interrelated, synchronized changes in the states of all or most of the five organismic subsystems in response to the evaluation of an external or internal stimulus event as relevant to major concerns of the organism" (*Scherer 2005 p. 03*). What this means is that emotions are created through a stimulus, be it biochemical (internal) or environmental (external), that is in some way important or associated with the organism, this could be seen as a reason why people find certain sounds raise certain emotions as it takes them back to an emotionally poignant event that is associated with the sound. These emotional reactions to sounds have been utilised in the areas of architecture and business; when creating gardens, particularly those in a stressful, noise filled, urban environment the use of water is seen on many occasions. The sound of trickling water has shown, with some interesting research (*Schaffer 1977, Treasure 2007, Wei Yang & Jian Kang 2005, Regan and Horn 2005*) to be a relaxing, enjoyable sound. Through using fencing and plants to help muffle the exterior urban sounds and then adding a water feature, which not only helps in relaxation but also masking any unwanted sounds, architects are able to create a therapeutic environment, separate from the overwhelming noises outside.

2.1.1 Categorising Emotions

Like with colours there are basic emotions (primary colours) and complex emotions (mixing of primary colours). The basic emotions are normally listed to be happiness, surprise, fear, anger, disgust and sadness. Through a mix of these emotions many more complex 'emotion families' can be achieved.

It should be stated that there is a difference between emotions and feelings, the main being that emotions are object or event related, as explained above, they are also normally of brief duration,

whereas a mood or feeling can derive from no obvious reason and last for a much longer period of time (*Tran 2005*).

2.1.2 *The Brain and our Emotions*

It is commonly agreed that one of the main areas of research for emotions is that of the brain, more specifically the different sections of the brain and the emotions that they are involved in creating.

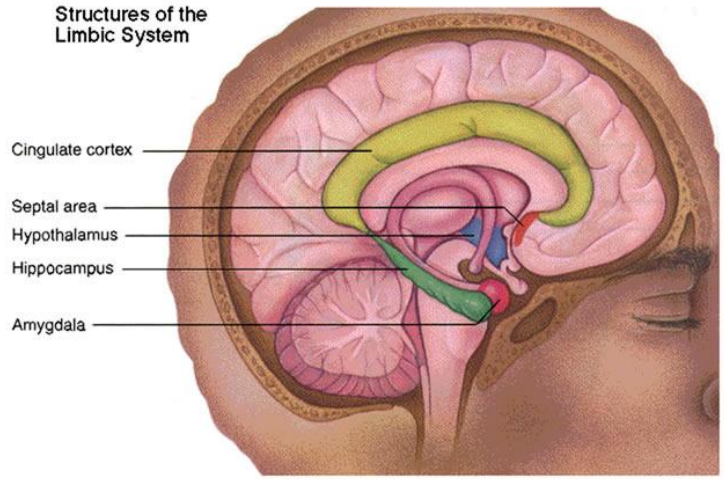


Figure 2.1 Structures of the Limbic System, n.d.

There is still a lot of research to be done as to of the roles that many sections of the brain play. When examining the brain in generating emotion however there are sections that have been found to play specific roles, for instance the 'amygdala' found in the Limbic system has direct correlations to the emotion of fear. This section is also found to create emotional memories as it is connected to the hippocampus (memory) section of the brain (*Fanselow and Gale 2006*), and it is here that we create our fears of certain stimuli, if we have a bad experience with the sea, for example, then the amygdala will create an association between the sea and that emotion, which means that each time we see or hear the sea this stimuli will trigger the amygdala of the brain, evoking the emotion that was felt. This is an important area to take note of for this research as it is the emotional connection that we have with the stimulus of sound that will be playing an important role in the outcome of this project. It is also this area of the brain that is found to create some of the physical reactions that

occur when feeling certain emotions, such as increased heart rate, respiration and even freezing and being unable to move, this occurs because the amygdala is connected to the sympathetic nervous system which is found to create the fight-or-flight response.

Although there are a number of theories behind what causes emotions, we know when we experience a stimulus that is deemed as important to us our body reacts to it both physically and psychologically (our reactions and an emotional response). Through evolution we naturally react to certain stimuli in a certain way; a dangerous predator will induce fear and make us run away, the sound of a baby crying will make us protective and alert "The high voice of a child or small animals makes us feel curious or perhaps tender [...]" (*Sonnenschein 2001 p. 91*). It is these natural emotional reactions to certain stimuli that will be the basis of this project's testing as certain ambient sounds should evoke certain reactions because of the connotations behind them, there are of course other areas of a film that elicit emotional responses and these have been discussed in chapter 2.4.

2.2 *Measuring the Perception of Emotion*

There are a number of ways in which we are able to pick up on people's emotions, and in turn be able to translate these into data. One way is through a person's facial expressions. This is an effective method in everyday life as it has been observed that strong emotions such as fear, sadness and joy can be very reliably picked up on, even between two people of different cultures. (*Ekman 1972*) The way we vocalise our emotions can also play just as powerful a role. We laugh when we are told a funny joke, we yawn when we are bored and we cry when we are given sad news. These are the simple ways of reading certain emotions; however the use of vocalisations can be far more complex. A good, simple example of these complexities would be that of a laugh; it tends to derive from humour but it can also be brought about through anger or frustration. Our speech patterns also change depending on our emotions, our voices quiver when we are sad and seem brighter when we are happy. (*Russel et al 2003*)

Another emotional response is through the fight-flight response. This preparation of 'action tendencies' (*Scherer 2005*) quickens the respiratory rates, heightens heart rates and releases adrenaline and cortisol into the body (*Treasure 2007*) which essentially means that the person is being affected physiologically as well as psychologically (all of which was explained in chapter 2.1), these changes are able to be measured using different apparatus. This reaction to strong emotional episodes can be produced through production techniques in films. A number of techniques utilised in sound design (mentioned in *Chapter 3.2*) work towards eliciting these responses, particularly when it comes to horror and thriller genres. A quiet scene of building tension suddenly broken by a loud noise or sudden shocking moment causes us to jump as our Fight or flight response takes effect. It is these reactions that would be measured.

Although the ways described would have given some good results, from early on in the project it became evident that the most efficient method of measuring the subjective perception of sound is through the listening test. A large number of scholars, including *Beck* and *Zacharov* (2006) have come to a consensus that this method would be the most efficient approach for achieving the desired outcome.

The difficulty comes when looking at the way in which the listening tests must be undertaken. A significant number of variables need to be taken into account, the acoustics, the scientific methodology and the technology being used, as well as a number of other factors. The large number of variables make it extremely hard to fulfil the requirements of them all, as you would have to be extremely well versed in a very broad area of research. This is impractical, as well as difficult. The solution has come through a number of authors, particularly *Toole* (1982), who have written extensive reviews on the methodology and the control of variables for listening tests, as well as areas to avoid so as not to cause bias in the tests.

Although listening tests are the best model to be using for the type of research being undertaken, there is a new challenge that derives from this that must be overcome. This is to ensure that the

testing methods and the collection of the subjective emotions are done in a way that is known to others, by doing so would allow future researchers to use a similar testing model to allow for comparable results, thus creating a standard for the way of testing in this area of research.

2.3 *Testing models*

As the results of this project would be achieved through listening tests it was essential to find what would work best as a testing model. It was decided that Rating Cards would be the best option, a number of rating card models can be found, all of which work through the subjective response of the listener. It is difficult with listening tests that are gauging emotions to transfer accurately what the listener is feeling to what the experimenter is noting down, which is why rating cards were chosen for this process.

There are currently two implemented approaches that can be used when testing emotional responses, these are *Categorical* and *Dimensional* based approaches. The categorical approach of testing states that there is a small amount of emotions that are hard-wired in our brains such as anger, joy, sadness fear and disgust, it also states that more complex emotions such as contempt are seen as a blend of the more basic emotions, which in this case could be a mixture of anger and disgust, with this a person's emotions would be noted down within one or a small number of emotion categories. A number of theorists feel that this is too simplistic as in everyday life people experience many more complex emotions to the ones listed in the *Categorical* approach, these non-basic emotions therefore may not be easily categorised into a single label. To address this issue a different model was brought about; the *Dimensional* approach.

The *Dimensional* approach does not categorise emotions into sections but instead relates all emotions to each other in a systematic manner. A good example of the *Dimensional* approach is the circular dimensional model of the *Circumplex of Affect* which was introduced by *Russel* in 1980. This model claims that each emotion can be represented by two bipolar dimensions these being valance

(Pleasant vs. Unpleasant) and arousal (relaxed vs. aroused). With this the categories are not separate as they all fall at different points of the circle depending on the arousal and valance of that emotion.

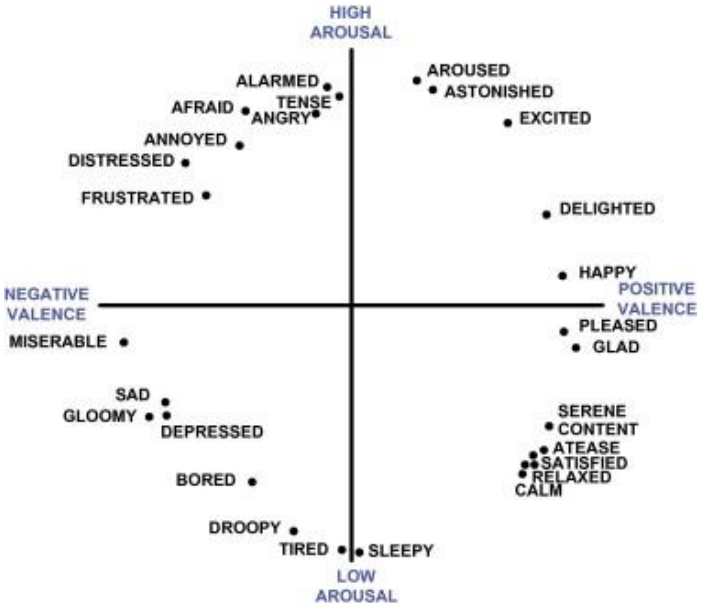


Figure 2.2 Russel's Circumplex Model of Affect 1980

Although this approach allows for more detail in terms of scaling a person's emotions there are also limitations with this model. There is a reduction in the differentiation of emotions, *Scherer* (2008) states an example of which would be the emotion of anger being very close to fear. There are also no mechanisms that allow for the prediction of response patterning and so it can be hard to hypothesise the results obtained using this model.

As well as the *Curcumplex Model of Affect* there are other models that have been created to measure a person's perceived emotions, one of which is the more recent *PrEmo* model that utilises a human's natural ability to pick up on a person's emotional state through their facial expressions.

2.3.1 *PrEmo*

The PrEmo model has a number of different faces expressing different emotional states. We as humans are very adept at being able to recognise people's emotions through the slightest changes in facial expressions as mentioned in the previous chapter. We gain this knowledge of facial expressions from not only learning them at a young age, a child may learn that laughing and smiling

makes everyone else laugh and smile whilst crying creates a more negative environment, but also through linking the expressions to past memories

> "When we see a facial expression of fear, we can relate it not only to the precepts of other facial expressions in terms of its structure, but we can recognize that the person whose face we see is likely to scream, is likely to run away, has probably encountered something scary, and so on. None of that knowledge is present in the structure of the stimulus; it is present in our past experience with the world" (*Adolphs 2002 p.29*)

This experience of facial recognition makes the PrEmo very effective at allowing the listeners to relate the emotion that they perceive to the expressions presented in front of them. The issue that became apparent was that there was no rating system for people to select how strong they perceived these emotions. Overall there are 12 emotions used with the PrEmo method, six negative and six positive. Although this would be good for, as an example, emotionally rating business products it did not cater quite so well to the many types of emotions that could be experienced whilst watching a film. It is the lack of emotions and grading system that led to looking at the Geneva Emotion Wheel.

2.3.2 *Geneva Emotion Wheel*

The Geneva Emotion Wheel (GEW) (*Scherer 2005*) was selected as the best model to use for this project, the limitation of being unable to grade the emotion using the PrEmo has been solved with this model. The GEW has twenty emotion families, these families have multiple meanings "[...] the Irritation/Anger family also covers emotions such as rage, vexation, annoyance, indignation, fury, exasperation, or being cross or mad." (*Scherer 2005 p.03*). This aids in the issue of the *categorical* approach that saw the listed emotions being over simplified. Similar to the *Circumplex model of Affect* the emotions listed are split into two bipolar dimensions: the arousal levels of the emotions are on the vertical axis and the positive/negative categorisation or valance of the emotions are on the horizontal axis (the left half being negative and the right being positive).

Although there are similarities to *Russel's Circumplex* there are also a number of key differences. The first being that the emotions are already listed around the wheel in set intervals. The second is that there is a five point grading scale for each emotion which represents the strength of the perceived emotion. The layout of the wheel allows for easy identification of each emotion by comparing it to the two axes, the addition of the five point grading scale increases the amount of information being obtained about the person's perceived emotional state. By having these set categories and their perceived strength it allows for an easier description of the emotions elicited by the ambient sounds when analysing and describing the different effects, this allows other people to easily identify the type of emotion that they would be eliciting if using one of the ambient techniques.

There are of course limitations to the model, it may be difficult at times for people to be able to associate the emotion they felt with the ones listed, even if there is a corresponding emotion on the wheel it can be hard to decipher that at times, however by including an introduction to any person taking part in the tests describing these emotional families any problems derived from this would be reduced. However the limitations were shadowed by the overall efficiency of the model. Any changes of the limitations that are specific to this project have been explained in Chapter 5.1.6.

2.4 *Creating Emotional Responses in Film*

With a general understanding of emotions and the way in which they are measured it is also important, for this project, to see how emotions are generated in response to viewing a film, this chapter will explore that subject.

The following influence emotional reactions in film:

- Moving Image
- Dialogue
- Music
- Sound Design (Described in Chapter 3)

2.4.1 *Moving Image*

The moving image of a film has numerous techniques that can be implemented to create or emphasise an emotional reaction. The two main categories that these fall into are the editing techniques and the art direction.

Art Direction

Art direction has a number of elements that fall under its category. The colour pallet of a film can create its mood and emotional setting; this is normally achieved by using filters both practically during filming, in which a filter is placed over the lens of the camera, and in post production using software to digitally filter specific colours. The style of a film also falls under art direction. What is meant by style is the way in which the image is presented to us, be this through a comic book effect, computer graphics or the setting.

Examples

There are numerous examples of the colour pallet being used to emphasise the emotional reactions of a film. In Danny Boyle's *Sunshine* the colour pallet helps by setting the mood over the whole film,

whilst also emphasising the emotional points; long periods are spent in the cold blue and white corridors of the spaceship Icarus 2, this acts as a stark contrast to the scenes spent in the glaring, golden yellow sun (an example of this can be found at 00:08:14). This contrast gives us much more of a reason to feel what the crew are feeling; a longing to spend more time with the sun, but also a slight fear of it; as the sun glares and fills the majority of the image we are reminded of just how powerful and dangerous it is.

A stylised film is Zack Snyder's *300*. Because this film was based on a comic book a stylised comic approach was implemented. The style increased the spectacle that was being viewed, increasing the feeling of wonderment and awe, particularly the battle scenes with the high contrast in the image, the bright reds used on the Spartans' capes contrasting with the browns of the rest of the environment, and the use of stylised slow motion (an example of this can be found at 00:46:06 through to 00:47:15).

Editing

The cuts, sweeps and fades all fall under editing. By implementing fast cuts and sweeps particularly in times of stress or action the viewers emotional reaction is further emphasised. Alternatively the longer cuts, with slow fade outs increase a more calming or sombre atmosphere and mood state.

Example

Edgar Wright has a recognisable editing style, implementing cuts to work as an addition to the atmosphere of a scene. In his film *Hot Fuzz* the end showdown between Simon Pegg's character Nicholas Angel and the corrupted members of the town builds up as Angel rides in on the back of a horse (01:28:31), during this sequence there are long holds on the different characters in play building the tension of the scene. As the action and shooting begins (01:29:39) the cuts become extremely quick, changing from character to character, with fast camera sweeps and an erratic

camera style with fast zooms and a stylised shake. This increases the excitement of the scene as the fast paced action is translated into the visual cuts.

2.4.2 *Dialogue*

Well written and delivered dialogue is a strong factor in creating a believable film. If the dialogue is read in an unrealistic wooden way the impact of that speech falls short of the impact had it been well delivered. The dialogue helps show the characters' emotions both through the wording and the delivery, i.e. the way the actor's voice sounds, as well as evoking an emotional reaction in the viewer. Much of the story is learnt through the dialogue whilst it also helps the viewers to create opinions of the characters. Essentially since the first spoken word film, dialogue has been important for story, setting and emotions.

Examples

The 'Freedom' speech in Mel Gibson's *Braveheart*, which can be found at 01:13:54, is a speech that evokes emotions such as wonderment, awe, interest and pride both for the characters listening to the speech and the viewer as William Wallace persuades the army in front of him to stay and fight.

Alternatively a much more intimate speech comes from Ted Kotcheff's *First Blood*, at the end of the film (01:21:56 to 01:25:00) Sylvester Stallone's character Rambo opens his heart to his old Vietnam general. The speech is raw and full of emotions which in turn help to evoke emotions such as sadness and pity in the viewer.

2.4.3 *Music*

Music has been used in film since the days of the silent movie and has always been used as a tool in which to evoke an emotional response. There are already techniques, when applied to music which evoke certain emotions; "Fast movement; animated and triumphant melody; warm tone colour; more consonant harmony" (*Sonnenschein 2001 p. 108*) implementing these elements into a score

will help in creating the overall feeling of happiness, whereas the opposite; “slow movement, languid melody [...] prevailing dissonant harmony” will help evoke the opposite emotion of sorrow. In terms of the way that the music is composed. Julian Treasure in his book *Sound Business* (*2007*) talks of how we naturally associate emotions with the beat of the music. Because our resting heart rate works on a three beat; ‘lub-dub-pause’ as well as our resting breathing we find that three time beats in music tend to have soothing effects because of the connotations of these resting rates. When exercising our breathing and heart rate goes into a two-time beat as the heart beats faster missing out the pause; ‘lub-dub-lub-dub-lub-dub’. This is a reason why beats of two or four-time are associated with dance or military music as the beat holds associations with excitement and exertion.

Music is used as a therapy in everyday life; it is a strong emotional trigger to past memories and provides a suspension of judgement that words are not able to achieve as well as giving power to emotions (*Sonnenschein 2001*). Simply put, because it is so emotionally moving, music will always be linked to films both as a way of evoking emotions in the viewer and to help show the emotions being played out in a scene.

Examples

Without music many impacting, poignant and memorable moments would not have been quite so powerful. The death of Willem Dafoe’s character, Sergeant Elias, as he throws up his arms in the film *Platoon* would not have been the same without the Adagio For Strings playing in the background (01:16:03), the slow melancholy of the music complementing the saddening scene. The music of *Gonna Fly Now* by Bill Conti in the film *Rocky* as he gets better and better in his training (01:26:49) fills us with the sense of excitement and anticipation for his fight. The bass duh-duh music (00:16:09) represents the threat of *Jaws,* this builds the tension of knowing the shark is near but not knowing exactly where.

The final area of film that creates an emotional response is the sound design, this is explained, in detail, in the next chapter.

Chapter 3 – Ambience in Film

3.1 *Breakdown of a Film's Composite Track*

A film's *Composite Track* is the amalgamation of a number of different tracks, these are:

- Dialogue
- Music
- Hard Sounds
- Foley
- Design Sound Effects
- Ambience (Described in Chapter 3.2)

By having these different tracks the sound editors are able to mix and edit all of the different sounds before they are put together for the final mix.

3.1.1 *Dialogue*

The dialogue track of the Composite track contains all spoken word that is associated with the main characters and any other lines of importance. This also includes all ADR (Automated dialogue replacement), ADR is a process in which the actors will come into a recording studio and reread their lines so that a better quality recording can be made as well as give the director a chance to alter the way that the lines were delivered. The dialogue track does not include mumbling and background chatter as this is found on the ambience track.

3.1.2 *Music*

This can also be called the soundtrack. All music and scores are found on this track. A lot of the time the Soundtrack will be original pieces of music written for the film. The music can also be synchronised with the moving image, be this through the composer's scoring or through digital manipulation.

3.1.3 *Hard Sounds*

The hard sounds are common sounds whose origin can ordinarily be seen on the screen or their presence is known to be in that environment, sounds such as gun shots, creaking doors and passing cars fall into this category.

3.1.4 *Foley*

Originally Foley was a term used for any post-production sound, the name originated from a pioneer in post production sound named Jack Foley. The meaning of the term Foley changed when Walter Murch coined the phrase 'Sound Designer', a profession that he was world-renowned in by pioneering a number of aspects that are common place in sound design today. Since then Foley has played a more specific role, this being movement sounds that are normally synchronised with the actors such as footsteps, clothes rustles, chair scrapes, cutlery clinking and so on. These sounds are recorded in a Foley room by Foley Artists as the film is played out so that the synching and characteristics of the sounds fit the image as closely as possible.

3.1.5 *Design Sound Effects*

The sounds of monsters and aliens, space ships and lasers all fall into this category. Sound design is essentially any sounds that do not normally occur in nature, or are extremely difficult to record otherwise. The sounds created are normally a mix of real world and synthesised sounds, edited and manipulated to create an interesting sound that fits the object it is accompanying.

3.2 *The Uses of Ambience in Film*

There are four main areas in which ambience can be utilised, these are:

1 Using real world sounds to create a believable environment within the film (*Using Real World Sounds*)

2 Holding continuity between edits and transitions (*Holding Continuity*)

3 Manipulating real world and non-real world sounds to evoke an emotional response (*Manipulating sounds*)

4 Removal of ambient sounds (*Using Silence*)

3.2.1 *Using Real World Sounds*

Ambience, also known as *atmos* or *background tracks* is the sound of the world; although we cannot normally see where the sounds are coming from they help to build a sense of the film world being larger than just what we are seeing on screen.

Michel Chion wrote a good description of this traditional use of ambience:

> "Let us call *ambient sound* sound that envelops a scene and inhabits its space, without raising the question of the identification or visual embodiment of its source: birds singing, church bells ringing. We might also call them *territory sounds*, because they serve to identify a particular locale through their pervasive and continuous presence" (*Chion 1994 p. 75*)

To create a believable film environment an ambient track is used, this is normally recorded in a similar location to the one being presented on screen so as to hold continuity. By mixing the ambient track in postproduction much more control over the sounds can be achieved. This means that there is also the opportunity to change the perceived size of the environment, Chion called this *extension*. It may be that it is desired to only focus in on the room that the scene is taking place in, the ambience in this case would be the room tone, with perhaps some other light ambient sounds that may be found in the small environment. The other extreme would be that it is desired to give the room a sense of being in a much larger world; in this case the ambiences may be the room tones,

then perhaps the sounds from the hallway next door, then the distant traffic outside and then potentially the sound of a very distant siren. The use of *extension* with ambient sounds plays on the use of ambience creating a believable environment as we are able to choose the size of the environment we want to convey, and therefore change the overall sonic feeling of the scene.

Example

M. Night Shyamalan's *Unbreakable* uses extension to increase the reality of the situation and in doing so emphasise the feeling of tension within the scene. A good example within the film can be found at 01:00:07 through to 01:02:49**,** in this a high tension scene is taking place in which Bruce Willis has a gun pointed at him by his son who is trying to prove that his farther cannot die, as all of this is going on we can still hear the radio in the background as well as a dog barking in the distance, this places an unbelievable situation into a believable environment giving the scene an increase in tension. The use of extension, in this example, works to remind the viewer that there is a world going on around this family, with this a feeling of realism is formed which aids in viewers associating with the situation.

3.2.2 *Holding Continuity*

Essentially in a scene with many cuts and edits the ambience is implemented in such a way so that it is all recognisably the same sonic environment and thus it becomes evident that the scene all remains in the same location. "Ambience from the production tracks is mostly important for creating a seamless sonic landscape, helping to create the illusion that all the cuts of the scene are taking place in one continuum." (*Sonnenschein 2001 p. 36*) By having one ambient track span over a number of fast cuts we are able to keep an overall sense of continuity for the scene. If the ambient sounds change as fast as the edits the scene would quickly become disjointed and confusing.

In the same light the ambient track can also be used to transition between scenes. By putting in the ambience of the next scene for perhaps a second or two at the end of the previous one, the

transition between the two becomes smoother as we are expecting a change of environment through the preceding ambient sounds.

3.2.3 *Manipulating Sounds*

There is very little in the way of research with regards to ambient techniques used to elicit or boost an emotion in a film's scene, however there are a number of successful examples in existing films, these are:

- Ambient Crescendo
- Low end Sweeteners
- Focus shift

3.2.3.1 *Ambient Crescendo*

Like with music, Ambient Crescendo is the gradual build up of a sound. The difference with ambient crescendo is that ambient sounds are used instead of musical instruments. There are two ways in which this technique can be implemented; the first is through the gradual build up of layers, thus increasing the density of the ambient track. The other method is by increasing the volume of just one ambient track. This build up, again like with the musical equivalent, increases a sense of tension within the film's scene.

Example

In Francis Ford Coppola's *The Godfather* the main character Michael Corleone is about to make his first hit, killing two men in a restaurant (this scene can be found at 01:24:42 through to 01:25:28). As the scene builds towards the intended deed so too does the sound of a train outside, the engine getting louder and louder with the introduction of the wheels screeching on the track as it gets closer, until finally Corleone shoots the two men. This build up of the train sound outside helps with

the increasing tension and ultimately the technique was necessary for the scene to be as effective as it was.

3.2.3.2 *Low End Sweeteners*

A low end sweetener (LES) is a deep bass rumble mixed into a film's ambient track. The use of an LES is effective at altering a person's emotional reactions to certain frequencies. As a frequency gets lower the sound becomes harder and harder to localise due to the sound waves increasing in size, this leads to the decreased influence of diffraction and thus the low frequency becomes less directional making it harder to pinpoint the source of the sound. Put in the right context a LES becomes affective at increasing the feeling of dread and worry.

Example

A film example that implements this technique is Oren Peli's Paranormal Activity. In this film a woman is being followed by a demon that is getting more and more vicious towards her, throughout the film we are unable to see the demon, the only indication that it is around is from the low bass rumble that occurs when it is in the room. This rumble is what really builds the overall dread of not knowing what or where this thing is. "The low humming or drone sound accompanying the night scenes corresponds to an increase of anxiety that could be explained by the low frequency sounds."(*Marin-Guzman 2009*)

3.2.3.3 *Focus Shift*

Focus shift is a way of using ambient sounds to show a shift between characters, normally helping to represent the individual characters' emotions, or as a way of emphasising a change of emotions, perhaps from fear to relief. A good example that *Sonnenschein* mentions is a scene in Steven Spielberg's *Raiders of the lost Ark*.

Examples

> "In *Raiders of the Lost Ark*, the shift of the very present rumbling ambience in the collapsing cave to a more distant rumble looking from outside the cave, marks a dramatic cut when Indy must escape disaster. It is not a realistic sound change, but helps the audience perceive the potential safety outside." (*Sonnenschein 2001 p. 162*)

A way of using *focus shift* to show the difference in characters' emotions in a film's scene is by the complexity of the ambient sounds being used. There are two good examples of this found in Steven Spielberg's *Saving Private Ryan;* during the beach assault, at the start of the film (00:20:49 to 00:21:30), there is a lot of explosions, gunfire, bullets whizzing and snapping past and shouting. The ambient track is very rich and full, then when Jackson, the sniper, is focused on, during a part when he is aiming at a gun emplacement, the ambient track becomes much sparser with very little in the way of the rich war ambience heard when focused on the other characters. This is a way of showing the character's concentration, as all of a sudden the sounds that we were hearing just a moment ago have all but disappeared and we are left with the utterances and concentration of the sniper. This shift in focus and ambient sound helps in drawing the viewer into the character. As the surrounding sounds are much fewer we are focused more intently on the character. We are experiencing what the sniper is experiencing; he is concentrating on the task in hand and not of his surroundings and so the surrounding ambience is no longer present.

Another good example that can be found in Sonnenschein's book (*2001*) is again from *Saving Private Ryan* when focusing on the sniper in a later scene. In this scene Jackson the sniper is facing off against his German equivalent (00:51:50 to 00:55:09), again as the scene is progressing we are able to hear the war going on in the distance, people moving around and artillery going off. Once the scene has built up to the climax and the two snipers have caught sight of each other through their scopes, the ambient sounds that we were initially hearing are no longer there, instead only the sound of the dripping water is focused in on, reminiscent of the beating of a drum, suddenly the focus is fully shifted onto these two characters with the outside world essentially cut out from the scene.

3.2.4 *Removal of Ambient Sounds*

Ambience does not always have to be the introduction of real world sounds; it can also be done by subtracting some of the noises and effects. Two techniques that do this are:

- Silence
- Suspension

3.2.4.1 *Silence*

As Sonnenschein explained (*2001*) it is not possible to get perfect silence, there is always sound; even if there is none emanating from your surrounding area you will still be able to hear the noises made from within your body. It is because of this that silence in film is best and most easily achieved through the contrast of sound levels, or as *Chion* (1994 p.57) put it: by "preceding it with a noise-filled sequence". This contrast of many sounds suddenly being cut to only a few can give both a positive and negative emotional outcome. Having this contrast between a sonically rich scene and a scene with a simple and quiet audio track helps with the perception of loneliness or emptiness and depending on the circumstances being portrayed this can result in a positive or negative reaction to these emotions.

Example

In Steven Spielberg's Raiders of the Lost Ark; at the end of the film (01:41:20 through to 01:44:38) the Ark is opened by the soldiers, essentially all hell breaks loose, sounds of screaming, explosions, gusty wind, low rumbles and thunder is heard, then just as abruptly as it starts the lid falls back down and closes the Ark. All of a sudden we are left with a light wind ambience that leads to a small cricket chirping in the background. This sudden silence after what has just happened helps to create the sense that the threat is over, that relief has now set in.

This example shows how a more positive emotional reaction can be achieved by using silence on the ambient track. Silence can, however, create a feeling of oppression or dread "Psychologically, humans like to make sound and surround themselves with them to nourish the concept of perpetual life, so that silence can represent aspects of negative attitudes such as oppression or solemnity." (*Sonnenschein 2001 p. 125*) The lack of sound also forces the viewer to focus more intently on the screen, this helps with Horror and Thriller films as by having the viewer transfixed at what is going on onscreen they are more susceptible to being given an audio or visual fright. These two contrasting emotions were proven to work with the use of silence through the author's past research.

3.2.4.2 *Suspension*

As with silence, suspension is an ambient technique that works by removing sounds from a film. The difference being that suspension is the removal of a specific sound and not just lowering the overall density of an audio track. Normally suspension is the removal of a sound that would normally be expected in a scene, such as a river that can be seen in the background or the sound of rain in a downpour, and a lot of the time it is initially heard before it is ducked out (*Chion 1994*).

There are numerous ways of using suspension; one use is to show the shock felt by an individual character that is being focused on; at the start of the scene all of the sounds will be heard, and then when this moment of shock occurs some of the ambient sounds that would normally be expected are ducked out. Because some of the main sounds have been removed the viewer will begin to focus in on the image and the character, it will raise questions in their minds and force them to try and get their answers from what they are seeing onscreen, it can also add a sense of confusion and ultimately help the viewer associate with the character some more.

Example

There is a good example of using suspension with bird calls. This example can be found in Michele Chion's book *Audio Vision*, the example focuses on a scene in the film *Nights of Cabiria* and can be

found at 01:48:31, a woman is having a romantic walk in a wood with a gentleman she feels is the man of her dreams, what she does not know is that the man intends to kill her for her money. The viewer is meant to feel a slight pang of anxiety "Where did our premonitory anxiety come from? From the fact that over this magical landscape not a single birdsong is heard." (*Chion 1994 p.133*). We associate the picturesque woods with certain sounds, the predominant of which are bird calls; the lack of such sounds seems odd as the scene would not correspond with what we expect. We naturally build a feeling of danger because of the lack of birdsongs.

Essentially suspension works best as a technique that allows the viewer to associate with the character or the situation that they are in more, particularly when they are going through a time of shock, confusion or emptiness.

3.3 *Summary*

The uses of ambience in most cases come down to creating a believable environment in a film and to hold continuity between edits, these are deemed as the more traditional uses and are roles that ambient sounds always fill. The other implementations mentioned have been shown to work as a way of eliciting emotional reactions in the viewer, emotions such as dread and worry from the use of a low end sweetener, increased worry and tension with an ambient track building to a crescendo, the emotions of fear and even relief with the subtraction of certain types of ambient sounds, all of these have seen use in films. There are limitations to these techniques however, the main one being that they are largely restricted to the genres of action and horror, this both limits their use but also brings focus to the fact that many genres do not have ambient techniques that could either be used to emphasise the more positive emotions or work alongside a less action or horror orientated scene. This leads to the other limitation; all of these techniques created fairly negative emotions, most of which being tension and fear, the only exception was that of silence, which was able to create the sense of dread or the feeling of relief depending on the context in which it was used. Also because of the lack of information on how best to use the techniques it is difficult to implement them with any

confidence as the majority of them have been added by a sound designer who *feels* that it sounds right instead of putting any scientific process towards the technique. This has further legitimised the importance of this project as the limitations that have been found here will no longer be an issue as the ambient sounds being used in this project will have a mix of both positive and negative emotions as well as directions as to the types of sounds used, the types of variables being implemented and the way in which they can be manipulated to create specific emotional responses.

Chapter 4 – Determining an Effective Emotional Soundset

4.1 *Initial Research and Testing Introduction*

Although there are examples of ambient techniques (as shown in chapter 3.2), the criteria in which these techniques should be used are not explained, this leaves their use to be much more of a gamble. The main risk comes from the ambient sounds that are implemented (low end sweetener is an exception to this case) as there are no rules in place to explain what sounds would work best with what technique. As has become apparent with the likes of *Schafer* (2005) and *Raimbault* (2005), the sounds themselves play an important role in creating the psychological and emotional impact for the viewer. It is because of the lack of information that this project will look into different ambient sounds' emotional effects, thus making the choice of the optimum sounds to use, be it in conjunction with one of the techniques or on its own, more straight forward. This will be achieved through the manipulation and editing of different ambiences to find whether one or a number of emotions can be elicited from them as well as to see if through their manipulation the emotional response towards the ambience changes.

The first task was finding a number of ambiences found to be emotionally significant; it is these ambiences that were used throughout the testing.

4.2 *Selection of Ambient Sounds*

The primary method of selecting the emotionally significant ambient sounds was through the use of the *International Sound Preference Survey* which was undertaken by *Schafer* (1977) to discover what soundscapes people from around the world find pleasant and unpleasant. The results found in this survey were further justified by implementing an informal test in which a number of the ambient sounds found to be emotionally significant through Shafer's data were edited onto a track. This track contained the different sounds, which would transition between each other to create a 'journey'

through the different soundscapes (transitional piece) this track was then played to a number of test subjects.

4.3 *International Sound Preference Survey*

This survey was undertaken by R. Murray Schafer and can be found in his book *The Soundscape* (*1977 pp.268-270)*. Schafer used this survey to find the types of sounds that people 'liked' and 'disliked'. Varying amounts of people were asked in four different countries; Auckland, New Zealand, Vancouver, Canada, Port Antonio, Jamaica and Zurich, Switzerland. The sounds are listed by category (water, wind, machinery, transportation etc.) and show the percentage of people that found them pleasant and unpleasant. This survey was the main source for selecting the ambient sounds that have been used throughout the rest of this project.

The table of results for this survey can be seen in *Appendix A Table A.A.1 p.120.*

4.4 *Transitional Piece*

The transitional piece used to find the most emotionally significant ambient sounds would transition through different ambient locations, these being: a quiet field, moving into some woods, then into a rainstorm, into an area where children are playing, then to a fairly quiet rural road, into a city that builds in intensity over a number of minutes, it then calms down. For a short time there is a steady build-up of the sea, then from being next to the sea it moves to being in the sea, then to a storm, then it calms down and turns into a river, then a babbling brook and finally back to the quiet field at the start. This was edited in both stereo and multi-track surround sound so as to see the difference in people's perception of sounds when they are surrounded by them instead of having them just play out in front.

The actual testing method was not based on any set model, it was done in a way so as to get people's opinions on the sounds, to see whether they linked the emotions to these sounds because of past experiences or something more subconscious and ultimately to find which ambient sounds

had the strongest emotional impact on the listeners and whether this impact was a positive or negative one.

4.4.1 *Method*

20 listeners took part in the test, 10 listeners were played the surround mix and the other 10 the stereo mix. The listeners were asked to sit in a darkened room with their eyes closed. They were given a microphone which was set to record the moment the track was played, this allowed the time scale to be easily translated when listening back to the subjects. The listener was asked to record any emotions or thoughts in response to the sound. By doing the test in this way meant that the listeners were not trying to recall their feelings and emotions at a later time as this may have had an impact on the listeners' descriptions. They were also asked that if any past experiences or images were raised because of the sounds to mention this, if they were comfortable to do so.

The microphone was used instead of a pen and paper for two reasons, the main was so that the listener was not pulled out of the world being created through the transitional piece's soundscape, this would most likely have occurred if they had to open their eyes and write the information down. The second was practically it would have been difficult to write in a darkened room, this may have prevented or even put people off writing some of their answers.

Although these tests were done in an informal manner a number of points were gained by doing it:

4.4.2 *Results*

This is in no way classed as one of the major tests and should not be viewed as such. The main reasoning behind these tests was to gain an insight into the type of ambient sounds that were deemed to be emotionally significant to the listeners. The tests also helped to raise questions that could be answered over the course of the project.

The emotions mentioned by the listeners were split into different groups; positive, negative and neutral. The most important emotions looked at were the ones that fell into the categories of positive and negative as these would be describing the emotionally significant ambiences. The transitional piece was split into sections along the time line so that a general view could be seen of where and when the emotions were felt.

Table 4.1 Tally of positive and negative emotions found in different sections of Transitional piece

Transitional Piece Section Ambience	**Time: m:s:ms**	**Positive Emotion Tally**	**Negative Emotion Tally**
Field	00:00:00	15	0
Squeaking Gate addition	00:18:07 + 00:34:06	0	8
Rain	00:44:07	2	5
Thunder clap	01:15:17	4	8
Children playing +field	02:01:23	11	2
Rural Road	02:45:14	3	9
Light Urban (with plane)	04:06:05	3	6
City	04:54:02	0	26
Rural traffic	06:18:28	8	1
Cliff	07:20:00	9	3
Ocean	08:08:10	9	0
Full Ocean	08:49:25	9	6
Water Lapping	10:29:06	5	0
Ocean Storm	10:44:26	0	21

Lapping Water	12:15:23	8	0
River	12:44:26	12	0
Babbling Brook	13:56:21	21	0
Field	16:06:05	4	2
Squeaking Gate addition	16:28:00 + 16:44:03	0	3

4.4.3 *Analysis*

The quiet field, with a light breeze and birds singing, at the start and end of the piece was widely viewed as positive. An interesting point was that the bird songs which were put into certain sections were mentioned on a number of occasions and were largely found to be an instigator of positive emotions, with comments such as; “And there’s a bird [...] which again I love listening to”, “Birds are there, lovely”, “Nice and peaceful, me and the birds”, “Birds in the background, so that’s nice and calming”. This point can be further supported by the *International Sound Preference Survey* (*Schafer 1977*). In this survey bird calls are mentioned; in Auckland, New Zealand 49 percent of the people asked found the sounds to be pleasant, while only 3 percent found them unpleasant, in Vancouver, Canada 53 percent of people found them pleasant with no one finding them unpleasant. There are similar results with the other two cities also.

Another interesting point was that from the ocean section through to the babbling brook section there was a significant amount of variation in terms of the types of emotions felt. The sound of the ocean in front of the listener had mentions of only positive emotions, as the sounds of the ocean changed, moving further out to sea, so too did the emotional descriptions, with mention of apprehension, anxiousness and of being scared, until the full ocean storm brought up very negative emotional descriptors. There is also a stark contrast between the ocean storm and the babbling

brook, the storm having 21 mentions of negative emotions whilst the babbling brook had 21 mentions of positive emotions. It is evident that the sounds of water sources can create significant emotional responses, both positive and negative depending how the ambient source has been edited.

The full city ambience was also emotionally provocative, with the sounds of traffic, construction, sirens, pedestrians, alarms, horns and loud music coming out of passing cars. With 26 mentions of negative emotions this was the most effective ambience utilised in the transitional piece.

The listeners of the surround mix also mentioned the feeling of being surrounded or engulfed at times, particularly with the traffic sounds and the ocean. This created an increased emotional reaction to these sounds and showed that, by having the ability to be able to surround the listener with the ambient sounds, an increased emotional response can be achieved.

Overall this test was not one that would answer questions, but raise new ones as well as build awareness towards the areas that would be researched over the rest of the project. With help from the *Sound Preference Survey* (*Schafer 1977*), it also helped towards compiling the list of ambient sounds that would be tested throughout the rest of the project.

4.5 *Ambient Choices*

There were a number of criteria that had to be met before an ambience was selected. The main factor was the *International Sound Preference Survey*; the tests with the *Transitional Piece* were used as a way of further justifying this data. The selected sounds had to have a strong emotional reaction whether it be pleasant or unpleasant, if there were sounds which showed high emotional relevance but had a split between positive and negative selections then the ambient sound would be tested further to see whether this split derives from different variables in that soundscape. Another factor was whether the ambience could be widely used, it would have been impractical to choose an ambience that was emotionally significant but would only work in one specific film context, to

increase the usefulness of the ambiences only ones that could be used in multiple environments and circumstances were selected.

4.5.1 *Traffic*

Table 4.2 Transportation section of *Sound Preference Survey* (*Schaffer 1977*)

	Auckland New Zealand 113 People Tested		Vancouver Canada 99 People Tested		Port Antonio Jamaica 72 People Tested		Zurich Switzerland 217 People Tested	
Transportation	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)
Traffic Noise	0	43	0	32	0	0	4	6
Specific Vehicles Mentioned	8	30	6	58	13	26	4	94
Aircraft	1	4	0	5	7	0	2	36
Trains	0	1	3	1	1	0	4	6
Sounds of Accidents	0	6	0	1	0	4	0	1

The *Sound Preference Survey* shows that 43% of the people tested in New Zealand mentioned traffic sound, and all said that it was deemed as unpleasant. There are similar results from Canada with 32% mentioning traffic and all of those saying that, again, the sound was deemed to be unpleasant. There was no mention of traffic in Jamaica, a reason for this could be from it being a less developed country at the time and so traffic would not have been as prominent as some of the other cities, these results do however show that the sound of traffic is one that is widely regarded as unpleasant, this data resulted in the ambience of traffic being used for further testing.

The ambient sound of traffic was also mentioned a number of times in the transitional piece “The mass of cars building up is a little bit distressing”, “Again not particularly easy, traffic everywhere”, “That was pretty fast that, I don’t like listening to noises like that, we’re obviously very close to a motorway [...]”, “The sound of cars always breaks the calm”. It is evident that the traffic sounds were having an emotional impact on the listeners, this increased as the intensity and density of the traffic was raised. The emotional response to traffic was also found to increase when mixed into surround sound.

Traffic has also been chosen because it can be used in a number of contexts, if a film scene is set in a city or a place of civilisation there is always a high chance of roads and traffic sounds.

4.5.2 *Birds*

The positive association with birdsongs could link to our past. The sound of birds in the trees would show that everything is calm and as it should be, if the birds suddenly took flight or were not present to begin with, particularly in an environment that would normally harbour birdsongs, then it could have been interpreted to be a sign that a predator or danger was near, thus provoking a negative emotional response (*Treasure 2007*). Also the use of birdsongs has been used as a method of relaxation through architectural and business soundscapes to improve living quality and productivity as mentioned in Julian Treasure’s book (2007).

In the *Sound Preference Survey* there is a very high percentage of people selecting bird sounds as a pleasant sound. With 49, 53, 68 and 75 percent of people from the four different cities finding the bird sounds to be pleasant the ambient sound of bird songs was selected for further testing.

As talked about in the analysis of the transitional test, birds were mentioned on a number of occasions during the transitional piece and singled out from the rest of the ambient soundscape when they were being implemented. The multiple mentions of the birds brought up further reason to look into the use of bird calls as an emotionally significant ambient technique in more detail. The

ambient sound of Birdsongs could be used in many environments, from forests, fields, cities and towns; if the film scene is based in a fairly natural environment then there is every chance that the sound of birds could be heard. The survey, tests and the ability to use birdsongs in many different environments meant that it would be an ideal ambience for further testing.

4.5.3 *Construction*

Table 4.3 Machinery and Mechanical section of *Sound Preference Survey* (*Schaffer 1977*)

	Auckland New Zealand 113 People Tested		Vancouver Canada 99 People Tested		Port Antonio Jamaica 72 People Tested		Zurich Switzerland 217 People Tested	
Machinery and Mechanical	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)
Machinery (General)	0	23	1	19	0	0	2	46
Construction	0	11	0	10	0	0	0	15
Jackhammers	0	15	0	13	0	0	0	14
Dentist Drills	0	12	0	13	0	0	0	5
Power Lawnmowers	0	18	1	0	0	0	0	3
Sirens	0	15	0	25	0	0	0	26
Other	1	12	0	27	0	0	0	18

In the *Sound Preference Survey* construction fell under the category of Machinery; as well as construction there were more specific sounds such as jackhammers and power lawnmowers. As can be seen in the table above, the majority of selections are found to fall under the category of

Unpleasant. This high percentage of perceived unpleasantness made the ambience of construction and machinery a category that would be tested further.

The sound of construction (jackhammers, sawing, hammering) was one of the many sounds found in the full city ambience during the *Transitional Piece*, which when played evoked a strong emotional response. The other sounds were of traffic, sirens and car alarms. Because the sounds of sirens and car alarms already hold a purpose, to draw people's attention and make them alert of the sound's location, they would not be tested as their uses would have been fairly restricted. Traffic and construction are different; these sounds are by-products of other elements and are not there to specifically create an emotional reaction, the response comes naturally through their timbre, frequencies and connotations. The strong emotional response to the city ambience that held the sounds of construction further reinforced the reasoning behind selecting this ambience for further testing. Because of where the construction sounds were being played on the transitional piece and how there was largely a negative emotional response to these, as well as the strong unpleasant emotional reaction listed in the survey, it was deemed that a construction ambience certainly warranted to be tested further. Also, like with traffic, the use of construction sounds could be used in many film scenes that are set around built up or urban areas.

4.5.4 *Sea*

It would appear the sound of the sea is the most efficient ambience at shifting people's emotions, particularly between positive and negative ones. On the *Sound Preference Survey* (*Schafer 1977*) the category of '*water'* which contains sounds such as brooks, rivers, waterfalls and oceans had a significant percentage of people mentioning that they felt positive emotions. This large percentage (59% of people mentioning the ocean in Auckland, New Zealand, with 58% saying that it's a largely positive sound) shows that the sound of the ocean is emotionally poignant to a large amount of people. What is interesting is the fact that there are very few people associating the sound of the

ocean in a negative way, perhaps many relate it to the sound they hear when relaxing on the beach, or when they are on holiday, instead of being caught in the middle of an ocean storm.

Table 4.4 Water section of *Sound Preference Survey* (*Schaffer 1977*)

	Auckland New Zealand 113 People Tested		Vancouver Canada 99 People Tested		Port Antonio Jamaica 72 People Tested		Zurich Switzerland 217 People Tested	
Water	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)
Rain	31	1	23	0	7	3	25	1
Brookes, Rivers, Waterfalls	18	0	27	0	6	0	43	0
Ocean	58	1	42	0	19	8	4	0
Other	7	0	10	0	0	0	21	2

The shift to the more negative emotions was found during the transitional piece in which there was a large portion that contained the sounds of running water, from the sea to a babbling brook. It has become evident that the sound of water can bring a whole host of emotions depending on what the water sounds contain. At 08:08:10 in the transitional piece there is the sound of a distant ocean, the descriptive words used were positive “very pleasant”, “very soothing” and “relaxing”. This positive description changed as the transitional piece moved into the ocean, at this point it became a split of positive and negative descriptors, then when the deep low end frequencies and the full storm ambiences were introduced this split moved to all negative descriptors. The shift in emotions through changing certain sounds in the ocean ambience was the main reason for choosing sea ambience for further testing.

The sea brings us life "[...] of cleansing, of purification, of refreshment and renewal." (*Schafer 1977 p.170*) It gives us hydration and food sources. It is also seen as a thing of immense and immeasurable power, destroying or swallowing anything unprepared. It is this contrast of the sea being able to give and take life that will be a factor in creating the emotional impact of the sounds.

In terms of the frequencies, the sea is a broadband sound.

> "[...] it is a full-frequencied white noise. Yet the spectrum always seems to be changing; for a moment deep vibrations predominate, then high whistling effects, though neither is ever really absent, and all that changes is their relative intensity. The impression is one of immense and oppressive power [...]" (*Schafer 1977 p170*)

Although the sea cannot be used in as many situations as traffic and bird calls, the emotional impact of the sound was enough to test further; there are examples in films that show that the use of an ocean ambience can create an emotionally charged soundscape. The best example of this would be the film Cast Away starring Tom Hanks and directed by Robert Zemeckis. When Tom Hanks' character gets stranded there is no use of music during the section of the film in which he is on the island, instead the sound designer Randy Thom used the natural elements as the film's score. The sound of the sea is ever present during the scenes on the island, changing to suit the mood of the situation. This effective use of the sea as an emotional tool helps to show that with further testing some interesting results may be achieved.

4.5.5 *Rain*

As found in the *International Sound Preference Survey* and in Table A.A.1 on page 121 the ambience of rain was deemed as a largely pleasant sound, with a high percentage of the people taking part in the survey selecting the sound and almost all of which finding it pleasant. Because of this further testing would be carried out for this ambient sound.

Like with the sounds of water and the ocean the survey showed that people found the sound of rain to be largely pleasant, however with the *Transitional Piece* there was once again a split in how

people felt towards the sound; “Nice”, “relaxed” and “happy” were the types of positive descriptors, “uncomfortable”, “sad” and “Isolated” were those of a more negative nature. Naturally when the thunder was introduced there was an increase in negative emotional descriptors. This mix of descriptors is interesting as the sound of rain is evidently emotionally poignant, but can create two very different feelings between two people. This is most likely down to a person’s individual opinion of the rain as well as through past experiences with it. The fact that there is an interesting split in the emotional reaction to the sound was deemed as a justifiable reason to do further testing. The largely positive selection in the sound preference survey coupled with the contrasting emotions found with the transitional piece made this ambient sound one that would be used for further. One area of interest would be to see whether the emotional split could be isolated and utilised when using the ambience as an emotional tool.

Finally rain can be found in any outdoor environment, the only criteria is that it is raining in the film scene, this further reinforced the reason to use rain as one of the ambiences to be tested further.

Chapter 5 – Determining the Perceived Emotions of Selected Ambiences and their Perceptual Strength

5.1 *Methodology*

5.1.1 *Testing Method Introduction*

Having found the ambiences that would be used a testing method that was best suited to examine how these sounds could be manipulated had to be devised. The ultimate goal of this project was to see whether the ambient tracks could be manipulated so as to boost, reduce or create certain emotions in the viewer. To find this out each of the ambient sounds had to be looked at in much more detail.

5.1.2 *Deconstructing the Ambient sounds*

All ambiences have a number of 'component' sounds (all of the individual sounds that make up the ambience) that create the characteristics we have come to expect from them. In conjunction with these 'component' sounds there are a number of other variables associated with these ambiences that have also been explored. It was decided that if these variables could be determined for each ambience then it would make manipulating the overall sound a much easier task.

The reason for editing these individual component sounds to gain the desired impact instead of recording the whole ambience under different circumstances was that of control. By layering sounds together to get the ambient track it allowed for more detail to be added to certain elements of that ambience such as the volume or an effect to a single element, this level of detail could not be achieved with a recording of the whole ambience as it could not be broken down into its component sounds. It may be that some of the ambiences sound less natural however this is a risk that has been taken to achieve this much greater control, all of which can be replicated without having to record very specific ambient tracks.

It should be said that these variables and component sounds were chosen to create the strongest emotional impact. It could be argued that there are many other sounds and variables that could be examined for each of these; however it was intended that a set of rules could be created from these tests and so the variables had to be defined and easy to understand. It may be that future research could look at these ambiences and test other variables alongside the ones mentioned below. The accuracy of the ambiences was also left out as a factor. It may be that the bird calls used are not found in certain parts of the world, or the construction tools are not found on certain building sites, creative licence has been used here and as this is intended for cinema, a medium well known in using creative license, it was felt that there was no problem in this respect.

5.1.2.1 *Traffic*

With ambient tracks for traffic there are a number of component sounds and variables that can be changed. The main points were deemed to be:

Speed – The speed of the cars was an important variable that can completely change the overall sound of the ambient track. A car driving past at 70mph is a very different sound to a car driving at 30mph. The volume and frequency range of the sound increases as the car gets faster thus changing the impression of the sound, and, with further testing, potentially the overall emotional impact.

Delay time – The delay time between the cars was an important variable to include, as it is with the delay times that the density of the traffic could be determined. A short delay between car sounds would show a busy road with many cars driving past, while a longer time between them would create the sense of a quieter road.

Gear – The gears that the cars are in changes the sonic makeup of the engine sound. Having a car in a high gear lowers the revs and so the revving sounds of an accelerating car are less audible.

In a lower gear this sound becomes much more pronounced, changing the overall sonic identity of the car's engine.

It was these three variables that would be looked into in more detail. Other variables were considered; the engine types and the surface the car was on. Although these are both fairly prominent components in making the overall sound of a car passing, it was deemed that the other variables would have a more noticeable impact. In regards to the engine types it was decided to have both petrol and diesel engines in all of the mixes to create as diverse a traffic sound as possible.

5.1.2.2 *Construction*

Construction was found to be a harder ambience to determine the main components and variables. There are many more elements that could go into a construction ambience; there are numerous different tools, surfaces and vehicles as well as the overall density of the effect. It was therefore decided to select only the most prominent of these components. The sound of tools was chosen, the different tool types were placed into three categories and these consisted of: Hammers, Saws and Drills. Each of these categories contained a number of different tools; hammers had normal hammers as well as jackhammers. Saws consisted of a number of different sized saws, and drills consisted of hand operated electric drills of different types as well as some other drilling machinery. Although this in no way represents every type of tool sound that could be found in a construction ambience it gave a good cross section of them with a good sonic range, all of which could be easily replicated or found in a sound library.

It was also decided that vehicle sounds would be taken out, focusing primarily on those of the tools. It may be that in later research vehicle sounds could be introduced, however it was decided that the sounds of the tools in motion would play a stronger role in boosting a person's emotions, as well as them being the prominent feature of a construction ambience. The final selection of variables were:

Tool types – As explained above, the types of tools used would play a major role in the overall soundscape of a construction ambience.

Density – The density of the tools – how many tools are going at once – would also be an important factor. All of the variations would be explored for this, different tool types would be layered on top of each other as well as the same types placed together.

These two variables would be the ones being manipulated, both of which had many variations that could be tried out and tested.

5.1.2.3 *Tweets*

It was difficult to find what variables would work best when manipulated and changed. Bird calls have infinite types and variations and are both notoriously hard to notate or mimic: “Many of the sounds uttered are not single tones but complex noises, and the high-frequency range and rapid tempo of many songs preclude their being transcribed in a notational system [...]”. (*Schaffer 1977 p. 30*) This meant the sounds had to be refined so as to make the testing an easier task. As defined by the title for this ambience bird tweets were the only bird sounds used, other variations such as pigeons, eagles and any other types of birds that do not tweet were not included. The difficulty of imitating bird calls meant that creative license would have to be used to create easily replicable calls. This refined the ambience making it much simpler for other people to repeat if so desired.

The main variables determined to be the most influential when manipulated were:

Delay – The delay time between the calls would change the overall soundscape of the ambience, as well as the joviality of the songs.

Density – The layering of the different bird calls would also be looked at. A single bird tweeting was seen to potentially have a very different impact to multiple birds singing at once.

5.1.2.4 *Squawks*

The sound of bird tweets is seen to be a relaxing sound (*Schaffer 1977, Treasure* 2007) whereas the sound of a crow's squawk can give the opposite outcome because of the connotations and contexts that are associated with this sound in cinema. It was decided that both types should be looked at. The variables for this ambience were decided to remain the same as the tweets ambience so that a direct comparison could be made.

5.1.2.5 *Rain and Sea*

Both rain and sea were fairly difficult to find some easily replicated variables. It was decided that the main factor would be that of density for both of them as this would determine the strength of the ambience from a light drizzle or a calm sea to a downpour or a storm at sea. The density of these ambiences would consist of the amount of audio tracks being played to create the ambient sound, the higher the density the more samples used in the ambience.

5.1.3 *Video Selection*

Although it is the sounds that are being tested in this project it was decided early on that, after the initial testing using the transitional piece, videos would be used alongside the ambient sounds. The reasoning behind this choice is that ultimately this project is looking at how sound design in *film* can affect us emotionally, this means that when used in a practical way the sounds that are being tested will almost always be accompanied by an image. It is this idea that led to including video clips in the testing stages.

Initially it was intended that a clip extracted from a film would be used. A selection process was begun looking for scenes in films that would be able to cater for one or more of the ambiences being tested. There were a number of issues that were brought to light when selecting existing film scenes; the main issue was that the scenes would already have an emotional sway and would inevitably have

an impact on the emotions of the viewer, although this would be good in an actual film situation this was not desirable when the emotional impact of the sounds are the point of focus within these tests.

It was decided that more neutral clips would be used instead. This meant recording short clips that would work for the different ambient sounds. It is difficult to have an image, be it still or moving, and have it completely neutral of emotions, people may associate images with memories or a person's subconscious may pick up on something that elicits an emotional response. The way chosen to keep the clips as emotionally neutral as possible was by recording an area that did not show too much, but was also easily associated with the ambient sound that would be accompanying it. This will be better explained by describing and explaining the video clips used for each ambient sound.

5.1.3.1 ***Birds***

The video used for the bird tweet and squawk ambience is of one long held image. The camera holds on some swaying trees in a woods, no birds are seen, this allows them to be implied by the sounds allowing for complete control over the type and density of the birdsongs. Having birds in the actual clip may have made it more difficult to keep the continuity between the sound and the image. Nothing more is going on in the clip.

5.1.3.2 ***Rain***

As with all of the videos the clip used for the rain ambience is of one long held image. In this clip the camera is focusing on a path next to a fence with a small leafy plant coming out of it in the rain. To help keep the continuity between the image and the sound the video was intentionally recorded in quite a small area and fairly close up to the ground so that it is easy to see that it is raining but difficult to make out just how heavy, again allowing more control with the rain sounds.

5.1.3.3 *Traffic*

There were a number of issues when creating a clip for the traffic sounds, the main being that there could not actually be any cars or traffic in the image as this would dictate the type of traffic sound that would be expected. It was initially intended to film a motorway but have the camera focusing on something in the foreground, making the traffic out of focus, unfortunately the traffic in the area that was being filmed was too light and so the large density edit of the traffic ambience would have been disjointed and out of place. It was therefore decided that there would not be any cars but it still had to be fairly obvious that it was near an area that could have varying amounts of vehicles going at differing speeds. The clip that was eventually recorded is one of the side of a motorway, there are a number of bushes and plants swaying, and importantly there are some motorway signs on the side with part of the hard shoulder in view. This acts as the visual cue that the clip is shot near a motorway and so allows the different traffic sounds to work contextually.

5.1.3.4 *Sea*

The difficulty with the sea clip was that it had to cater for many different strengths and weather types of the ocean, it was decided to have a clip that was filmed on a fairly dull day, this would help keep it as neutral as possible as well as allowing the use of different sea strengths without it seeming too out of place. The chosen clip is a shot showing the ocean, the lighting is slightly grey and the water a little choppy, having the sea in this fairly gloomy state meant that many of the different ambiences would work contextually alongside it.

5.1.3.5 *Construction*

As construction ambiences are common place in most built up areas it was easy to show an image and have the construction sounds work convincingly alongside. The video that was shot is one of a wooden post holding up a washing line, with the camera angle pointing towards the sky, in the

background is a tree and behind that a roof, showing that it is in a populated area whilst also keeping the clip fairly plain and emotionally neutral.

Although the clips are not very visually engaging they do help compliment the ambient sounds by giving them a context so that they are not just disjointed noises. These clips were used for the main body of testing.

5.1.4 *Audio Editing*

With the videos created it was also necessary to collect the right sounds for the tests. All the sounds used in the clips were recorded to get first hand, controlled, high quality recordings.

With all of the clips a light background ambience (*Non-testing ambience*) was added before the main ambience (*Testing Ambience*) so that the edits did not seem sparse and out of place. What is meant by this is; had the main ambiences being tested been played on their own the video would have felt empty. The clip for the bird tracks contained swaying trees, without this extra ambience the bird calls on their own would have been very sparse and strange, which would have affected the overall results. These non-testing ambiences were specific for each video clip; however they remained the same throughout so that the only things changing between the edits were the variables of the main ambience. Once these non-testing ambiences had been recorded and implemented it was then possible to begin constructing the variations of the testing ambiences. Cubase 5 was used for all of the audio editing with Vegas Pro 10 used for video editing.

5.1.4.1 *Traffic*

Non-testing ambience

As some bushes and trees could be seen blowing in the wind next to the motorway a light wind ambience was put in alongside the sound of leaves and shrubbery rustling.

Testing ambience

A number of car recordings were obtained for this ambience. A diesel car and a petrol car were recorded. Each was asked to drive at 30mph, 50mph and 70mph on a dual carriageway, national speed limit road. They were asked to drive these speeds in a high and low gear. This gave the components for two of the main variables; the delay variable could be done in editing.

When editing all of the variations of the different variables were implemented. This meant that the cars going at 30mph in a low gear were layered over each other with a certain delay time between each sample. The delay times being tested were: 0.5, 1, 2 and 3 seconds between samples. This was then repeated with the other delay times, then in the high gear then at a different speed until all of the variations had been created.

So as to make the samples seem like a clip of a longer ambience the tail end of some car tracks were placed at the start so that the sounds did not feel disjointed and out of place, this would give a more natural feel, like the sounds had been going on before the clip had started recording. To avoid the unrealistic and disjointed scenario of having the same sample played in rapid succession (machine gun effect) it was necessary to keep the samples as varied as possible. Had the same sample been played twice in succession this would most likely have seemed odd to the listener and so ultimately impacted on the results. This also meant doing some light pitch shifting and equalising of some of the tracks.

5.1.4.2 *Birds*

Non-testing ambience

As mentioned earlier the video contains swaying trees in the wind and so a forest ambience was put in. This ambience was recorded in the same woods as the video during a particularly windy day and so works well in the context.

Testing ambience - Tweets

As many of the audio recordings were done in the height of summer it was straightforward recording a number of different bird calls. It was then necessary to single out the bird tweets; this meant cutting the audio sample so that it isolated individual tweets then equalising the sample by adding a high pass filter, leaving as clean a sample as possible. Having these individual tweets meant that their manipulation was much easier. Although the 'machine gun' effect was much less likely with bird calls some of the samples were also copied and lightly pitch shifted.

With the samples prepared it was then possible to begin editing the ambience. The first stage was to create the different delay times. These were: 0.25, 1 and 3 seconds the final delay was called 'Overlapping' as the calls were made to be fast and sporadic. These delay times were chosen for tweets so that a number of more believable bird calls could be created, having the delay times in intervals like those of squawks, which are explained below, sound unnatural to the ear. With the delay times of 'Overlapping', 0.25, 1 and 3 seconds different bird calls could be created using different pitched tweets; this meant that the overall sound was more realistic whilst also being controlled. This created the basis for the delay time tracks; these could then be layered to create the density tracks. All of the variations were included.

To see if there was a strong difference between these controlled bird tweets and those of real songs, a recording of a morning chorus was also placed over the video so a comparison could be made.

Testing ambience – Squawks

The overall method of creating the squawk tracks was the same as the tweets, the only difference being the delay times. As with tweets a number of squawk recordings were isolated, with some being copied and pitch shifted so that there was some more variation in the sounds. The delay times chosen were: 0.5, 1, 2 and 3 seconds. As squawks are less complex when compared to tweets the believability of the clips was easier to create using these more formal intervals.

All of the variations were included in the clips, all of which was done in the same manner as tweets.

5.1.4.3 *Construction*

Non-testing ambience

Because very little is shown with this video all that was needed was a quiet town ambience, again recorded at the same location as the video.

Testing ambience

All of the construction sounds were recorded first hand with the exception of the jackhammer, which was taken from a sound library. A number of different tools were sampled; all recorded being used on different materials. The materials were: wood, metal and concrete. This created some differing sounds for the tools. With the electric tools a dry recording of them in motion but not cutting into one of the materials was also recorded.

As the video clip for construction was based outside, as well as the fact that this ambience would almost exclusively be used in outdoor scenes, it was necessary to place a reverb on the recordings to reflect this fact. A number of versions were created, the difference being the amount of reflections being created by the sound as well as the decay time of the reverb. The delay time that was chosen was because of the sound being distant enough to work as a background ambience, whilst also holding enough punch in the sound to have a stronger impact than some of the more distant sounding versions.

Once the samples were edited they were then able to be put into the mix. The delay times of the individual hits and saws were not tested, this was because it would create a very large amount of variables, given the amount of ambiences being tested and the number of variables in each of those, it was deemed as impractical and ultimately unnecessary, so it was decided to continue with the chosen variables. Three different tracks were created for each tool category (drill, hammer and saw).

These tracks were tested individually and layered together; they were then tested with the other tracks of the different tools so that all of the possible variations were included in the testing clips.

5.1.4.4 *Rain*

Non-testing ambience

The same quiet town ambience used in the construction clip was also used here.

Testing Ambience

A number of different tracks were recorded for the overall rain sound. Multiple tracks of real rain falling were recorded; these recordings had a good amount of variation in strength. Detailed recordings of drips and trickling were also recorded for the ambience.

It was difficult finding a way of categorising the types of sounds in the rain, as well as how these sounds would be layered in an easily replicable manner. The method that was decided was to categorise the sounds in terms of detail. Recordings of real rain, that are very full but lacking much detail were classed as the '*general'* tracks, these provided a much broader stroke to the sounds as they are able to fill the soundscape. The other category was '*detail*', these were recordings of dripping, trickling sounds, which would give the detail of the ambience. Having these two categories meant it would be possible to control both the strength of the sound through the density, but also the detail and the types of sounds going into the mix.

16 tracks were used to build the density, 8 tracks were general tracks with the other 8 being the detailed tracks. In the 8 general tracks one was a pink noise turned down fairly quiet with another being yellow noise, these were to increase the overall effect of the rain strength. Two versions of the increase in density were created, one starting from the more general sounds, building those 8 layers and then introducing the detail tracks layer by layer. The other version was starting from the more

detailed tracks and then adding the general tracks after them, this would give a better representation of a light trickle of rain building into a full rainstorm.

All this meant that when the clips were played in sequence there would be a logical build up in the strength of the rain using sounds that are controllable and could be replicated by other people trying to reproduce this ambience.

5.1.4.5 *Sea*

Non-testing ambience

No other ambiences were needed as the different variations of the sea ambience would cater for any sounds needed. A general track of the sea was used at the start of both versions, this is explained below.

Testing Ambience

The principles used with the rain ambience were also used with the sea ambience. There would be 16 tracks overall; 8 being detail tracks and the other 8 being general tracks. The sounds were recorded first hand, for the general tracks the sea was recorded at different distances and during different weather types so that the individual tracks had their own identity, pink and yellow noise were again used as two of the general tracks. The detail tracks were recordings of sloshing sounds, of water running through sand and of trickling. All of the detail sounds were recorded in close proximity to the sound source to get a good, detailed, clean recording.

Like with the rain ambience, two different versions of the build up were created, one being general sounds to detailed and the other being detailed sounds to general. The difference with this to the rain ambience was that having a trickling sound as the first track would not have worked alongside the image of the ocean. This meant that on both versions the first track used was a general track of the sea moving in and out on a mild day.

5.1.5 *Testing Method*

5.1.5.1 *Live Tests*

5.1.5.1.1 Test Procedure

In order to conduct the listening tests successfully and gain meaningful informed results a number of criteria were observed before beginning with the actual tests. All subjects were instructed sufficiently so that there was little to no doubt as to how the test would be undertaken. A written instruction sheet was handed to all of the subjects alongside the answer sheets; this was a simplified version of the instructions that were also given verbally. A test video was played so that the subjects understood what they would be seeing and hearing, as well as see how long each clip would take and how they would present their answers on the answer sheets, this gave a sufficient amount of training for the test subjects to be able to confidently take part in the tests.

So as to make the testing procedure as efficient as possible an image of the Geneva Emotion Wheel was included with the instructions and answer sheet. All of the emotion categories were numbered; this meant that on the answer sheets the subjects would only have to write down the number to the corresponding emotion which helped to speed up the process.

5.1.5.1.2 Test Environment:

The test environment was a lecture hall at Huddersfield University. The layout was one of tiered seats reminiscent of a cinema environment. The reason for selecting this testing environment was to resemble, as accurately as possible, the cinema environment that many of these sounds would be experienced whilst watching a film. Professional monitor speakers were used for the sound playback to keep the audio quality at a high standard. The speaker layout conformed to the ITU-R BS.1116 recommendations for a stereo set-up. Although not all of the test subjects were able to be in the optimum reference listening position no subjects were placed in the worst case listening positions as the answers obtained from these positions would have caused too much of a bias in the results.

Having people in different positions around the lecture hall also meant that a more accurate representation of people seated at a cinema could be achieved.

5.1.5.1.3 Test Subjects:

All test subjects were a selection of students studying at Huddersfield University. Due to the instructions that were issued at the start of each test as well as the large number of subjects taking part it was not necessary to select 'experienced' listeners in the subject area of audio for film as a large and varied set of results could be achieved with a broader selection of subjects, which would more accurately represent the normal population. Having a large amount of listeners also allowed for the probability that subjects vary in their sensitivity to different artefacts.

5.1.5.1.4 Test Sounds and Clips:

All of the sounds played were normalised so that they were at the same volume. The speakers were turned up to a point that all the subjects in the test environment could comfortably hear the sounds; the volume was then left so there were no variations or biases between the clips as subjects may have been distracted from a sudden change in volume levels, which may have altered the results.

147 clips containing the different ambiences and edits were used in total, all were played in a random sequence; all of the ambient sounds were mixed as well as the order in which the edits of these ambient sounds were played, this helped in reducing habituation (as explained in Chapter 5.1.7) and loss of concentration. A ten second pause with a countdown timer was used between clips, this allowed the subjects to write down their selection.

5.1.5.2 Online Tests

5.1.5.2.1 Test Procedure:

A more detailed version of the written instructions presented in the live tests was shown on the homepage of the website so that the subjects would have a comprehensive understanding of the test method before taking part. An example of the test was also included so that the subjects would understand the layout of the testing screen and be able to familiarise themselves with how it worked. Before being able to begin with the tests a small survey had to be filled out, this survey asked for age group, gender, country of origin and type of headphones used.

When undertaking the test the subjects were presented with a screen showing the clip and a fully interactive Geneva Emotion Wheel next to it. To select the perceived emotion and strength the subject merely needed to click on that point. A 'Next' arrow allowed the subject to continue onto the next clip, however this could only be done once the clip they were on had been filled out, this prevented any loss of results from subjects not selecting from the GEW.

5.1.5.2.2 Test Environment

The testing environment could not be controlled due the test being undertaken online. Because of this It was specified that headphones be used, this would reduce the biases caused by environments with poor acoustics and in using low quality speakers such as those built into laptops, the frequency range of which would not be sufficient enough to allow for viable results. The small survey that needed to be filled out before starting the tests asked for the type of headphone used so that a standard could be kept, if the headphones were of a low quality the results from that subject were not included in the overall results. The headphones would be deemed as sufficient or insufficient on a case by case basis, through research of the headphones, paying particular attention to frequency range and audio quality.

5.1.5.2.3 Test Subjects

By putting the tests online a more varied set of test subjects could be used. Many of the subjects that were asked to take part in these tests have a background in the production of sound and music, this reduced the risk of having these subjects take part in the tests without any supervision as there would be a greater understanding in the use of listening tests, this also meant that the quality of the audio equipment being used would be of a higher standard.

Family and friends were also asked to take part in these tests, many were invited to take part in the online tests in a more controlled environment and using good quality monitor headphones. The website remained the same however the position and environment the subject was in could be arranged in a more controlled manner. In this case the subjects were sat in a sound proofed room, they were given monitor headphones and had a computer screen in front of them with the website up and ready to use.

5.1.5.2.4 Test Sounds and Clips

So as not to influence the results the subjects were instructed to adjust their volume levels whilst watching the reference clip to a point where it was comfortable, they were then asked not to adjust these levels again so that the volume remained the same throughout. All of the audio was normalised before being uploaded onto the website as with the live tests.

The problem of habituation led to the randomising of the clips. The actual ordering of where each ambience went was decided and controlled so that the same type of ambience was not played twice in a row. The order in which the different edits of the ambiences were put in was made random so that that there was no logical sequence to them, thus lowering the possibility of habituation.

To further reduce the risk of habituation and loss of concentration the clips were split into four sets, each could be completed at separate times, this meant that the subject did not have to go through the test in one go, they did however have to finish the set that they were on.

5.1.6 *Changes to the Geneva Emotion Wheel*

There have had to be a number of changes so as to cater towards the needs of this project. The main difference is the way in which the testing has been undertaken using the GEW. As explained earlier (chapter 2.3) ordinarily the tests would be carried out with the full list of emotions and their five point grading scale. Due to the large amount of variables that are raised in this testing model the GEW has been adapted.

The main difference is that two different tests have been undertaken to collect the results. These tests consist of the selection phase (Chapter 5.2) and the grading phase (Chapter 5.3). The selection phase has the listeners going through all of the material with the Geneva Emotion Wheel presented in front of them, the full list of emotions is present as well as a “no emotion” and “other” option, there is, however, no five point grading scale. The reason behind this testing is to find the most poignant emotions for each ambient sound. The listener is then asked to choose an emotion, as with the usual model of the GEW they are asked to select just one of the emotions. A tally is collected of all the choices made, which can then be analysed to find which are the most prominent emotions felt for each ambient sound.

The grading phase has the same material, the difference being that the GEW no longer has all of the emotions listed, just the ones that were deemed to be most significant (this list of emotions on the GEW will change depending on the ambient sound). Each of these emotions would then have the five point grading system. At this point instead of the listener choosing just one emotion they are to grade all of the emotions present on the GEW so that an average can be calculated of the strengths of each of these prominent emotions.

The reason for the selection stage is to take out all of the variables that are not needed such as the emotions that are not felt at all and the ones that were not found to be statistically significant. This allows for a more focused set of results on the grading phase, thus showing how each of the

prominent emotions are affected by the different edits of each ambience without being altered by some people selecting the less significant emotions.

5.1.7 *Habituation*

Habituation comes from the over exposure of a certain element, it can happen with your sense of smell; when you are in a room that has a certain smell for an extended period of time you eventually stop smelling it even though it is still there. The same happens with sound, if we are in a room with an air conditioning system we are exposed to that sound for an extended period of time and, like with smell, our senses that pick up those frequencies become fatigued resulting in us no longer registering the sound. The actual definition can be found in *Thompson and Spencer's* (*1966*) paper, in this a number of descriptions are made for habituation and the way that it can be prevented: "Given that a particular stimulus elicits a response, repeated applications of the stimulus result in decreased response (habituation). The decrease is usually a negative exponential function of the number of stimulus presentations" this is the accepted definition of habituation. In the same paper there is also mention that by withholding the stimulus the response that is lost will recover over time.

5.2 *Determining Perceived Emotions of Selected Ambiences*

5.2.1 *Selection tests*

To select the prominent emotions the grading scale found on the emotion wheel was removed, the test subjects were then asked to select the strongest emotion on the wheel which corresponded closest to what they felt for each clip.

Although the tests were initially done online, because of technical problems that were experienced at this satge as well as many test subjects failing to complete the sets, only the results gained from the live tests were used for the analysis.

At this stage it did not matter which clip was creating which emotions, the main area of interest came from how frequently the emotions were chosen over all of the edits for each ambience.

To select the most prominent emotions for each ambience a number of criteria were adhered to. Firstly the overall percentage of people selecting each emotion played a significant role; if the emotion was the highest rated then it would be deemed as statistically significant and selected. What is meant by the overall percentage is how many times that emotion was selected over all of the clips in relation to the other emotions.

Some emotional families were chosen even though their overall percentage was lower than other emotions; the reasoning behind this comes from looking at the individual clips. One of the emotions on one clip may be fairly low in terms of people selecting it; however on a later clip of the same ambience the selection rate may be much higher. This shows that the different edits are working in terms of building the strength of some of the emotions. With results like this the emotion was also selected.

Alternatively, some of the ambiences may not have been selected even though they had a fairly high overall selection rate. This situation would occur if some of the emotions were consistently selected

by a certain small number of the listeners, this would result in these emotions having a fairly low selection rate for each clip, but because it stays at a constant level throughout all of the clips the overall percentage is higher than some of the more statistically significant emotions.

5.2.2 *Results and Analysis:*

5.2.2.1 *Rain*

Table 5.1 Tally and percentage of selected emotions for rain ambience

Emotion	**Number of times Selected**	**Percentage**
Irritation/Anger	45	5.93
Contempt/Scorn	11	1.45
Disgust/Repulsion	6	0.79
Envy/Jealousy	8	1.05
Disappointment/Regret	**68**	**8.96**
Guilt/Remorse	25	3.29
Shame/Embarrassment	15	1.98
Worry/Fear	24	3.16
Sadness/Despair	**140**	**18.45**
Pity/Compassion	48	6.32
Involvement/Interest	16	2.11
Amusement/Laughter	15	1.98
Pride/Elation	9	1.19
Happiness/Joy	**61**	**8.04**
Enjoyment/Pleasure	36	4.74
Tenderness/Feeling Love	32	4.22
Wonderment/Feeling Awe	15	1.98
Feeling Disburdened/Relief	**88**	**11.59**
Astonishment/Surprise	4	0.53

Longing/Nostalgia	36	4.74
None of the listed emotions	57	7.51
Total	**759**	**100**

Sadness/despair was chosen as it held 18.45% of all selections. Because it was the highest selected emotion there was little that needed to be analysed for this selection.

Feeling disburdened/relief was chosen as it was also statistically significant with 11.59% of all selections. Throughout the clips it also changed in intensity which was a good sign that the emotion was changing due to the changes in the edits. This ranged from 5.3% of people choosing it for one edit to 15.8% on another.

Happiness/Joy was selected as it ranged from 2.6% of selections for one edit and 13.2% on another. This fairly substantial increase in selections justified it to be carried on for the grading tests.

Disappointment/Regret was the final emotion selected, throughout the edits this emotion ranged between fairly low selections to one of the highest, ranging between 5.1% and 15.8%. This 10.7% difference between edits deemed it as a significant emotion to carry through.

These four emotions were the top four selected over all of the edits. Irritation/Anger and Pity/Compassion were almost chosen, however they stayed at fairly similar levels over all of the edits and so were not deemed as significant enough to continue them into the grading tests.

5.2.2.2 *Traffic*

Table 5.2 Tally and percentage of selected emotions for traffic ambience

Emotion	Number of times Selected	Percentage
Irritation/Anger	**328**	**35.16**
Contempt/Scorn	28	3.00
Disgust/Repulsion	32	3.43
Envy/Jealousy	18	1.93
Disappointment/Regret	47	5.04
Guilt/Remorse	24	2.57
Shame/Embarrassment	15	1.61
Worry/Fear	47	5.04
Sadness/Despair	34	3.64
Pity/Compassion	18	1.93
Involvement/Interest	**60**	**6.43**
Amusement/Laughter	12	1.29
Pride/Elation	8	0.86
Happiness/Joy	8	0.86
Enjoyment/Pleasure	38	4.07
Tenderness/Feeling Love	9	0.96
Wonderment/Feeling Awe	13	1.39
Feeling Disburdened/Relief	16	1.71
Astonishment/Surprise	11	1.18
Longing/Nostalgia	23	2.47
None of the listed emotions	144	15.43
Total	**933**	**100**

Irritation/Anger was the first emotion family to be chosen, with 35.5% of all selections being this emotion it is evident that this has a significant impact towards the ambience of traffic.

Involvement/Interest was also selected. The reason behind this choice was that it was the second most selected emotion. The actual amount of selections throughout the different edits varied a good amount as well; between 10.1% and 2.6%.

The other emotions were deemed as too low to be of any significance. These two emotions would work well to show the change between the more negative emotion of Irritation/Anger and the positive one of Involvement/Interest.

5.2.2.3 *Squawks*

Table 5.3 Tally and percentage of selected emotions for squawks ambience

Emotion	Number of times Selected	Percentage
Irritation/Anger	**107**	**15.62**
Contempt/Scorn	27	3.94
Disgust/Repulsion	26	3.80
Envy/Jealousy	21	3.07
Disappointment/Regret	33	4.82
Guilt/Remorse	27	3.94
Shame/Embarrassment	12	1.75
Worry/Fear	**135**	**19.71**
Sadness/Despair	**64**	**9.34**
Pity/Compassion	20	2.92
Involvement/Interest	39	5.69
Amusement/Laughter	6	0.88
Pride/Elation	3	0.44
Happiness/Joy	18	2.63

Enjoyment/Pleasure	16	2.34
Tenderness/Feeling Love	5	0.73
Wonderment/Feeling Awe	17	2.48
Feeling Disburdened/Relief	15	2.19
Astonishment/Surprise	5	0.73
Longing/Nostalgia	24	3.50
None of the listed emotions	65	9.49
Total	**685**	**100**

The first emotion selected was *Worry/Fear* due to it being the most selected emotion overall with 19.71% choosing it.

Irritation/Anger was also selected; the primary reason for this was that the overall percentage is very high. The other reason was that this emotion stays as one of the most significant throughout the edits; however there are points when it drops this left the lowest percentage for a clip at 9.2% with the highest being 27.6%. This substantial difference between edits justified this as being one of the more interesting emotions for the ambience.

The third emotion chosen was *Sadness/Despair*. Not only did the emotion hold a fairly significant overall percentage but also had a strong amount of variation. Again this emotion remained in the top three most significant emotions for the majority of the clips. There were two edits in which the emotion was found to be significantly lower, because of this the selection percentage ranged between 1.3% and 13.2%. These different points meant that this would be a good emotional family to use in the next set of tests.

The rest of the emotions remained fairly low throughout the clips, as is evident with the overall percentages shown above.

5.2.2.4 *Sea*

Table 5.4 Tally and percentage of selected emotions for Sea ambience

Emotion	Number of times selected	Percentage
Irritation/Anger	56	6.71
Contempt/Scorn	15	1.80
Disgust/Repulsion	10	1.20
Envy/Jealousy	10	1.20
Disappointment/Regret	31	3.72
Guilt/Remorse	12	1.44
Shame/Embarrassment	6	0.72
Worry/Fear	**80**	**9.59**
Sadness/Despair	39	4.68
Pity/Compassion	11	1.32
Involvement/Interest	28	3.36
Amusement/Laughter	4	0.48
Pride/Elation	24	2.88
Happiness/Joy	**75**	**8.99**
Enjoyment/Pleasure	**88**	**10.55**
Tenderness/Feeling Love	30	3.60
Wonderment/Feeling Awe	**106**	**12.71**
Feeling Disburdened/Relief	**75**	**8.99**
Astonishment/Surprise	4	0.48
Longing/Nostalgia	80	9.59
None of the listed emotions	50	6.00
Total	**834**	**100**

The first emotion selected was *Wonderment/Feeling Awe*. This was the strongest overall emotion. There was also an interesting decrease in selections which meant that the lowest percentage was 5.3% with 19.7% being the highest, this difference also made this an interesting emotion to choose.

Enjoyment/Pleasure was chosen as it was the second highest selected emotion. The variation between clips was also interesting; varying between 4% and 14.5%.

Feeling Disburdened/Relief was chosen as the changes in the amount of people selecting the emotion was deemed as significant, The lowest being 0% selecting the emotion for one clip and the highest being 21.1% of the listeners selecting it for another. This sizable difference in selection made this an emotion that would be of some interest in the grading tests.

Worry/Fear was also chosen. One of the reasons was the overall percentage of 9.59% the other being another considerable contrast between the amount of selections amongst the clips, ranging from 1.3% to 20%. The other interesting point that would be gained by using this emotion in the grading tests would be to show a contrast between this negative emotion and the other positive ones.

Irritation/Anger may not be one of the higher percentages overall, however there are very strong contrasts in the amount of people selecting this emotion throughout the clips. This was the main reason for this selection; in one clip 0% of the listeners selected the emotion at all, while on another clip it was the second highest selected emotion at 14.5%.

Happiness/Joy was selected as throughout all of the clips it remained at a fairly high selection level, falling into the top three selected emotions for 4 of the 11 clips.

Although *Longing/Nostalgia* was overall a fairly significant emotion with 9.59% of the overall selections it was decided that it would be left out. Throughout all of the clips the amount of people selecting this emotion varies between 10 and 6, this was not deemed as a significant enough change, and overall the percentage for each individual clip remained fairly low. The overall percentage was

quite high due to the amount of people selecting each clip remaining at a constant level throughout. By not including this emotion it also helped to keep the variables at a more manageable level.

5.2.2.5 *Construction*

Table 5.5 Tally and percentage of selected emotions for Construction ambience

Emotion	Number of times Selected	Percentage
Irritation/Anger	**459**	**47.03**
Contempt/Scorn	**61**	**6.25**
Disgust/Repulsion	**62**	**6.35**
Envy/Jealousy	8	0.82
Disappointment/Regret	21	2.15
Guilt/Remorse	21	2.15
Shame/Embarrassment	8	0.82
Worry/Fear	**55**	**5.64**
Sadness/Despair	19	1.95
Pity/Compassion	4	0.41
Involvement/Interest	**80**	**8.20**
Amusement/Laughter	31	3.18
Pride/Elation	5	0.51
Happiness/Joy	19	1.95
Enjoyment/Pleasure	12	1.23
Tenderness/Feeling Love	3	0.31
Wonderment/Feeling Awe	8	0.82
Feeling Disburdened/Relief	10	1.02
Astonishment/Surprise	12	1.23
Longing/Nostalgia	15	1.54
None of the listed emotions	63	6.45

Total	**976**	**100**

Instantly it became obvious that the strongest emotion felt towards the ambience of construction is *Irritation/Anger* with 47.3% of all selections, therefore it was chosen to be used in the grading tests.

Worry/Fear was also chosen as a significant emotion, varying between 0% and 14.3% of people selecting the emotion over different edits of the ambience.

Involvement/Interest was selected because of the high overall percentage. For 10 of the 13 clips *Involvement/Interest* was in the top three selected emotions for this ambience.

The next emotion selected was *Disgust/Repulsion*. The overall percentage of people selecting these emotions was lower for this ambience because of *Irritation/Anger* taking most of the votes. This being said the emotion of *Disgust/Repulsion* showed a good amount of variation in strength, differing between 0% and 10.3% with a good selection of percentages in between.

The final emotion selected for the ambience of construction was *Contempt/Scorn*. Varying between 3.9% and 13.2% there was a good amount of variation showing that the level of the emotion changed through the different edits.

All of the other emotions were not deemed as significant enough to justify being used for the grading tests.

5.2.2.6 *Tweets*

Table 5.6 Tally and percentage of selected emotions for Tweets ambience

Emotion	Number of times Selected	Percentage
Irritation/Anger	38	4.13
Contempt/Scorn	5	0.54
Disgust/Repulsion	9	0.98
Envy/Jealousy	5	0.54
Disappointment/Regret	14	1.52
Guilt/Remorse	8	0.87
Shame/Embarrassment	4	0.44
Worry/Fear	10	1.09
Sadness/Despair	22	2.39
Pity/Compassion	11	1.20
Involvement/Interest	41	4.46
Amusement/Laughter	18	1.96
Pride/Elation	29	3.16
Happiness/Joy	**199**	**21.65**
Enjoyment/Pleasure	**110**	**11.97**
Tenderness/Feeling Love	**57**	**6.20**
Wonderment/Feeling Awe	**88**	**9.58**
Feeling Disburdened/Relief	**106**	**11.53**
Astonishment/Surprise	12	1.31
Longing/Nostalgia	**54**	**5.88**
None of the listed emotions	79	8.60
Total	**919**	**100**

It became evident from the start of looking over these results that all of the significant emotions fell in the category of positive emotions. The first chosen was *Happiness/Joy* with the highest selected percentage overall.

The next emotion was *Enjoyment/Pleasure*, with the second highest overall percentage. This emotion remained in the top three most selected for 10 of the 12 clips.

Wonderment/Feeling Awe was also selected. The range of selections throughout the edits varied from 5.2% to 14.7%, this was a good indicator that this emotion would show a good amount of variation between edits in the grading tests.

Feeling Disburdened/Relief was selected not only because of the high overall percentage but also the variation between 5.3% and 19.5%. This was a fairly large difference. It should also be noted that for the majority of the clips the selection level for this emotion remained high.

Tenderness/Feeling Love and *Longing/Nostalgia* were both chosen because of the variation in their selections over the different clips. *Tenderness/Feeling Love* varied between 2.6% and 15.1%. *Longing/Nostalgia* varied between 1.3% and 10.3%. These changes in percentage as well as the emotions both having some of the highest overall percentages meant that both would be carried through to the grading tests.

5.3 *Determining the Strength of Perceived Emotions*

5.3.1 *Statistical Analysis Model*

All of the results have been normalised according to BS1116 recommendation in case the listeners have used the grading scale in different ranges. The results have been normalised using the below equation:

$$\mathrm{Z}_i = \frac{X_i - X_{si}}{S_{si}} \times S_s + X_s$$

Where:
Z_i = Normalised Result
X_i = Score of subject *i*
X_{si} = Mean score for subject *i* in session *s*
X_s = Mean score of all subjects in session *s*
S_s= Standard deviation for all subjects in session *s*
S_{si} = Standard deviation for subject *i* in session *s*

With the results normalised the analysis will consist of a One-Way ANOVA test for each independent variable, with the dependent variables consisting of the tested emotions. By using ANOVA as a method of statistical analysis an F-ratio can be worked out. The F-ratio is the important factor in the results and can be worked out in this way:

$$\mathrm{F} = \frac{MS_M}{MS_R}$$

Where MS_M corresponds to the Model Mean Square (between groups) and MS_R corresponds to the Residual Mean Square (within groups).

The F-ratio shows the ratio of the variation that is explained by the model to the variation that is explained by unsystematic errors, if the F-ratio is found to be less than 1 then this is classed as a non-significant effect. The higher the F-ratio is the more variations that can be explained by the model and therefore increasing the chance of the results being reproducible, there is always the possibility that the F-ratio has occurred through chance, the confidence interval (labelled Sig. in the

tables) shows how likely the F-ratio size could have been obtained if the population were not subjected to the stimuli. In this study a confidence interval of .05 will be used, this means that if the F-ratio is found to have a confidence interval (CI) of .05 or less then the results show a statistically significant difference (in other words with a CI of .05 there is just a 5% chance that the results happened by chance).

An example of an ANOVA table would look similar to this:

Table 5.7 Example of ANOVA table

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Emotion 1	Between Groups	103.562	6	17.260	12.883	.000
	Within Groups	1116.008	833	1.340		
	Total	1219.570	839			

With this method of analysis, if the F-ratio was seen as significant (with a confidence interval of .05 or lower) then it would show there to be a significant difference in strength of the listed emotion between two or more edits of the independent variable. This is where the limitations of ANOVA begin to show as there is no way of determining which edits are showing a significant change, to find this out a *Bonferroni* post hoc test was also carried out.

The *Bonferroni* test method consists of a number of pairwise comparisons in which every possible combination between the different edits is compared so as to be able to show where the significant differences are within the independent variable.

The *Bonferroni* table would be presented like this:

Table 5.8 Example of *Bonferroni* post hoc test table

Multiple Comparisons							
Bonferroni							
Dependent Variable	(I) Tools	(J) Tools	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Emotion 1	Variable 1	Variable 2	.342	.149	.472	-.11	.80
		Variable 3	.417	.149	.114	-.04	.87
		Variable 4	-.400	.149	.159	-.86	.06
		Variable 5	-.233	.149	1.000	-.69	.22
		Variable 6	-.258	.149	1.000	-.71	.20
		Variable 7	-.608*	.149	.001	-1.06	-.15
	Variable 2	Variable 1	-.342	.149	.472	-.80	.11
		Variable 3	.075	.149	1.000	-.38	.53
		Variable 4	-.742*	.149	.000	-1.20	-.29
		Variable 5	-.575*	.149	.003	-1.03	-.12
		Variable 6	-.600*	.149	.001	-1.06	-.14
		Variable 7	-.950*	.149	.000	-1.41	-.49

By utilising the *Bonferroni* post hoc test more accuracy can be achieved during the analysis as specific edits can be singled out as main contributors to a significant change in emotion. In this case there is a statistically significant change in the emotion between Variable 1 and Variable 7 with a mean difference of -0.608, this is a significant value as the interval scale for the emotions is between 0 and 4, a mean difference of this number is therefore sizable. To help visualise the results found in the ANOVA and *Bonferroni* analysis models error bar graphs will also be included.

With the information obtained through the explained statistical analysis method a firm understanding of the results can be achieved. From this a discussion as to the likely reasons why these certain results were obtained will be included to bring further insight to the results.

5.3.2 *Using the Findings in a Practical Environment*

The rest of the chapter will discuss the results, findings and potential practical implications for each ambience, this should add some insight and context, however to use these ambiences in a practical environment some more information is needed. In Appendix B there are a number of tables showing the means of the results. To use the data that has been collected in this study for practical purposes these are the tables that should be referred to. However to understand the trends that have been found in the ambiences as well as a discussion on the findings it is recommended to read through the results and analysis first.

The tables in Appendix B are similar to the one shown below:

Table 5.9 Example of Appendix B table showing variable, emotion, mean level and lower and upper bound of confidence interval for mean level

			Confidence interval (95%)	
Independent Variable	Emotion	Mean	Lower Bound	Upper Bound
1	Emotion 1	2.42	2.21	2.63
2		2.08	1.86	2.30
3		2.00	1.80	2.20
4		2.82	2.62	3.02
5		2.65	2.45	2.85
6		2.68	2.48	2.88
7		3.02	2.81	3.23

The most important part of this table is the mean; this will show (on a scale of 0 to 4) the strength of the emotion. If there is no plan of altering the ambience to change the emotional levels in a film scene (if just one emotional level is required) then this is all that is needed. If a number of edits are

wanted to increase or decrease a certain emotion then the upper and lower bound columns also need to be taken into account. These columns show the lowest and highest emotional levels that may be elicited for that specified edit (with the 95% confidence interval this means that there is only a 5% chance of the emotional level being outside of this bracket), if a significant difference in the emotion is required then, out of the two edits that are being used to alter the emotion, the lower bound of the highest mean should be compared with the upper bound of the lowest mean, if the lower bound is higher than the upper bound then there is a significant difference and so it is very likely that there will be a change in the emotional level.

An example of this from the above table would be: if the desired result is to lower emotion 1 then it would be possible to use independent variable 7 (IV7) and then transition it to independent variable 1 (IV1), the mean of IV7 is 3.02, whereas it is 2.42 with IV1 which is certainly a drop in level, to check that this is a significant drop the confidence interval needs to be taken into account. As IV7 has the higher mean the lower bound of that confidence interval will be used, which in this case is 2.81, when comparing this to the upper bound of IV1, which is at a level of 2.63 it is evident that there is a significant drop in the emotion as the lower bound figure of IV7 is higher than the upper bound of IV1. This means there is no crossover, thus showing that this would be an efficient pair of edits to use when lowering the strength of Emotion 1.

To work out the lower bound and upper bound statistics the below equation was used:

$$\text{Lower Bound} = \bar{X} - (1.96 \times \text{SE})$$

$$\text{Upper Bound} = \bar{X} + (1.96 \times \text{SE})$$

Where $\bar{X}$ = Mean and SE = Standard Error.

Between -1.96 and 1.96 is where 95% of *z*-scores fall (a z-score is a score from a normal distribution with a mean of 0 and standard deviation of 1), this is where the 1.96 in the equation derives from.

5.3.3 *Results and Analysis*

5.3.3.1 Construction

Tool Types		F	Sig.
Irritation	Between Groups	12.883	.000
Contempt	Between Groups	7.695	.000
Disgust	Between Groups	10.829	.000
Worry	Between Groups	4.297	.000
Interest	Between Groups	0.680	0.67

Table 5.10 ANOVA table for Tool types variable of construction ambience

Density		F	Sig.
Irritation	Between Groups	21.291	.000
Contempt	Between Groups	8.852	.000
Disgust	Between Groups	14.507	.000
Worry	Between Groups	2.998	.030
Interest	Between Groups	0.376	0.77

Table 5.11 ANOVA table for Density variable of construction ambience

The F-ratio of Involvement/Interest is 0.68, this is below 1 and shows that there is more unsystematic than systematic variance. With a Significance level of 0.67 this shows that there is a 67% chance that any variances found within the results could be replicated without the addition of the stimuli. What this means is that by changing the type of tools used in the construction ambience there is no significant change in the emotion of Involvement/Interest and so it has been discounted as an emotion that can be altered by the construction ambience. This is further justified when analysing the independent variable of density (the amount of tools layered together) with an F-ratio of 0.38 and a significance level of 0.77 there is a 77% chance that the results could be replicated without the addition of the test material.

There are however statistically significant F-ratios for the rest of the emotions as shown in the ANOVA table. With the F-ratios being greater than 1, and all with a significance of .000 there is very

little chance that these results could happen if there was no influence in the population. This is once again further justified when analysing the independent variable of density.

In the *Bonferroni* Post hoc test it becomes evident that the majority of the significant variances come from the density; whether it's more layers of the same tools, more layers of different tools or a mixture of both there is an evident increase in a selection of the emotional families.

There is a marked increase in emotional level between the hammer on its own and when there is more than one tool layered together, the same can be said when comparing the saw with multiple tools.

Table 5.12 Bonferroni table showing comparisons of Hammer edit with all other edits and Saw edit with all other edits

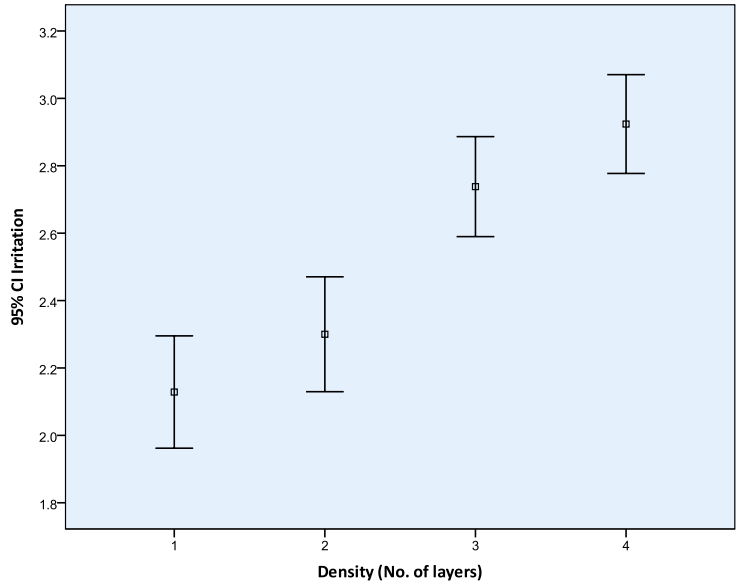
Dependant Variable	(I)Tools	(J)Tools	Mean Difference(I–J)	Sig.
Irritation	Hammer	Drill	-.34	.371
		Saw	.07	1.000
		Drill+ Hammer	-.74	.000
		Drill + Saw	-.58	.001
		Hammer+ Saw	-.60	.001
		All	-.95	.000
	Saw	Drill	-.42	.081
		Hammer	-.07	1.000
		Drill+ Hammer	-.82	.000
		Drill + Saw	-.65	.000
		Hammer+ Saw	-.67	.000
		All	-1.02	.000

As can be seen there are significant differences between the single tools of hammer and drill and the multiple tools. The main difference being between Saw and all of the tools together with a mean

difference of -1.02 this shows that, with the emotion of Irritation/Anger, there is an increase of one level on the emotion scale when all of the tools are played together when compared to a saw being played on its own.

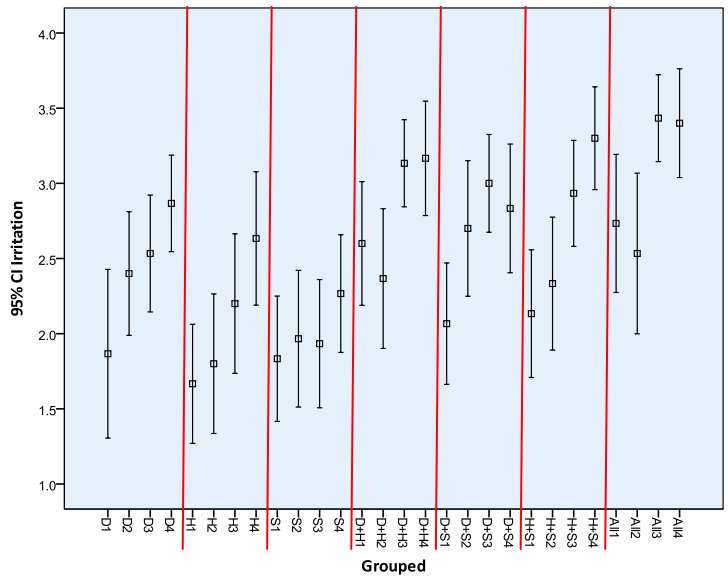
In terms of density (the number of layers for each tool) there are evident increases in the emotions as the density increases, as can be seen in this error bar graph showing the effect density has on the emotion of irritation/anger:

Figure 5.1 Error Bar graph showing effect of density in the construction ambience towards the emotion of irritation



As can be seen in the graph there is a significant difference between lesser number of layers and the larger number, particularly between one layer and four. This remains the case for the emotions of Contempt and Disgust; however there are no significant differences for the emotion of worry. By increasing the amount of tools as well as the amount of samples used for each tool there is a definite increase in the emotions, with a number of significant effects comparing one layer for each tool and four as can be seen in the graph below for Irritation/anger:

Figure 5.2 Error Bar graph showing effect of all edits in the construction ambience towards the emotion of irritation



D = Drill, H = Hammer, S = Saw. The number at the end of each of the 'Grouped' labels shows how many layers of each tool there is. The red lines have been used to split types of tools, so it is easier to see the increase in density over the four edits.

Discussion

There are a number of factors that may have contributed towards the obtained results. The building in density means that the sounds begin to mask any other ambiences that may be present, this could be seen as a major source of irritation and disgust as the very unnatural, intrusive sound of construction builds in density, the less tools being used the less intrusive the overall sound is. The combination of the different types of tools may also have been a contributing factor in building these negative emotions, the constant high frequency of the drill coupled with the loud staccato of the hammers is very difficult to mask with other sounds.

In terms of a practical application of this ambience, it is evident that it would be very affective as a method of crescendo, building the layers of construction sounds to build on the emotions of irritation, contempt, disgust and worry. With this knowledge it would also be possible to decide the strength of these negative emotions, if, for example, one hammer sample was used there is a good chance of eliciting the emotion of Irritation at a level (using the Geneva Emotion Wheel scale) of 1.67 with the lower bound 95% confidence interval being 1.30 and the upper bound being 2.04, whereas using a construction ambience with all of the tools used in this study with four layers of

samples for each tool, there is a strong chance of eliciting the emotion of irritation at a level of 3.40, with the lower bound being 3.05 and the upper bound being 3.80. To view the results table and find what edits have significant differences please refer to Appendix B.

5.3.3.2 Traffic

Speed (30,50,70mph)		F	Sig.
Involvement	Between Groups	4.204	.015
Irritation	Between Groups	40.644	.000

Table 5.13 ANOVA table for speed variable of traffic ambience

Gear (High/Low)		F	Sig.
Involvement	Between Groups	2.641	.105
Irritation	Between Groups	2.257	.133

Table 5.14 ANOVA table for gear variable of traffic ambience

Delay (0.5,1,2,3Seconds)		F	Sig.
Involvement	Between Groups	1.246	.292
Irritation	Between Groups	3.427	.017

Table 5.15 ANOVA table for delay variable of traffic ambience

By looking at the ANOVA tests of the three independent variables it becomes apparent that the main contributing variance is that of Speed. Looking at the emotion of Irritation there is an F-Ratio of 40.644 this is a very large F-ratio and with a significance level of .000 there is extremely little chance that this increase in emotion could be replicated without the addition of the stimulus. When using the *Bonferroni* post hoc test there is a significant difference (in this case it is .000) found between 70 and 30mph with the emotion of Irritation/Anger, with a Mean difference of .917 when increasing the speed. There is also a smaller but none the less significant difference between 30 and 70mph for the emotion of involvement/interest, with a mean difference of -0.25 there is certainly an increase in the emotion as the speeds increase.

In terms of delay times there is another significant F-ratio, the significant difference is found between 0.5 seconds and 3 seconds delay times, with a mean difference of .361 there is certainly a decrease in the emotion of Irritation/Anger as the delay between samples increases, thus lowering the overall density.

The main points that can be gathered from these results is that the main variable to concentrate on is that of speed, which has a significant impact on the emotion of Irritation/Anger, and to a lesser degree that of Involvement/Interest. By increasing the speed both emotions will also increase in strength.

Discussion

The main cause of the increase in irritation is that of speed, the reasoning behind this could be the fact that as cars increase in speed their sonic identity also changes; at 30mph the engine will have lower revs, which means the frequency range will be lower, the build up of the sound as it approaches will also take longer, making it less of a shock as the car passes the listener. Alternatively as the speed increases to 70mph the revs increases the higher frequencies whilst also making them more strained and with an increase in volume, this makes the overall sound of the engine more intrusive, also because the car is going faster there is a shorter build-up before the car passes, this would make it more of a shock to the listener. By having more 70mph samples the ambient sound becomes more intrusive as the volume increases.

This ambience when used in a practical environment would work well in situations such as a car chase or a stressful action filled urban sequence. By using traffic going at 70mph there is a good chance that the irritation and in turn stress levels will be around 2.26 with the lower bound of the confidence interval being 2.12 and the upper bound being 2.40, this would help in increasing the stress of an action scene. It would also be possible to later show that the situation had calmed by replacing the 70mph samples with 30mph ones to lower the feeling of irritation to a level of 1.35 with the lower bound of the confidence interval being 1.21 and the upper bound being 1.49.

5.3.3.3 Rain

5.3.3.3.1 Detail to General

Density (1-15 layers)		F	Sig.
Disappointment	Between Groups	1.119	.339
Relief	Between Groups	4.012	.000
Happiness	Between Groups	2.015	.016
Sadness	Between Groups	2.445	.003

Table 5.16 ANOVA table for density variable of detail to general edit of rain ambience

It is evident from this ANOVA table that the emotion of Feeling Disburdened/Relief has a significant difference found between a number of the layers, it also has the highest F-ratio and lowest significance level, both happiness/joy and sadness/despair are also found to have significant differences brought about by the stimuli with significance levels below 0.5.

When examining the *Bonferroni* post hoc there is a very evident decrease in the emotion of feeling disburdened/relief as the density increases. The most extreme example can be found between one layer and fifteen, there is a Mean difference of 1.133 with a significance level of .001. This shows that there is a drop of over one level when the amount of layers is increased from 1 to 15. For a better visualisation this has been shown in the below error bar graph:

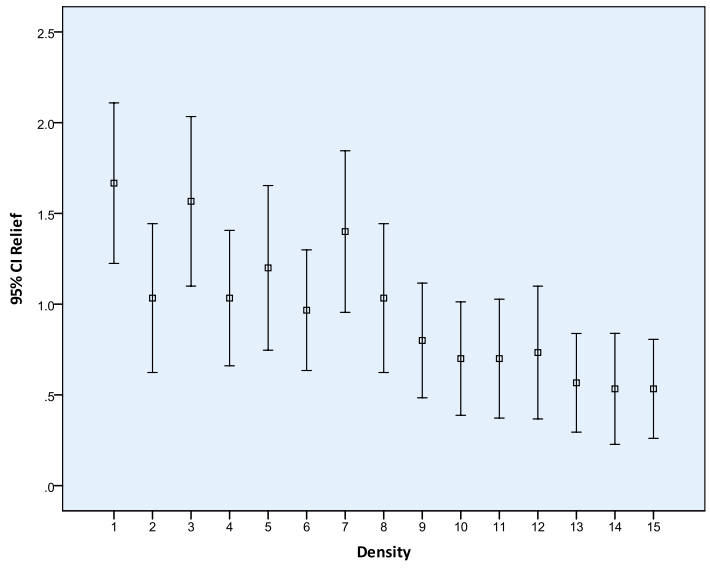


Figure 5.3 Error bar graph showing effect of density in the detail to general rain ambience towards the emotion of Relief

When building the density of the rain ambience from detailed tracks through to general ones there is a significant decrease in the emotion of feeling disburdened/relief.

This is the main point that can be taken from this ambience, although Sadness showed a significant difference between the density of 3 layers and 11 with a mean difference of 1.100 and a significance level of .003, there was no real trend to be found as the majority of the layers showed no significant difference in emotion between one another.

Discussion

A possible reason why there is a decrease in level of the emotion relief as the density builds is that of the sample track order. Because the detailed tracks were used first the sound lacked the broadband frequencies that a full rain storm would have, this meant it sounded more of a light drizzle, as the other tracks are introduced the frequency range increases until the ambience resembles the sound of heavy rain fall, by having the ambience sound like a drizzle at the start meant that there is a greater contrast between the first edits and the last, as the ambience becomes more like a down pour the frequency range increases until all other sounds are masked, this could be a contributing factor as to why the emotion of relief decreases. There is also the potential thought of being caught in a down pour, which may also have an impact on the level of relief felt.

A practical use of this ambience could be as a method of eliciting the emotion of relief through fading out layers of the rain ambience. By starting with the full 15 layers during an intense scene, be it through action or a heated argument, a base level could be achieved in which to be able to increase the feeling of relief as the intensity decreases, by the point in which the ambience has only one layer there is a good chance that the emotional level of relief would be 1.67 with the lower bound of the confidence interval at 1.24 and the upper bound at 2.10. It is possible that the level would be higher under these circumstances, as the intense situation has subsided the feeling of relief would be a natural reaction the rain ambience being used as a tool to further emphasise this.

5.3.3.3.2 General to Detail

Density (1-15 Layers)		F	Sig.
Disappointment	Between Groups	1.690	.060
Relief	Between Groups	1.691	.060
Happiness	Between Groups	1.435	.140
Sadness	Between Groups	2.184	.010

Table 5.17 ANOVA table for density variable of general to detail edit of rain ambience

The emotions of Disappointment/Regret, Feeling Disburdened/Relief and Happiness/Joy have low F-ratios with significance levels that exceed the confidence interval they cannot therefore be seen to have any significant differences occurring due to the stimuli. Sadness and despair's F-ratio is 2.18, which is better than the other emotions however still fairly low. Sadness/despair does have a significance level of .01 which shows that there are some instances in which there is a significant difference because of the test itself, however looking at the *Bonferroni* post hoc test it is apparent that there are none. Although there are a number of Mean Differences such as between layers 2 and 14 that exceed 0.8 the significance levels are too high and so cannot therefore be seen to be as a direct result of the test.

Overall it is evident that building the density of the rain ambience from general tracks through to detailed shows no real change in emotions, no trends can be found and therefore this is not an efficient use of the ambience with the detail to general edit eliciting more emotional differences throughout the edits.

Discussion

A reason as to why editing rain ambience from the general tracks to the detailed ones had no significant outcome is that there is very little contrast throughout. The first track is a general recording of rain, a very broadband sound with little detail, as the tracks build the ambience remains as a down pour only changing slightly with intensity and detail, without the contrast that the detail to general edits had there is understandably much less of any emotional changes to the ambience.

5.3.3.4 Sea

5.3.3.4.1 Detail to General

Density (1-16 Layers)		F	Sig.
Relief	Between Groups	7.210	.000
Enjoyment	Between Groups	3.076	.000
Happiness	Between Groups	6.911	.000
Irritation	Between Groups	2.299	.004
Wonderment	Between Groups	.381	.984
Worry	Between Groups	9.874	.000

Table 5.18 ANOVA table for density variable of detail to general edit of sea ambience

All emotions but Wonderment/Feeling Awe show there to be significant differences, with Worry showing the highest F-ratio with a significance level of .000 showing that the emotional levels have a high chance of being due to the ambience.

With the aid of the *Bonferroni* post hoc test it is evident that, with the emotion of feeling disburdened/relief, there is a significant drop in level as the density increases. The highest Mean difference being between 2 layers and 14 (1.9 with a significance level of .000) this difference of almost two levels shows how affective the increase in density is at dropping the level in the emotion of feeling disburdened/relief.

The emotion of enjoyment/pleasure also shows a drop in levels as the density increases, although less so than feeling disburdened/relief, the highest Mean differences is between 1 layer and 13 (1.27 with a significance level of .005) this too is a significant difference, it is evident however that feeling disburdened/relief had a smoother, more visible drop in level and with a more significant difference between the first few layers and the final few, as shown in the line graphs below:

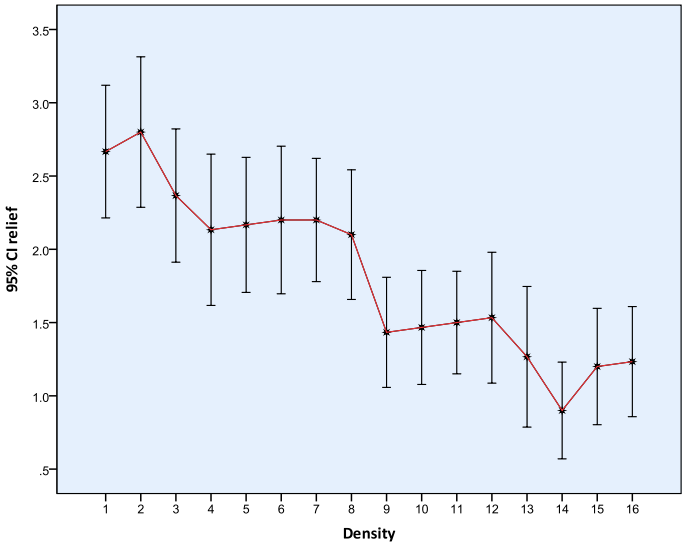


Figure 5.4 Error bar graph showing effect of density in the detail to general edit of sea ambience towards the emotion of Relief

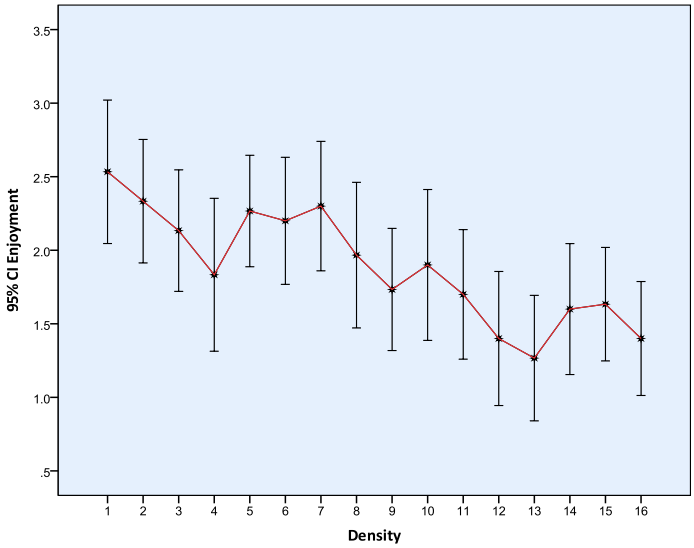


Figure 5.5 Error bar graph showing effect of density in the detail to general sea ambience towards the emotion of Enjoyment

The emotion of happiness/feeling awe also shows a significant drop as the density increases, there does in this instance appear to be a point in which the emotion visually drops between 8 layers and 9, which can also be seen in the disburdened/relief error bar graph above.

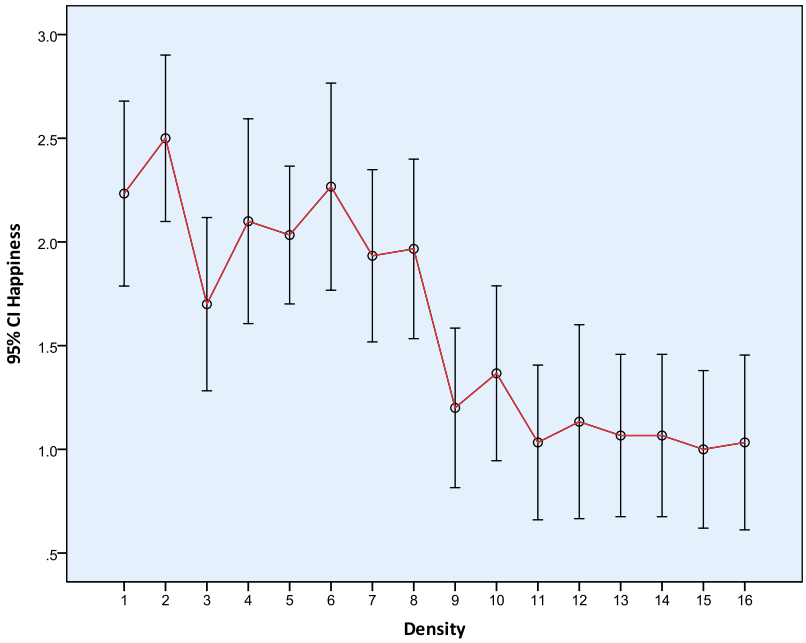


Figure 5.6 Error bar graph showing effect of density in the detail to general sea ambience towards the emotion of Happiness

The first 8 edits (leaving out the 3 layers edit as there are no significant differences to be found) show a high number of significant differences with the final 8 edits, the largest mean difference being between 2 layers and 15 (1.50 with a significance level of .000).

Although in the ANOVA test the emotion of Irritation/Anger was deemed to be significant with a F-ratio of 2.299 and a significance of .004 there is no significant mean differences found within the *Bonferroni* post hoc test, a reason for this could be that this post hoc test corrects the level of significance for each comparison so that the type I error rate remains at .05 (with a confidence interval of 95% there is still a 5% chance that the test model will deem the data to have a genuine effect on the population even though it has not, the more data there is the larger the chance of this error happening, this is a Type I error), by being more conservative in the type I error rate for each comparison, in this case by lowering the confidence interval, there is a greater risk of a type II error, in which a genuine effect gets rejected because it does not meet the more stringent confidence intervals. This is certainly a limitation of the *Bonferroni* post hoc model, however the large majority of the comparisons show a significance of 1.000 a significance of this high a level shows that there are no real trends with only a small number of comparisons showing less than this number.

The final emotion is that of Worry/Fear, this emotion has the highest F-ratio showing that it should have a higher amount of genuine effects. The *Bonferroni* post hoc test shows a very similar set of comparisons to those of happiness/joy with the first eight edits showing significant differences to the final 8 (excluding the edit with 11 layers, which shows no significant differences between any other edit).

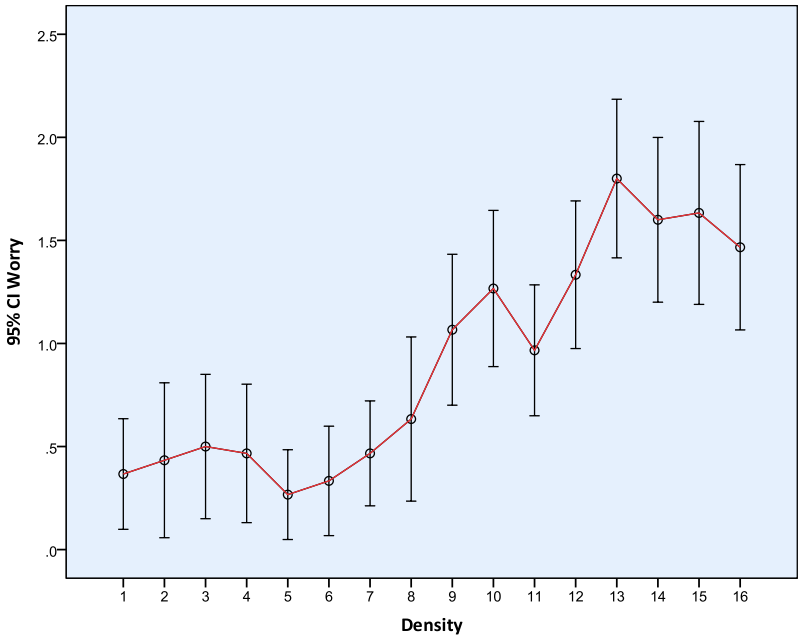


Figure 5.7 Error bar graph showing effect of density in the detail to general sea ambience towards the emotion of Worry

The other difference is that this is deemed as a negative emotion whereas the other significant emotions were of a positive nature, this is evident in the above error bar graph as the density increases so too does the level of Worry/Fear, the other emotions showed a drop in levels with the increase in layers.

The main points that can be established from these results are that as the density increases (from detailed tracks through to general tracks) positive emotions of relief, enjoyment and happiness drop in level, whilst the negative emotion of worry/fear increases. The two prominent emotions are that of worry/fear and Happiness/joy, with feeling disburdened/relief also showing significant results.

Discussion

This is certainly the most effective ambience at eliciting both negative and positive emotions depending on which edit is being used. A reason why this occurs would be due to pre-conceived notions of the sea. The early tracks represent a calm sea with an audible sound of trickling water, this, as found in the transitional piece mentioned earlier in this study, could elicit memories of being at the beach or on holiday, making it a relaxing sound. As the track increases in density it also increases the overall ferocity of the sea until the full density is reminiscent of an ocean storm, this

could not be deemed as anything other than stressful or worrying as the ocean in this way could easily engulf anything confronting it.

There is a clear shift in level between 8 layers and 9 layers for the emotions of worry, happiness and relief. The difference in these two tracks is one layer, a 'breaking waves' sample, it could be that the introduction of hearing breaking waves is what shifts the perception of a calm ocean to a choppy threatening one, potentially also eliciting the feeling of actually being in, or very near to, the water instead of being at a distance from it.

A practical use of this ambience would work in films such as *Cast Away* or films set near or on the sea. The results achieved in this study could help build a character for the sea, by using the different density tracks to instil different emotional reactions based on what is wanted for the film's scene. For instance starting at 11 tracks of density there is a good chance of heightening the feeling of worry and dread, at a level of 0.97 with the lower bound of the confidence interval being 0.66 and the upper bound being 1.28, it would then be possible to build upon this density to increase the fear of a scene, by adding two extra densities it is possible to gain a statistically significant increase in this emotion. By having a density of 13 there is a strong chance of achieving an emotion level of 1.80 with a lower bound of 1.43 and an upper bound of 2.17. Alternatively it could be used to diminish the feeling of worry and instil the feeling of relief, for example starting with a density of 13 the level of worry would be the same as what was explained earlier, while the emotion of relief would most likely have a level of 1.27 (which is a substantial drop from the smaller density tracks) with a lower bound of 0.82 and upper bound of 1.72, as the scene calms from the action it would be possible to reduce the density of the ambience, if it were reduced to 7 layers then the emotion of worry would be at a level of 0.47 with a lower bound of 0.24 and upper bound of 0.71, with the emotion of relief raised to 2.20 with a lower bound of 1.79 and upper bound of 2.61. As is evident this is an effective ambience to be able to significantly change the emotional reactions.

5.3.3.4.2 General to Detail

Density		F	Sig.
Disburdened	Between Groups	7.558	.000
Enjoyment	Between Groups	9.501	.000
Happiness	Between Groups	3.708	.000
Irritation	Between Groups	1.756	.048
Wonderment	Between Groups	.716	.748
Worry	Between Groups	3.028	.000

Table 5.19 ANOVA table for density variable of general to detail edit of sea ambience

As with the detail to general edits, all but wonderment/feeling awe were found to be significant. The emotion of Feeling Disburdened/relief has a high F-ratio of 7.56 with a significance level of .000 showing that there is some significant effects caused by the testing material. When viewing the *Bonferroni* results it becomes evident that, like with the detail to general version, as the density increases the level of the emotion decreases, with significant differences being found throughout as shown by the below error bar graph:

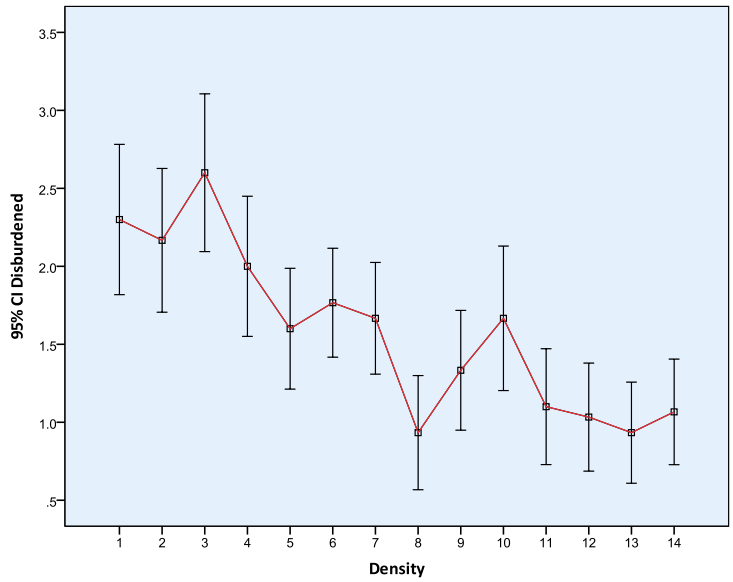


Figure 5.8 Error bar graph showing effect of density in the general to detail sea ambience towards the emotion of Relief

The emotion of Enjoyment/Pleasure shows the largest F-ratio at 9.501 with a significance of .000. The significant differences in this instance do not follow the same trend as has been found with other emotions. The large F-ratio appears to derive from the track with 2 layers, this edit is significantly different to all of the other tracks, with mean differences ranging from 1.300 up to

2.367. There is a slight drop in level as the density increases however there are very few significant effects, the only other being found between 3 layers and 8 and 11 layers.

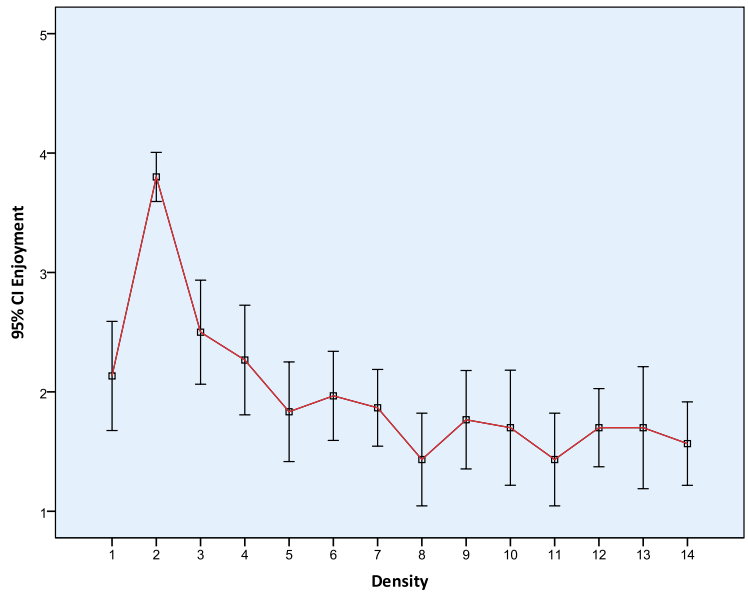


Figure 5.9 Error bar graph showing effect of density in the general to detail sea ambience towards the emotion of Enjoyment

The emotion of happiness/joy in the *Bonferroni* post hoc test shows a drop in level, which is in keeping with the pattern being found when increasing the density of the sea ambience, the mean difference between 1 layer and 14 being 1.167.

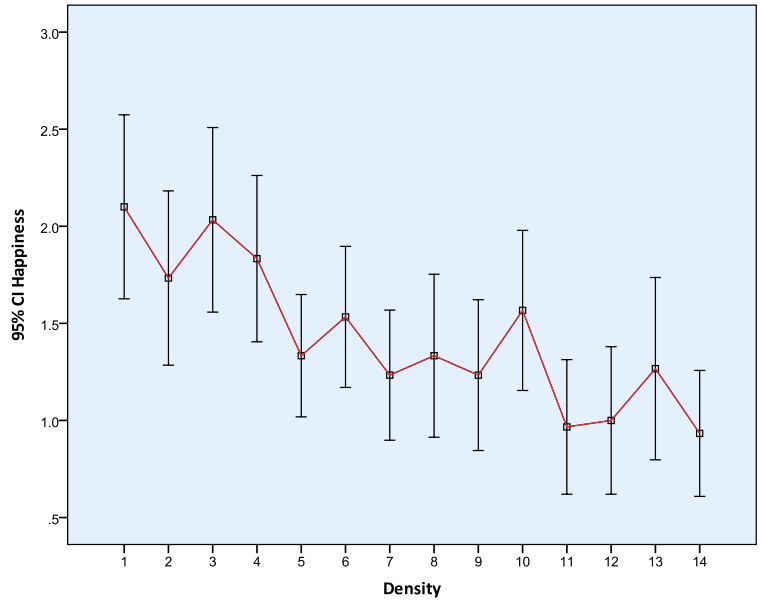


Figure 5.10 Error bar graph showing effect of density in the general to detail sea ambience towards the emotion of Happiness

With regards to Irritation/Anger, as with the detail to general equivalent, although the ANOVA table appears to show there to be significant results, when further analysing the data with the post hoc tests it becomes evident that there are no significant differences between the edits. There is a good chance that the reasoning behind this could be the same as explained for the detail the general version of this emotion.

The emotion of worry/fear shows a significant difference between 11 layers and 5 and 6 layers, 5 and 6 layers have a mean difference of -.800 and significance level of .047 when compared to 11 layers. Although there is an evident rise in level as the density increases, many of the results show no significant effect, it is therefore evident that this is more of a secondary emotion that is not affected in the same way as Feeling Disburdened/Relief.

The main points that can be obtained from these results is that, like with the detail to general version, as the density increases the positive emotions decrease in level and the negative increase. The main emotion to be found is that of Feeling Disburdened/Relief, however overall there is less of a significant emotional effect when editing the sea ambience from general to detail tracks as to when edited from detail to general.

Discussion and practical implications

Many of the reasons as to why these results were obtained will be very similar if not the same as the detail to general version of the edits all be it with less significant differences.

The spike in level with 2 layers for the emotion of enjoyment/pleasure is interesting. The two layers are a general sea ambience recorded from a distance with the ebbing sound of the water coming in and out and a river ambience, which has a bit more detail in the sound of the flowing water. Evidently these two sounds in combination are desirable when listening to the ocean.

In terms of the practical implementation of this edit, it would be better to use the detail to general edits as there are more statistically significant differences throughout. However if the general to detail version were to be used its use would be very similar to that of detail to general.

5.3.3.5 Tweets

Delay		F	Sig.
Relief	Between Groups	1.413	.130
Enjoyment	Between Groups	3.371	.000
Happiness	Between Groups	3.540	.000
Longing	Between Groups	1.680	.047
Tenderness	Between Groups	1.137	.317
Wonderment	Between Groups	3.649	.000

Table 5.20 ANOVA table for delay variable of tweets ambience

Density		F	Sig.
Relief	Between Groups	2.486	.031
Enjoyment	Between Groups	5.031	.000
Happiness	Between Groups	4.343	.001
Longing	Between Groups	3.189	.008
Tenderness	Between Groups	2.896	.014
Wonderment	Between Groups	7.486	.000

Table 5.21 ANOVA table for density variable of tweets ambience

With regards to the independent variable of delay, the emotions of Feeling Disburdened/Relief and Tenderness/Feeling Love, as shown by the ANOVA table, do not show any significant effect on the population when being presenting with the test stimuli of the Tweets ambience, with a significance level of .130 and .317 respectively. The other emotions show some significant outcomes.

With the independent variable of Density (i.e. the number of different samples layered). The only significant results come from the 'Real' bird calls, which tend to have a much higher level overall than the other edits. In terms of the different delay times there is very little change throughout and no easy to determine trends, there does appear to be a drop in level with the emotion of Happiness/Joy when the delay times increase, particularly when two delay times are layered together. An example of this is between the fastest delay times, which would be the overlapping sample coupled with the 0.25 second delay sample, when comparing this to the longest delay times,

which would be 1 second with 3 seconds there is a mean difference of 1.133 with a significance level of .006, showing a sizable drop in the level of happiness as the tweets become slower. This is the main trend that can be found, however there is by no means a large amount of significant data that can be found over the edits.

Discussion and practical implications

Although having a controllable method in which to elicit emotions using the ambience of tweets would have been preferable, it is evident that the manufactured sounds did not evoke the type of emotions that a recording of real bird calls would create. This could be due to the complexities of natural birdcalls, ones that would be near impossible to replicate, are missing from the manufactured calls, because of this it may be that the sounds lack a natural element that would be expected of it, this would understandably result in lower positive emotional levels.

In terms of a practical use, by using real bird tweets there is a strong chance of being able to elicit a number of positive emotions, such as enjoyment, happiness and wonderment. This ambience could be used in many circumstances as the sound of bird tweets can be heard in most habitable areas. The tweets would work best in more upbeat, light hearted and positive situations.

5.3.3.6 Squawks

Delay		F	Sig.
Disappointment	Between Groups	2.122	.010
Irritation	Between Groups	2.548	.002
Sadness	Between Groups	2.091	.011
Worry	Between Groups	1.064	.388

Table 5.22 ANOVA table for delay variable of squawks ambience

The emotion of worry/fear shows no significant impact on the population when presented with the test stimulus of Squawks ambience. The other emotions do, however, show a significant effect. Unlike with the tweets ambience no 'real' edit was used so the significant outcomes shown on the ANOVA table will come from the editing process.

Through further analysing the emotion of disappointment it is apparent that there are no significant differences when comparing the edits. The same is true with that of sadness/despair.

When exploring the *Bonferroni* post hoc table there is one trend that can be seen as the opposite to that of the tweets ambience. As the delay times increase between squawks the feeling of Irritation decreases, so faster tweets results in higher levels of happiness whereas faster squawks results in higher levels of irritation/anger.

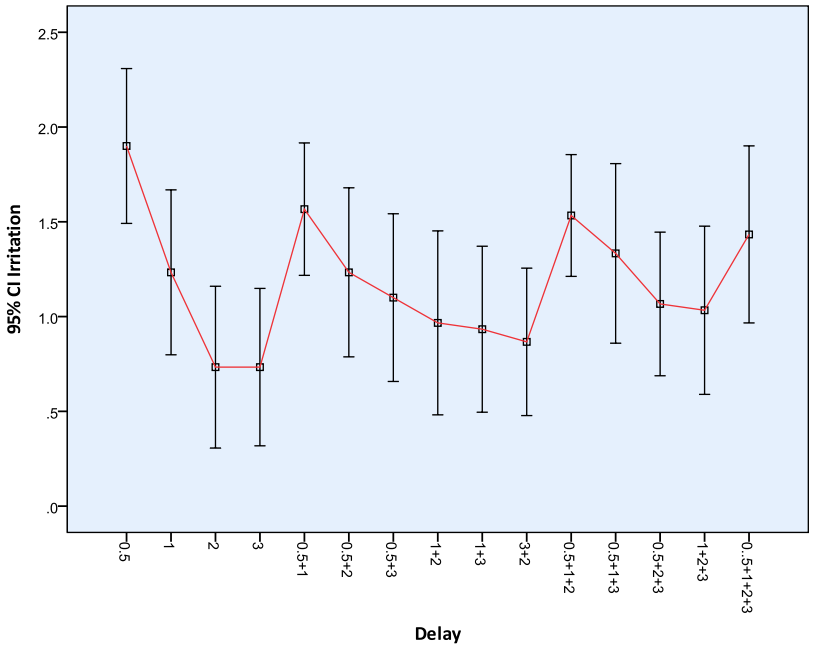


Figure 5.11 Error bar graph showing effect of delay in squawks ambience towards the emotion of Irritation

As with tweets however, there are very few significant effects, with even the trend described above showing a large amount of edits having no significant difference over the others.

Discussion and practical implications

Overall there are only minor changes in the emotional outcome when squawks are used as an ambience. A reason for this could be that the sounds of squawks have become almost a cliché to horror films; this may diminish the overall effect of them due to their overexposure in this area. Another reason could be that it is the idea of the sounds that are creating the emotional level and not the edits, what is meant by this is that although there are few statistically significant differences with the emotional levels they are still being altered because of the ambience, these levels may in

fact represent people's preconceptions of squawk sounds, so although the changes in the ambience are not changing the emotional levels the symbolism of the sound is still creating a certain amount of emotional output. An example of this is the emotion of worry which overall has a mean value of 1.39 with a lower bound of the confidence interval being 1.28 and the upper bound being 1.52, so even though there were no significant changes between the edits the actual emotional level throughout is still fairly high.

In terms of practical use, the ambience of squawks would work in horrors, sinister settings would benefit from the effect. There is a problem of it sounding overly cliché however so the ambience should be used carefully so as not to deteriorate from the experience trying to be achieved.

Chapter 6 - Conclusion

6.1 *Conclusion*

The question asked at the start of this project was whether the ambient track, and more specifically the type of sounds found in the track, can have a set of rules placed on them so they can be manipulated in an easily replicable way and in doing so induce a certain emotional response regardless of the genre or scene of the film, with this it could be said that this study has only been a partial success. With the results that have been achieved it is evident that four of the eight ambiences have enough significant emotional differences to justify being used in a practical environment, the four being Construction, Traffic, Rain (detail to general edit) and Sea (detail to general edit). All ambiences have been done in a way so they can be easily replicated, by using the results tables in Appendix B there is enough information to be able to confidently use the ambiences in the way suggested in chapter 5.3.2 and be able to achieve a certain level of emotion within a confidence range.

The ambience of sea showed the strongest reactions emotionally, with the ability to both elicit positive and negative emotions depending on the density of the sample tracks. Construction showed largely negative emotions, which have been found to increase in level as the density of the tools increase. Traffic increases the feeling of irritation as the speed of the cars within the samples increases. The ambience of rain showed a significant decrease in level for the emotion of relief as the density increased. The other ambiences tested showed some significant differences, tweets for instance showed that real bird calls held high levels of positive emotions, however with these ambiences it was found that there were no discernible trends like with the above material.

One area that has prevented this project from being a complete success is that of time. Because of the scope of this project a number of tests had to be left out. These were practical environment and confirmation tests which would have been done with the same ambience testing material whilst

changing the video that they are accompanied to. These tests would have introduced the ambient sounds to film scenes to see how effective they were in a practical environment. They would also have been able to give a confirmation in terms of the effectiveness of the ambiences, before starting the tests a hypothesis would have been placed on each edit stating what the emotional level was expected be, if the results were within the confidence range of the hypothesis then it could be stated that the ambiences could certainly be used successfully in a film's scene. Unfortunately these tests could not be carried out, and so what has been gained from this study is the knowledge that the four ambient sounds when played on their own with a neutral clip accompanying them are able to alter specific emotional levels. This gives a viable reason to continue research in this area allowing further information to be discovered about the ambiences before being able to confidently say that they will work within a film environment.

Another area that would have been done differently with the knowledge that has been gained over this project is that of the test material. If the tests were to be done again the video clips would be removed so that the ambient sound purely on its own could be tested. A number of comments made by the listeners about the tests mentioned that they found it better to close their eyes so the only stimulus is that of the ambience. Without the clips an emotional level for just the ambience could be gained with no other contributing factors. With the results from the sounds purely on their own they could then be tested in a film environment with the tests mentioned in the previous paragraph. Having done the tests it also became apparent that it would have been best to undergo them all in a live environment to be able to control many more of the variables such as seating positions, listening equipment and acoustics. Although the website was efficient in gaining a high number of results the downside was certainly a diminished amount of control.

In terms of the scope of this project it is evident that to be able to make the use of ambient sounds as an emotional tool worthwhile a much broader set of ambiences would need to be researched, this would offer choice in terms the situations these ambiences can be used in as well as the types of

emotions that could be elicited, unfortunately a wider selection of ambiences could not be achieved in this study due to the time restraints. Also in terms of further research; creating the test material in 5.1 surround sound as well as stereo would allow for a broader knowledge in the efficiency of these ambiences in a format that is more widely used in cinema.

Overall this project has produced a partial success. Through the research it is certainly clear that ambient sounds can be used to elicit and alter the emotional state of the public. The results within this project could be used in a practical situation; however discretion would have to be taken as there have been no tests to confirm that these ambient sounds work as well, in an emotional sense, in a much more complex film environment. These tests would have to be carried out to gain complete confidence in the practical use of the sounds. Although the results in this study are not ready to be confidently used in a practical environment they have certainly helped in progressing the idea of using ambience as an emotional tool in film.

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Appendix A

Figure A.A.1 Geneva Emotion Wheel (As seen on Website)

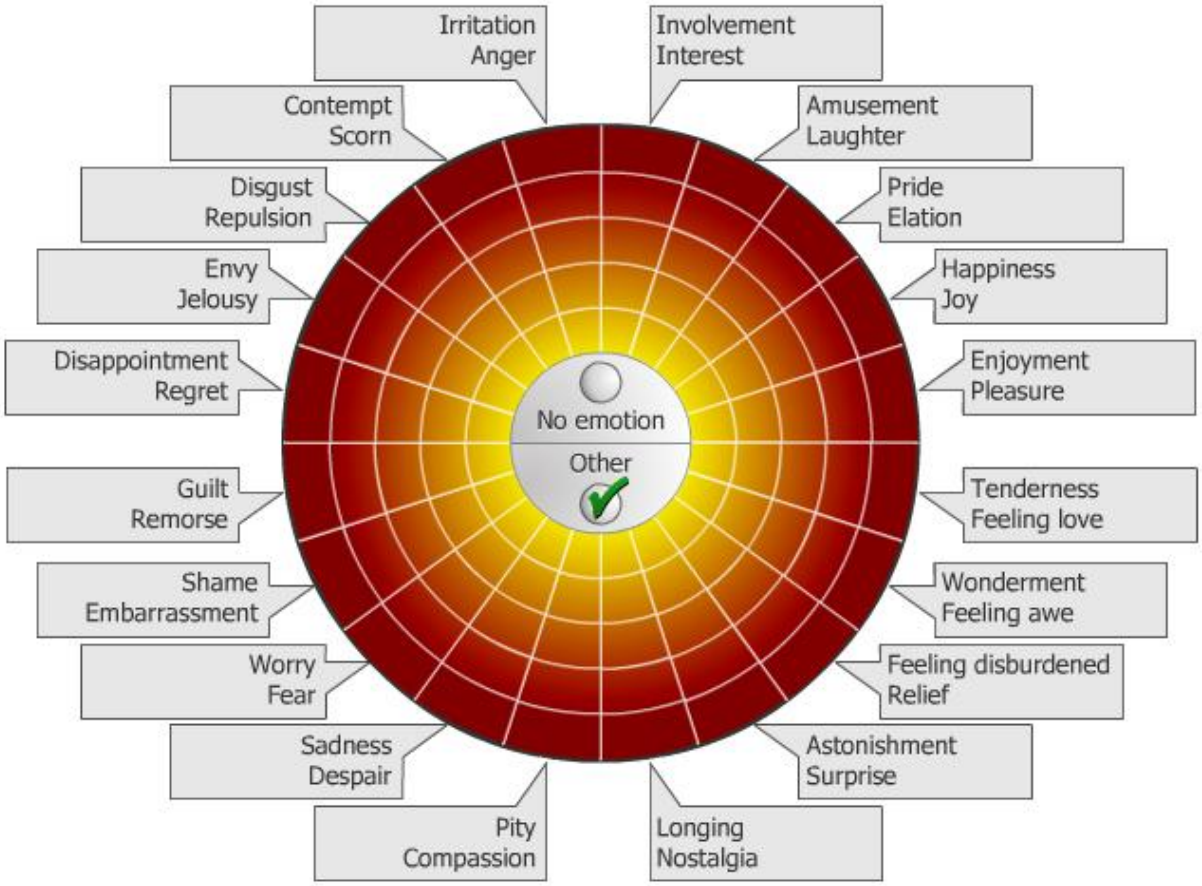


Figure A.A.2 Selection Test Website Instructions

Thanks for taking part in the test! On each page you will have the video and an 'Emotion Wheel'. On this wheel are a number of emotions (the left side of the circle are all negative emotions while the right side are all positive). All you have to do is select the emotion ‘family’ that you feel best represents what you are feeling; you just need to select one emotion per video. It's as simple as that, once finished simply click SUBMIT and then the 'next' button and that's all you need to do for each clip. There are 4 sets, each taking around 15minutes. You don’t have to do them all at once but it would be great if over the next two weeks you could get through all 4. Thanks again and enjoy!

Figure A.A.3 Grading Test Website Instructions

Thanks for taking part in the test! Once you click on a set you will see a video and an 'Emotion Wheel'. On this wheel are a number of emotions. Each type of emotion has two descriptive words; however there are also many more meanings for each of these (E.g. the Irritation/Anger family also covers emotions such as rage, vexation, annoyance, indignation, fury, exasperation, or being cross or mad.)

Whilst watching the clips (paying particular attention to the sounds) consider how strong you are feeling each of the listed emotions. Once the clip has finished simply select the strength that you felt each of these emotions (the further out you click the stronger you felt them). There are five selectable points for each (the point closest to the centre shows a minimum feeling and the point furthest out shows the strongest feeling). Also please make sure you select a strength for all of the emotions.

Once you have completed the clip just click ‘SUBMIT’ and then the ‘NEXT’ arrow to move onto the next one. It’s as simple as that! The sets should take no more than 15 minutes each and all I ask is for you to go through just two of them.

There can be a problem with the EMOTION WHEEL not loading for a video, if this happens simply close and reopen the website and skip the videos up to the one you got up to. To skip just click the next arrow and when asked if you would like to submit just click NO. That should sort out the problem; if not then send me a message to mikebovill99@hotmail.com and I’ll have a look into it.

Thanks again and enjoy!

Figure A.A.4 Geneva Emotion Wheel (As seen in live tests)

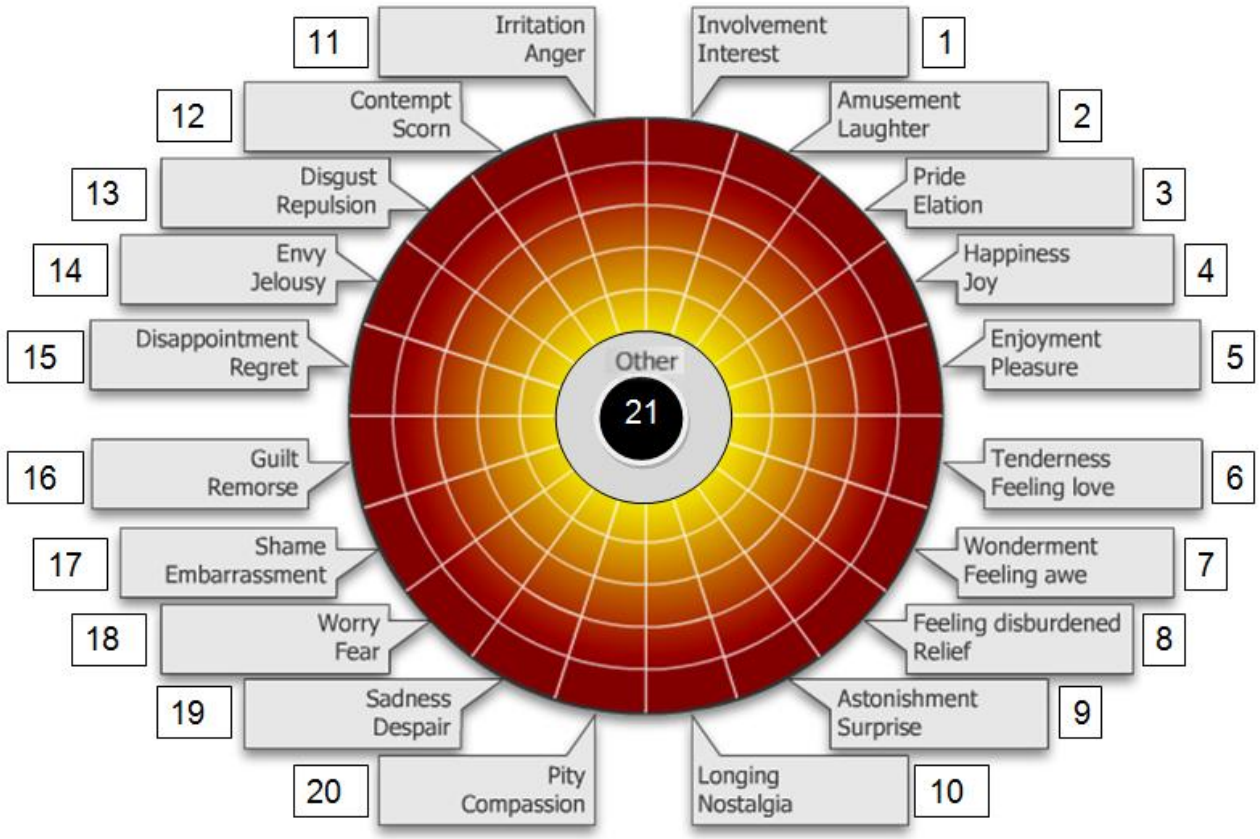
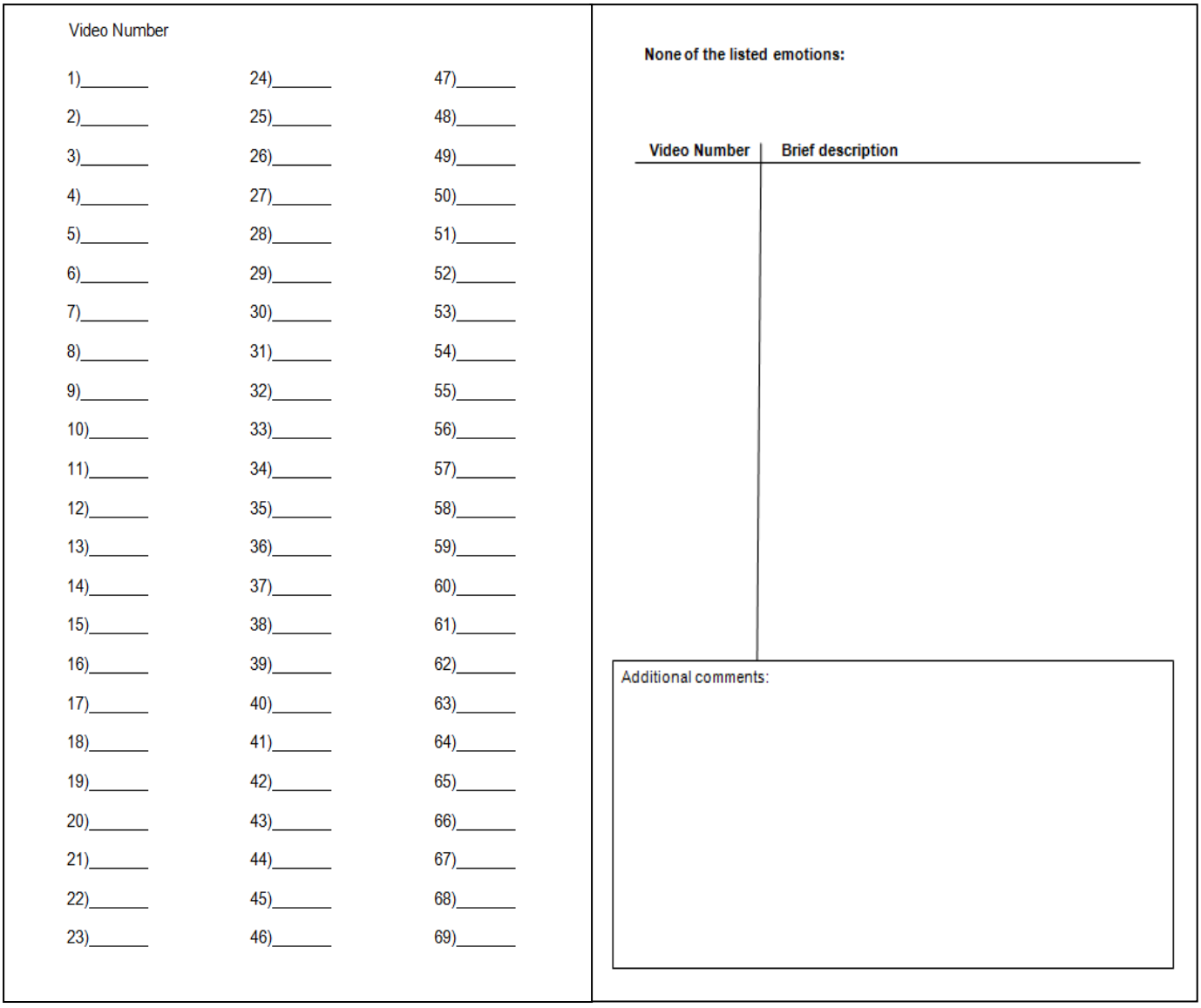


Figure A.A.5 Live Selection Test Questionnaire



Video Number

1)_____	24)_____	47)_____
2)_____	25)_____	48)_____
3)_____	26)_____	49)_____
4)_____	27)_____	50)_____
5)_____	28)_____	51)_____
6)_____	29)_____	52)_____
7)_____	30)_____	53)_____
8)_____	31)_____	54)_____
9)_____	32)_____	55)_____
10)_____	33)_____	56)_____
11)_____	34)_____	57)_____
12)_____	35)_____	58)_____
13)_____	36)_____	59)_____
14)_____	37)_____	60)_____
15)_____	38)_____	61)_____
16)_____	39)_____	62)_____
17)_____	40)_____	63)_____
18)_____	41)_____	64)_____
19)_____	42)_____	65)_____
20)_____	43)_____	66)_____
21)_____	44)_____	67)_____
22)_____	45)_____	68)_____
23)_____	46)_____	69)_____

None of the listed emotions:

Video Number	Brief description

Additional comments:

Video Number pages carried on to number 147

Figure A.A.6 Live Selection Test Instructions

Ambient sounds listening test

You will see that you have 5 sheets (including this one). One sheet has an '*emotion wheel'*, two have a list of numbers from 1) to 147) and one is for additional comments and reasons as to why you felt none of the listed emotions.

The Emotion Wheel has 20 types of emotions listed around it. These emotions are split into two halves, the right half of the circle corresponds to positive emotions, whilst the left corresponds to negative emotions. Each type of emotion has two descriptive words; however there are also many more meanings for each of these (E.g. the Irritation/Anger family also covers emotions such as rage, vexation, annoyance, indignation, fury, exasperation, or being cross or mad.)

First identify approximately what the clip meant to you, paying particular attention to the sound, and choose the emotion family that seems to best correspond to the kind of feeling you experienced when watching the clip, even though the words on the sheet may not capture all facets of your experience. Once you have chosen the emotion family simply write the number of the emotion next to the number that corresponds to the video.

It may be that you don't feel any of the emotions on the wheel correspond to what you feel. In this case write a number 0 next to the video number. If this is the case then please add further information on the sheet provided and describe why none of the options presented is applicable. You also have a box in which you can write down any additional comments you feel would be helpful.

Each clip is no more than 20 seconds and there will be a 10 second pause between each of them so that you have time to put in your answer. The test will take a total of **60 minutes**.

Table A.A.1 International Sound Preference Survey (*Schaffer 1977 pp.268-270*)

	Auckland New Zealand 113 People Tested		Vancouver Canada 99 People Tested		Port Antonio Jamaica 72 People Tested		Zurich Switzerland 217 People Tested	
Transportation	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)
Traffic Noise	0	43	0	32	0	0	4	6
Specific Vehicles Mentioned	8	30	6	58	13	26	4	94
Aircraft	1	4	0	5	7	0	2	36
Trains	0	1	3	1	1	0	4	6
Sounds of Accidents	0	6	0	1	0	4	0	1
Machinery and Mechanical	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)
Machinery (General)	0	23	1	19	0	0	2	46
Construction	0	11	0	10	0	0	0	15
Jackhammers	0	15	0	13	0	0	0	14
Dentist Drills	0	12	0	13	0	0	0	5
Power Lawnmower	0	18	1	0	0	0	0	3

s								
Sirens	0	15	0	25	0	0	0	26
Other	1	12	0	27	0	0	0	18
Water	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)
Rain	31	1	23	0	7	3	25	1
Brookes, Rivers, Waterfalls	18	0	27	0	6	0	43	0
Ocean	58	1	42	0	19	8	4	0
Other	7	0	10	0	0	0	21	2
Wind	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)
Breeze	50	0	47	0	30	0	28	0
Stormy	0	4	0	0	0	8	1	1
Other	0	0	0	0	0	0	0	0
Nature	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)
Dawn	2	0	0	0	0	0	0	0
Night	2	2	0	0	0	7	0	0
Thunderstorms	3	2	2	0	1	6	1	13

Fire Crackling	6	0	8	0	0	0	7	0
Trees	1	1	5	0	0	3	29	1
Other Nature Sounds	1	0	0	0	0	6	7	1
Animals	20	7	22	16	33	100	20	15
Birds	49	3	53	0	68	13	75	7
Insects	10	13	2	5	10	18	15	5
Human Sounds	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)
Voices	27	43	35	35	11	60	13	16
Baby Sounds	2	12	2	8	8	11	0	4
Laughter	27	3	20	2	31	6	6	0
Crying	10	16	0	23	0	40	0	7
Body (Breathing, Belching, Snoring, etc.)	8	9	13	21	7	15	2	6
Whistling	1	0	2	0	17	0	0	2
Lovemaking	6	0	8	0	0	0	0	0
Footsteps	3	4	3	0	0	3	3	4
Other	1	3	3	3	1	14	1	11

Music	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)
Specific Instruments	29	0	35	0	58	0	29	4
Vocal	23	0	12	0	49	0	7	4
Types of Music(Jazz, Classical)	13	4	4	17	15	0	9	1
Other Mentions	28	10	17	3	35	7	40	1
Sound Equipment	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)
Amplifiers	0	0	0	6	0	1	0	1
Malfunctioning Equipment	0	0	0	8	0	0	0	1
Radio and T.V. Commercials	0	9	0	7	0	0	0	0
Other	0	0	0	2	4	0	4	1
Domestic	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)
Door Slam	0	10	4	0	0	5	0	12
Clocks	2	12	1	6	0	0	4	8

Telephone	2	6	0	5	0	1	1	13
Other	9	4	10	19	1	18	5	14
Other Sounds	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)	Pleasant (In %)	Unpleasant (In %)
Bells	2	0	8	0	1	0	54	2
Loud Impact (Gunshot etc.)	0	8	0	7	1	4	1	13
Hammering	0	4	0	7	0	0	0	1
Chalk Squeaking on Blackboard	0	38	0	32	0	1	0	13
Miscellaneous	4	8	11	1	1	4	2	2
Silence	8	0	15	0	0	0	1	1

Appendix B

Results tables

These results tables should be referred to for the practical implementation of the research in this study.

To make finding significant differences easier any emotions that have no significant differences have been greyed out in the column labelled 'Emotion'

Table A.B.1 Construction ambience results table showing all edits, emotions, mean level of emotions and upper and lower bound confidence intervals

Construction Ambience results table

All edits	Emotion	Mean	Lower Bound	Upper Bound
D1	Irritation	1.87	1.33	2.40
D2		2.40	2.01	2.79
D3		2.53	2.16	2.91
D4		2.87	2.56	3.17
H1		1.67	1.29	2.05
H2		1.80	1.36	2.24
H3		2.20	1.76	2.64
H4		2.63	2.21	3.06
S1		1.83	1.43	2.23
S2		1.97	1.53	2.40
S3		1.93	1.52	2.34
S4		2.27	1.89	2.64
D+H1		2.60	2.21	2.99
D+H2		2.37	1.92	2.81
D+H3		3.13	2.86	3.41
D+H4		3.17	2.80	3.53
D+S1		2.07	1.68	2.45
D+S2		2.70	2.27	3.13
D+S3		3.00	2.69	3.31
D+S4		2.83	2.42	3.24
H+S1		2.13	1.73	2.54
H+S2		2.33	1.91	2.76
H+S3		2.93	2.60	3.27
H+S4		3.30	2.97	3.63

Legend

D = Drill

H = Hammer

S = Saw

The number at the end represents how many samples there are for each tool. E.g. D+S3 means there are 3 samples of drills and 3 samples of saws together.

ALL1		2.73	2.29	3.17
ALL2		2.53	2.02	3.05
ALL3		3.43	3.16	3.71
ALL4		3.40	3.05	3.75
D1	Contempt	1.17	0.73	1.61
D2		1.60	1.11	2.09
D3		1.70	1.31	2.09
D4		1.77	1.33	2.20
H1		0.87	0.52	1.21
H2		1.00	0.60	1.40
H3		0.77	0.41	1.13
H4		1.67	1.13	2.20
S1		1.13	0.73	1.54
S2		1.27	0.93	1.60
S3		1.03	0.60	1.47
S4		1.43	1.04	1.83
D+H1		1.47	1.03	1.90
D+H2		1.47	1.02	1.91
D+H3		2.13	1.69	2.58
D+H4		2.03	1.49	2.58
D+S1		1.53	1.17	1.89
D+S2		1.37	0.89	1.84
D+S3		1.97	1.55	2.38
D+S4		1.17	0.80	1.53
H+S1		0.87	0.47	1.26
H+S2		1.27	0.87	1.66
H+S3		1.80	1.29	2.31
H+S4		2.27	1.71	2.82
ALL1		2.17	1.71	2.63
ALL2		1.17	0.73	1.61
ALL3		2.33	1.83	2.83
ALL4		2.47	1.97	2.96
D1	Disgust	1.30	0.80	1.80
D2		1.50	1.06	1.94
D3		1.90	1.49	2.31
D4		2.13	1.71	2.56
H1		0.47	0.22	0.71
H2		0.80	0.42	1.18
H3		0.80	0.35	1.25
H4		1.60	1.07	2.13
S1		0.87	0.52	1.21

S2		1.37	0.97	1.76
S3		0.87	0.49	1.24
S4		1.77	1.36	2.17
D+H1		1.77	1.36	2.17
D+H2		1.57	1.08	2.05
D+H3		1.93	1.44	2.43
D+H4		2.17	1.64	2.69
D+S1		1.73	1.28	2.18
D+S2		1.33	0.85	1.82
D+S3		1.97	1.50	2.43
D+S4		1.63	1.17	2.10
H+S1		0.93	0.55	1.32
H+S2		1.43	1.02	1.85
H+S3		1.63	1.14	2.13
H+S4		2.20	1.71	2.69
ALL1		1.80	1.38	2.22
ALL2		1.47	0.92	2.01
ALL3		2.27	1.77	2.76
ALL4		2.70	2.21	3.19
D1	Involvement	1.47	1.03	1.90
D2		1.13	0.80	1.47
D3		1.37	1.01	1.72
D4		1.37	1.06	1.67
H1		0.90	0.48	1.32
H2		1.30	0.87	1.73
H3		1.20	0.83	1.57
H4		1.23	0.85	1.62
S1		1.07	0.69	1.44
S2		1.13	0.80	1.47
S3		1.13	0.70	1.57
S4		1.23	0.86	1.61
D+H1		1.23	0.85	1.62
D+H2		1.00	0.67	1.33
D+H3		1.10	0.80	1.40
D+H4		1.00	0.67	1.33
D+S1		1.27	0.93	1.60
D+S2		1.47	1.02	1.91
D+S3		1.03	0.68	1.39
D+S4		1.13	0.79	1.48
H+S1		1.43	1.03	1.84
H+S2		1.20	0.81	1.59

H+S3		1.03	0.71	1.35
H+S4		1.03	0.73	1.34
ALL1		1.23	0.93	1.54
ALL2		1.13	0.67	1.60
ALL3		1.00	0.58	1.42
ALL4		1.33	0.98	1.69
D1	Worry	0.90	0.48	1.32
D2		1.07	0.64	1.50
D3		1.33	0.90	1.77
D4		0.93	0.58	1.28
H1		0.57	0.22	0.91
H2		0.47	0.14	0.79
H3		0.53	0.17	0.89
H4		0.90	0.45	1.35
S1		0.57	0.27	0.86
S2		0.47	0.19	0.74
S3		0.57	0.25	0.89
S4		0.83	0.53	1.13
D+H1		0.67	0.43	0.90
D+H2		0.97	0.61	1.32
D+H3		0.77	0.43	1.10
D+H4		1.33	0.78	1.88
D+S1		0.97	0.57	1.36
D+S2		1.13	0.73	1.54
D+S3		1.00	0.62	1.38
D+S4		1.23	0.72	1.75
H+S1		0.87	0.48	1.25
H+S2		0.83	0.43	1.23
H+S3		0.53	0.24	0.83
H+S4		0.80	0.50	1.10
ALL1		0.63	0.39	0.87
ALL2		1.20	0.66	1.74
ALL3		0.87	0.54	1.19
ALL4		1.20	0.82	1.58

Table A.B.2 Traffic ambience results table showing all edits, emotions, mean level of emotions and upper and lower bound confidence intervals

Traffic all edits	Emotion	Mean	Lower Bound	Upper Bound
30H0.5	Irritation	1.47	1.13	1.80
30H1		1.30	0.92	1.68
30H2		1.23	0.87	1.59
30H3		1.50	1.06	1.94
30L0.5		1.70	1.24	2.16
30L1		1.43	1.09	1.78
30L2		1.03	0.65	1.41
30L3		1.10	0.74	1.46
50H0.5		2.33	1.94	2.72
50H1		2.43	2.00	2.87
50H2		1.70	1.33	2.07
50H3		1.70	1.23	2.17
50L0.5		2.20	1.81	2.59
50L1		2.10	1.63	2.57
50L2		2.03	1.60	2.47
50L3		1.67	1.31	2.02
70H0.5		2.17	1.68	2.66
70H1		2.00	1.67	2.33
70H2		2.03	1.62	2.45
70H3		1.83	1.44	2.22
70L0.5		2.40	1.97	2.83
70L1		2.63	2.20	3.07
70L2		2.73	2.29	3.17
70L3		2.30	1.87	2.73
30H0.5	Involvement	.83	0.49	1.17
30H1		.67	0.43	0.90
30H2		1.13	0.77	1.49
30H3		1.00	0.62	1.38
30L0.5		.97	0.55	1.38
30L1		.90	0.60	1.20
30L2		1.17	0.72	1.62
30L3		1.17	0.78	1.56
50H0.5		.90	0.57	1.23

Legend

Speed (in mph) = 30, 50 and 70

H = High gear

L = Low gear

The number at the end of each edit is the delay time between samples. The delay begins after the car has passed centre on the previous sample.

Delay times (seconds) = 0.5, 1, 2, 3

50H1		1.07	0.73	1.40
50H2		1.00	0.73	1.27
50H3		1.10	0.68	1.52
50L0.5		.87	0.54	1.19
50L1		1.00	0.66	1.34
50L2		1.20	0.83	1.57
50L3		1.07	0.76	1.38
70H0.5		1.00	0.62	1.38
70H1		1.30	0.96	1.64
70H2		1.20	0.80	1.60
70H3		1.00	0.69	1.31
70L0.5		1.30	0.87	1.73
70L1		1.30	0.87	1.73
70L2		1.20	0.87	1.53
70L3		1.53	1.15	1.92

Table A.B.3 Detail to general edit of rain ambience results table showing all edits, emotions, mean level of emotions and upper and lower bound confidence intervals

Rain d2g Density	Emotion	Mean	Lower Bound	Upper Bound
1	Disappointment	1.37	1.03	1.70
2		1.57	1.12	2.01
3		1.13	0.70	1.57
4		1.27	0.94	1.59
5		1.37	0.97	1.76
6		1.17	0.85	1.48
7		1.10	0.76	1.44
8		1.03	0.71	1.35
9		1.27	0.94	1.59
10		1.63	1.23	2.04
11		1.53	1.16	1.91
12		1.43	1.03	1.84
13		1.60	1.23	1.97
14		1.53	1.20	1.87
15		1.53	1.19	1.88
1	Relief	1.67	1.24	2.09
2		1.03	0.64	1.43
3		1.57	1.12	2.01
4		1.03	0.68	1.39
5		1.20	0.77	1.63
6		0.97	0.65	1.29
7		1.40	0.97	1.83
8		1.03	0.64	1.43
9		0.80	0.50	1.10
10		0.70	0.40	1.00
11		0.70	0.39	1.01
12		0.73	0.38	1.08
13		0.57	0.31	0.83
14		0.53	0.24	0.83
15		0.53	0.27	0.79
1	Happiness	1.17	0.75	1.59
2		0.80	0.47	1.13
3		1.03	0.68	1.39

Legend

Each number corresponds to the amount of layers in the edit. The below list is what was added with each layer.

When 'General' is at the end of a layer this means a general recording of rainfall, the strengths have been specified.

1. Light Trickle
2. Light drip
3. Light Trickle (heavier)
4. Rain Dripping (dry surface)
5. Rain Dripping (dry surface) 2
6. Rain Dripping (into water)
7. Rain Dripping (into water)
8. Rain Dripping (into water)
9. Light Rain (general)
10. Medium Rain (general, heavier rainfall than previous layer)
11. Heavy Rain with detail (general)
12. Heavy Rain (general)
13. Very Heavy Rain (general)
14. Pink Noise (100Hz Sine)
15. Yellow Noise 1000Hz sine

4		0.60	0.36	0.84
5		1.23	0.77	1.70
6		0.83	0.55	1.12
7		1.00	0.69	1.31
8		0.90	0.56	1.24
9		0.63	0.36	0.91
10		0.93	0.55	1.32
11		0.80	0.53	1.07
12		0.70	0.43	0.97
13		0.57	0.31	0.83
14		0.57	0.31	0.83
15		0.43	0.17	0.69
1	Sadness	1.43	1.07	1.79
2		1.67	1.24	2.09
3		1.17	0.74	1.60
4		1.50	1.18	1.82
5		1.57	1.17	1.96
6		1.63	1.38	1.89
7		1.50	1.12	1.88
8		1.33	1.03	1.64
9		1.57	1.23	1.90
10		2.07	1.65	2.49
11		2.27	1.88	2.65
12		1.60	1.24	1.96
13		1.73	1.40	2.07
14		1.67	1.32	2.01
15		2.07	1.72	2.42

Table A.B.4 General to detail edit of rain ambience results table showing all edits, emotions, mean level of emotions and upper and lower bound confidence intervals

Rain g2d Density	Emotion	Mean	Lower Bound	Upper Bound
1	Disappointment	1.07	0.72	1.42
2		0.87	0.57	1.16
3		1.43	1.04	1.83
4		1.03	0.76	1.31
5		1.23	0.78	1.69
6		1.67	1.20	2.13
7		1.43	0.97	1.90
8		1.53	1.23	1.84
9		1.47	1.02	1.91
10		1.50	1.19	1.81
11		1.60	1.28	1.92
12		1.67	1.34	2.00
13		1.43	1.04	1.83
14		1.60	1.21	1.99
1	Relief	1.57	1.10	2.03
2		1.07	0.68	1.45
3		0.97	0.61	1.32
4		1.23	0.84	1.63
5		0.97	0.51	1.42
6		0.83	0.48	1.19
7		0.93	0.51	1.35
8		0.53	0.23	0.84
9		0.93	0.55	1.32
10		0.87	0.54	1.19
11		0.73	0.47	1.00
12		0.83	0.49	1.17
13		0.93	0.57	1.30
14		0.70	0.37	1.03
1	Happiness	1.27	0.83	1.71
2		0.87	0.51	1.23
3		0.67	0.31	1.02
4		0.87	0.52	1.21
5		0.90	0.48	1.32

Legend

Each number corresponds to the amount of layers in the edit. The below list is what was added with each layer.

When 'General' is at the end of a layer this means a general recording of rainfall, the strengths have been specified.

1. Light Rain (general)
2. Medium Rain (general, heavier rainfall than previous layer)
3. Heavy Rain with detail (general)
4. Heavy Rain (general)
5. Very Heavy Rain (general)
6. Pink Noise (100Hz Sine)
7. Yellow Noise 1000Hz sin
8. Light Trickle
9. Light drip
10. Light Trickle (heavier)
11. Rain Dripping (dry surface)
12. Rain Dripping (dry surface) 2
13. Rain Dripping (into water)
14. Rain Dripping (into water)

15 layers is the same for both d2g and g2d and has been shown in the detail to general results table.

6		0.80	0.41	1.19
7		0.80	0.40	1.20
8		0.43	0.17	0.69
9		0.90	0.49	1.31
10		0.53	0.21	0.86
11		0.57	0.23	0.90
12		0.50	0.24	0.76
13		0.63	0.29	0.98
14		0.60	0.28	0.92
1	Sadness	1.10	0.76	1.44
2		1.00	0.62	1.38
3		1.17	0.85	1.48
4		1.27	0.89	1.64
5		1.47	1.04	1.89
6		1.57	1.09	2.04
7		1.40	0.97	1.83
8		1.90	1.52	2.28
9		1.17	0.73	1.61
10		1.40	1.07	1.73
11		1.57	1.19	1.94
12		1.83	1.44	2.22
13		1.77	1.32	2.21
14		1.87	1.43	2.30

Table A.B.5 Detail to general edit of sea ambience results table showing all edits, emotions, mean level of emotions and upper and lower bound confidence intervals

Sea d2g Density	Emotion	Mean	Lower Bound	Upper Bound
1	Relief	2.67	2.23	3.10
2		2.80	2.31	3.29
3		2.37	1.93	2.80
4		2.13	1.64	2.63
5		2.17	1.73	2.61
6		2.20	1.72	2.68
7		2.20	1.80	2.60
8		2.10	1.68	2.52
9		1.43	1.07	1.79
10		1.47	1.09	1.84
11		1.50	1.16	1.84
12		1.53	1.11	1.96
13		1.27	0.81	1.73
14		0.90	0.58	1.22
15		1.20	0.82	1.58
16		1.23	0.87	1.59
1	Enjoyment	2.53	2.07	3.00
2		2.33	1.93	2.74
3		2.13	1.74	2.53
4		1.83	1.34	2.33
5		2.27	1.90	2.63
6		2.20	1.79	2.61
7		2.30	1.88	2.72
8		1.97	1.49	2.44
9		1.73	1.34	2.13
10		1.90	1.41	2.39
11		1.70	1.28	2.12
12		1.40	0.96	1.84
13		1.27	0.86	1.68
14		1.60	1.17	2.03
15		1.63	1.26	2.00
16		1.40	1.03	1.77

Legend

Each number corresponds to the amount of layers in the edit. The below list is what was added with each layer.

When 'General' is at the end of a layer this means a general recording of the ambience.

1. Sea Ambience, calm, at a distance (general)
2. Light Trickle (brook)
3. Light Trickle (brook)2
4. Water Dripping (into water)
5. Water Dripping (into water)2
6. Dripping water, heavier
7. Sloshing water onto rocks
8. Fast river (detail of water hitting rocks)
9. Waves breaking
10. Light River (general)
11. Light River (general)2
12. Light River (general) 3
13. Small waterfall
14. Sea Ambience, heavy (general)
15. Pink Noise (1000Hz Sine)
16. Yellow Noise (1000Hz Sine)

1	Happiness	2.23	1.81	2.66
2		2.50	2.12	2.88
3		1.70	1.30	2.10
4		2.10	1.63	2.57
5		2.03	1.71	2.35
6		2.27	1.79	2.75
7		1.93	1.54	2.33
8		1.97	1.55	2.38
9		1.20	0.83	1.57
10		1.37	0.96	1.77
11		1.03	0.68	1.39
12		1.13	0.69	1.58
13		1.07	0.69	1.44
14		1.07	0.69	1.44
15		1.00	0.64	1.36
16		1.03	0.63	1.44
1	Irritation	0.20	-0.02	0.42
2		0.13	-0.05	0.31
3		0.27	0.06	0.48
4		0.53	0.19	0.88
5		0.20	0.05	0.35
6		0.37	-0.01	0.75
7		0.53	0.21	0.86
8		0.60	0.18	1.02
9		0.70	0.36	1.04
10		1.03	0.62	1.45
11		0.77	0.39	1.14
12		0.83	0.41	1.25
13		0.77	0.39	1.14
14		0.80	0.35	1.25
15		0.90	0.40	1.40
16		0.60	0.22	0.98
1	Wonderment	1.90	1.50	2.30
2		2.03	1.61	2.46
3		1.80	1.37	2.23
4		1.90	1.43	2.37
5		1.63	1.23	2.04
6		2.03	1.54	2.53
7		2.13	1.76	2.51
8		1.97	1.49	2.44
9		1.83	1.47	2.20

10		1.77	1.36	2.17
11		1.77	1.39	2.14
12		1.77	1.35	2.18
13		2.00	1.58	2.42
14		2.00	1.56	2.44
15		2.00	1.55	2.45
16		1.97	1.56	2.37
1	Worry	0.37	0.11	0.62
2		0.43	0.07	0.79
3		0.50	0.16	0.84
4		0.47	0.14	0.79
5		0.27	0.06	0.48
6		0.33	0.08	0.59
7		0.47	0.22	0.71
8		0.63	0.25	1.01
9		1.07	0.72	1.42
10		1.27	0.90	1.63
11		0.97	0.66	1.27
12		1.33	0.99	1.68
13		1.80	1.43	2.17
14		1.60	1.22	1.98
15		1.63	1.21	2.06
16		1.47	1.08	1.85

Table A.B.6 General to detail edit of sea ambience results table showing all edits, emotions, mean level of emotions and upper and lower bound confidence intervals

Sea g2d Density	Emotion	Mean	Lower Bound	Upper Bound
2	Relief	2.30	1.84	2.76
3		2.17	1.73	2.61
4		2.60	2.12	3.08
5		2.00	1.57	2.43
6		1.60	1.23	1.97
7		1.77	1.43	2.10
8		1.67	1.32	2.01
9		0.93	0.58	1.28
10		1.33	0.97	1.70
11		1.67	1.22	2.11
12		1.10	0.74	1.46
13		1.03	0.70	1.37
14		0.93	0.62	1.24
15		1.07	0.74	1.39
2	Enjoyment	2.13	1.70	2.57
3		3.80	3.60	4.00
4		2.50	2.08	2.92
5		2.27	1.83	2.71
6		1.83	1.43	2.23
7		1.97	1.61	2.32
8		1.87	1.56	2.17
9		1.43	1.06	1.81
10		1.77	1.37	2.16
11		1.70	1.24	2.16
12		1.43	1.06	1.81
13		1.70	1.39	2.01
14		1.70	1.21	2.19
15		1.57	1.23	1.90
2	Happiness	2.10	1.65	2.55
3		1.73	1.30	2.16
4		2.03	1.58	2.49
5		1.83	1.42	2.24
6		1.33	1.03	1.64
7		1.53	1.19	1.88

Legend

Each number corresponds to the amount of layers in the edit. The below list is what was added with each layer.

When 'General' is at the end of a layer this means a general recording of the ambience.

Layers 1 and 16 of the Detail to General Tracks are the same for General to Detail and so have been left out.

2. Light River (general)
3. Light River (general)2
4. Light River (general) 3
5. Small waterfall
6. Sea Ambience, heavy (general)
7. Pink Noise (1000Hz Sine)
8. Yellow Noise (1000Hz Sine)
9. Waves breaking
10. Fast river (detail of water hitting rocks)
11. Sloshing water onto rocks
12. Light Trickle (brook)
13. Light Trickle (brook)2
14. Water Dripping (into water)
15. Water Dripping (into water)2

8		1.23	0.91	1.55
9		1.33	0.93	1.74
10		1.23	0.86	1.61
11		1.57	1.17	1.96
12		0.97	0.63	1.30
13		1.00	0.64	1.36
14		1.27	0.82	1.72
15		0.93	0.62	1.24
2	Irritation	0.23	-0.04	0.51
3		0.37	0.02	0.71
4		0.13	-0.02	0.29
5		0.33	0.06	0.60
6		0.20	-0.04	0.44
7		0.20	0.03	0.37
8		0.23	0.05	0.41
9		0.63	0.21	1.06
10		0.47	0.12	0.81
11		0.67	0.26	1.07
12		0.33	0.12	0.55
13		0.40	0.16	0.64
14		0.83	0.36	1.30
15		0.57	0.22	0.91
2	Wonderment	2.10	1.58	2.62
3		1.70	1.21	2.19
4		1.87	1.48	2.25
5		1.80	1.31	2.29
6		1.67	1.28	2.06
7		1.70	1.35	2.05
8		2.03	1.69	2.38
9		1.57	1.21	1.93
10		1.83	1.44	2.22
11		1.77	1.39	2.14
12		1.83	1.41	2.25
13		2.10	1.73	2.47
14		1.53	1.12	1.95
15		1.73	1.32	2.14
2	Worry	0.70	0.32	1.08
3		0.33	0.08	0.59
4		0.20	0.03	0.37
5		0.47	0.17	0.76
6		0.30	0.07	0.53

7		0.30	0.13	0.47
8		0.40	0.18	0.62
9		0.80	0.39	1.21
10		0.83	0.47	1.20
11		0.67	0.29	1.05
12		1.10	0.76	1.44
13		0.93	0.57	1.30
14		0.80	0.41	1.19
15		0.83	0.52	1.15

Table A.B.7 Tweets ambience results table showing all edits, emotions, mean level of emotions and upper and lower bound confidence intervals

Tweets all edits	Emotion	Mean	Lower Bound	Upper Bound
OL	Relief	1.67	1.25	2.08
0.25		1.77	1.39	2.14
1		1.83	1.38	2.28
3		1.50	1.07	1.93
OL+0.25		2.13	1.70	2.57
OL+1		1.47	1.12	1.81
OL+3		1.77	1.41	2.13
0.25+1		1.57	1.22	1.91
0.25+3		1.43	0.90	1.97
1+3		1.43	1.07	1.79
OL+0.25+1		1.63	1.18	2.09
OL+0.25+3		1.60	1.16	2.04
OL+1+3		1.77	1.36	2.17
0.25+1+3		1.53	1.16	1.91
OL+0.25+1+3		1.67	1.29	2.05
OL+0.25+1+3+Real		2.07	1.62	2.52
Real		2.33	1.78	2.88
OL	Enjoyment	2.33	1.94	2.72
0.25		1.87	1.52	2.21
1		1.90	1.49	2.31
3		1.63	1.19	2.08
OL+0.25		2.33	1.92	2.75
OL+1		2.17	1.85	2.48
OL+3		1.90	1.58	2.22
0.25+1		1.67	1.32	2.01
0.25+3		1.70	1.28	2.12
1+3		1.37	1.02	1.71
OL+0.25+1		2.13	1.68	2.59
OL+0.25+3		2.20	1.76	2.64
OL+1+3		2.00	1.59	2.41
0.25+1+3		1.63	1.29	1.98
OL+0.25+1+3		2.33	2.00	2.66
OL+0.25+1+3+Real		2.33	1.94	2.72
Real		2.80	2.44	3.16

Legend

When there is a '+' sign the samples with the delay times shown have been layered together.

OL = Overlapping bird calls (faster than 0.25 seconds delay)

0.25 = 0.25 second delay between tweets

1 = 1 second delay between tweets

2 = 2 seconds delay between tweets

3 = 3 second delay between tweets

Real = Real bird songs (Recorded during morning chorus)

Some of the tweets have been pitch shifted in differing amounts to add variation to the bird calls.

OL	Happiness	1.90	1.57	2.23
0.25		1.47	1.16	1.77
1		1.70	1.33	2.07
3		1.57	1.21	1.93
OL+0.25		2.33	1.90	2.77
OL+1		2.20	1.82	2.58
OL+3		2.13	1.84	2.43
0.25+1		1.50	1.16	1.84
0.25+3		1.83	1.41	2.25
1+3		1.20	0.93	1.47
OL+0.25+1		2.07	1.58	2.55
OL+0.25+3		2.23	1.82	2.65
OL+1+3		2.07	1.64	2.50
0.25+1+3		1.63	1.28	1.99
OL+0.25+1+3		2.03	1.69	2.38
OL+0.25+1+3+Real		2.17	1.74	2.60
Real		2.60	2.17	3.03
OL	Longing	1.47	1.07	1.86
0.25		1.23	0.90	1.57
1		1.50	1.06	1.94
3		1.10	0.74	1.46
OL+0.25		1.53	1.17	1.89
OL+1		1.47	1.16	1.77
OL+3		1.43	1.11	1.75
0.25+1		1.03	0.78	1.29
0.25+3		1.33	0.93	1.74
1+3		1.20	0.82	1.58
OL+0.25+1		1.50	1.12	1.88
OL+0.25+3		1.43	1.05	1.82
OL+1+3		1.57	1.16	1.97
0.25+1+3		1.17	0.81	1.52
OL+0.25+1+3		1.50	1.18	1.82
OL+0.25+1+3+Real		1.40	1.05	1.75
Real		2.10	1.71	2.49
OL	Tenderness	1.40	0.98	1.82
0.25		1.43	1.13	1.74
1		1.47	1.01	1.92
3		1.40	0.94	1.86
OL+0.25		1.50	1.05	1.95
OL+1		1.63	1.25	2.01
OL+3		1.43	1.09	1.78

0.25+1		1.23	0.85	1.62
0.25+3		1.23	0.82	1.65
1+3		1.27	0.90	1.63
OL+0.25+1		1.57	1.09	2.04
OL+0.25+3		1.73	1.30	2.16
OL+1+3		1.77	1.37	2.16
0.25+1+3		1.63	1.30	1.97
OL+0.25+1+3		1.50	1.09	1.91
OL+0.25+1+3+Real		1.97	1.55	2.38
Real		1.93	1.52	2.34
OL	Wonderment	1.60	1.23	1.97
0.25		1.37	1.03	1.70
1		1.77	1.35	2.18
3		1.43	0.97	1.90
OL+0.25		1.87	1.46	2.27
OL+1		1.63	1.26	2.00
OL+3		1.43	1.07	1.79
0.25+1		1.20	0.83	1.57
0.25+3		1.47	1.06	1.87
1+3		1.03	0.68	1.39
OL+0.25+1		1.87	1.41	2.32
OL+0.25+3		1.60	1.18	2.02
OL+1+3		1.93	1.49	2.37
0.25+1+3		1.27	0.89	1.64
OL+0.25+1+3		1.80	1.46	2.14
OL+0.25+1+3+Real		1.83	1.47	2.20
Real		2.73	2.32	3.14

Table A.B.8 Squawks ambience results table showing all edits, emotions, mean level of emotions and upper and lower bound confidence intervals

Squawks all edits	Emotion	Mean	Lower Bound	Upper Bound
0.5	Disappointment	0.73	0.42	1.04
1		0.60	0.28	0.92
2		1.30	0.92	1.68
3		1.20	0.74	1.66
0.5+1		0.80	0.50	1.10
0.5+2		0.77	0.39	1.14
0.5+3		0.97	0.61	1.32
1+2		0.87	0.46	1.27
1+3		0.93	0.62	1.24
3+2		1.47	1.16	1.77
0.5+1+2		0.93	0.64	1.23
0.5+1+3		0.70	0.43	0.97
0.5+2+3		0.63	0.31	0.95
1+2+3		1.17	0.79	1.54
0.5+1+2+3		0.77	0.45	1.09
0.5	Anger	1.90	1.51	2.29
1		1.23	0.82	1.65
2		0.73	0.32	1.14
3		0.73	0.34	1.13
0.5+1		1.57	1.23	1.90
0.5+2		1.23	0.81	1.66
0.5+3		1.10	0.68	1.52
1+2		0.97	0.50	1.43
1+3		0.93	0.51	1.35
3+2		0.87	0.49	1.24
0.5+1+2		1.53	1.23	1.84
0.5+1+3		1.33	0.88	1.79
0.5+2+3		1.07	0.70	1.43
1+2+3		1.03	0.61	1.46
0.5+1+2+3		1.43	0.99	1.88
0.5	Sadness	1.20	0.79	1.61
1		1.20	0.79	1.61
2		1.50	1.05	1.95
3		1.30	0.85	1.75

Legend

Each number corresponds to an amount of delay in seconds.

- 0.5 = 0.5 second delay
- 1 = 1 second delay
- 2 = 2 seconds delay
- 3 = 3 seconds delay

When there is a '+' sign the samples with the delay times shown have been layered together.

0.5+1		0.97	0.60	1.34
0.5+2		0.73	0.36	1.11
0.5+3		1.43	1.03	1.84
1+2		0.93	0.55	1.32
1+3		0.90	0.58	1.22
3+2		1.60	1.22	1.98
0.5+1+2		1.03	0.70	1.37
0.5+1+3		0.93	0.60	1.27
0.5+2+3		0.80	0.50	1.10
1+2+3		1.50	1.04	1.96
0.5+1+2+3		0.83	0.46	1.21
0.5	Worry	1.67	1.29	2.05
1		1.27	0.87	1.66
2		1.20	0.83	1.57
3		0.97	0.60	1.34
0.5+1		1.47	1.06	1.87
0.5+2		1.20	0.77	1.63
0.5+3		1.47	1.06	1.87
1+2		1.40	0.92	1.88
1+3		1.23	0.79	1.68
3+2		1.60	1.18	2.02
0.5+1+2		1.83	1.40	2.26
0.5+1+3		1.40	0.93	1.87
0.5+2+3		1.40	0.96	1.84
1+2+3		1.57	1.18	1.95
0.5+1+2+3		1.63	1.13	2.13