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Perceiving Emotion Through Music

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Music is a substantial part of everyday life. We hear it more than we realize, and use it in a variety of circumstances. Music is more than just background noise while making dinner, or a way to pass time on a commute to work; it aids in social cohesion, it is a source of communication for thoughts and ideas, and it conveys emotion to those who listen to it. Music has been shown to consistently convey emotions to listeners, in part through structures of the music itself and partly through the context in which it is heard, and basic emotions have been shown to be conveyed accurately from the person making the music to the listener. There has been much musicological as well as psychological research into the extent to which music can convey emotion, how the emotion is perceived by the listener, as well as how listeners are aware of and use this power of music, however with more research comes more questions. In this paper, I will be examining the different ways in which the everyday listener perceives emotion through music, and the aspects of musical structure, performance, and context that make this possible. Once these paths have been considered separately, I will be looking at the similarities and differences between how they convey emotion and how the emotion is perceived, which paths are stronger than others, and finally how they interact to create a cohesive emotional experience for the listener.

There has been extensive research done on music and emotion, much of which has been done in the field of psychology. While a knowledge of musical structure, music's use in society at large, and a basis in musicology are vital to the study of music and emotion, much of the theories draw on psychological principles of emotion, perception, and cognition. In particular, theories of emotion guide the discussion of music and emotion. When examining emotion in relation to music, emotion is thought of using the circumplex model of emotion, which states that emotion consists of values of two dimensions, arousal and valence. Arousal is measured from

low to high, and valence, or the 'feeling' aspect of emotion, is measured from positive to negative. By this model, three major emotions - happiness, sadness and anger - fall in three distinct quadrants, with happiness having high arousal and positive valence, sadness having low arousal and negative valence, and anger having high arousal and negative valence. While this model is at times too simplistic, it provides a basis to examine emotion as it relates to music (Hunter and Schellenberg 2010).

The intricacies of the connection between music and emotion has been heavily researched, and so most of my paper is based on this research. However, considering that music is a large part of my life, as it is for many people, I have personal connections, examples, and anecdotes that I found increased my understanding of the theories presented. In addition, these personal experiences with music aid in my discussion and analysis of the information presented in the research.

In order to understand how music conveys emotion and how humans perceive music in emotion, it is important to understand emotion itself. While emotion seems like a simple thing to understand and describe, it is actually more complex than it seems at face value. Emotion consists of various parts, such as the feeling (the part that we are most aware of and gives the emotion meaning), bodily arousal (the way in which the brain, central nervous system, hormones, etc react and get the body prepared for action), sense of purpose (the part that gives emotion goal directed action, leading to behavior) and social expression (the part that allows us to communicate our emotion and understand others' emotions through body language and facial expressions). An emotion is felt due to biological process in addition to cognition, where we appraise the situation to determine the appropriate emotion. The cognitive appraisal is what allows two people to feel different emotions in the same situation, and is important in

determining which emotion we feel when presented with a stimuli (Reeve 2015). After cognitive appraisals determine the emotion, the emotion itself can be described using a model such as the circumplex model which allows it to be considered on multiple planes, in this case arousal level and valence.

One of the biggest debates surrounding music's impact on emotion is the extent to which music affects emotion. There are two main trains of thought, one that music in fact induces music in the listeners, and the other that listeners merely perceive emotion in the music. Supporters of the former argue that music elicits real emotion that the listener then feels. Supporters of the latter argue that the cognitive nature of emotion would not allow for a listener to feel real emotion. In order to have an emotion, one must cognitively appraise some personally relevant target, and music is not an event that you can cognitively appraise. Therefore, they argue, listeners are only perceiving emotion that is being conveyed in the music (Hunter and Schellenberg 2010).

Proponents of the induction viewpoint argue that cognitive appraisal is only one way to feel an emotion, and that music may tap into another pathway; mood contagion. Researchers have discovered neurons known as mirror neurons that fire both when you are performing an action and when you are watching someone perform an action. These neurons have been found to fire in the case of emotion as well, both when someone is feeling an emotion and when someone is looking at another person feeling an emotion. In this way, humans, on a biological level, feel an emotion when they witness someone else feeling an emotion. Some argue that this can be true of music as well. As music follows some speech patterns, it is thought that by hearing emotion in music, mirror neurons are then creating that emotion in you as well (Juslin and Laukka 2004).

There is anecdotal evidence for both the induction and perception views. On one hand, I would argue that everyone can think of a time that a certain song or album has turned their day around. For example, on the way home from a bad day at work, your favorite, happy song comes on the radio and all of a sudden you are in a better mood. In these cases, it seems as though music does, in fact, alter the emotion you are feeling. On the other hand, there are times where you find a sad song beautiful or peaceful and feel a positive emotion while listening to it. To this end, Juslin and Laukka (2004) argue that the two may not be mutually exclusive. In their discussion on induction versus perception of music, they say that music can induce emotion in its listeners, and listeners sometimes merely perceive emotion, but the mechanisms behind and the emotions felt when emotion is induced may be different than when emotion is perceived. In their study, they tried to determine the connection between emotion induction and perception using questions on a self-report and found that listeners report feeling induced emotion significantly less than they perceive emotion in music. I would argue that this is the most likely scenario for everyday listeners of music. Every single one of us can think of a time where music changed how we actually felt, but we can arguably think of more times that we recognized emotion in music but did not necessarily feel it. For the sake of this paper, I will be considering these two together, even though there is disagreement about whether or not emotion can, in fact, be induced.

There is general agreement, and much evidence, that music at least conveys emotion to a listener in a way that the listener can then accurately detect. Studies have found that listeners are consistent across trials and as compared to peers when determining the emotion found in music. Listeners are significantly better at judging broad, basic emotion categories than they are at judging specific, complex emotions. It is thought that while it is possible to accurately convey

some emotions, such as happiness or sadness, it may be impossible, or at least incredibly difficult, to convey other emotions such as jealousy. Some studies have determined that there may be five main emotions - happiness, sadness, anger, fear, and tenderness – that are capable of being communicated through music as well as they could be communicated through voice or facial expressions (Juslin and Laukka 2004). Studies have also been done in line with the circumplex model of emotion, where musical excerpts created specifically for the study could be classified into the quadrants of the model that they were intended to be (Hunter and Schellenberg 2010).

The ability to perceive emotion accurately in music has not only been replicated in numerous studies, but has been found across different groups of people. The phenomenon has been observed in listeners with and without musical training, which leads some researchers to believe that music listening may be an innate ability that we possess (Koelsch and Siebel 2005). It has also been found that children with Autism Spectrum Disorder (ASD) have the ability to identify emotion in music as well as their peers without ASD. This finding is particularly interesting in that a feature of ASD is an inability to label or match emotion that is seen in faces. While older children with ASD were less able to identify scary music than their peers, the children with ASD were able to accurately identify the other emotions heard in music, suggesting this emotion could be conveyed to these children even though they may not be interpreting it in facial expressions (Stephenson, Quintin and South 2016). It has also been found that children with cochlear implants, while being unable to analyze and process acoustic information to the same extent as normal hearing peers, are still able to identify emotion in music, although not quite as well as normal hearing peers (Hopyan, Manno, Papsin and Gordon 2016). Finally, basic emotions have been found to be identifiable to an extent cross-culturally. In

a study done by Argstatter (2016), participants from Western countries - Germany and Norway - as well as participants from Asian countries - Indonesia and South Korea - listened to western music designed to elicit certain emotions. While there were differences from country to country, overall emotions in music were recognized cross-culturally at a rate significantly better than chance. This finding may only be true for some emotions, however, as happiness and sadness were detected more easily.

It has been well documented that music has the ability to accurately convey emotions to the listener, and so the question becomes, what about music is allowing a listener to perceive and even feel a given emotion? It appears that listeners perceive a decent amount of cues for perception from the musical structure itself. On a very biological level, our brains process the acoustic components of music, such as melody, rhythm, timbre, and intervals, grouping them based on the Gestalt principles of similarity, proximity and continuity. The findings are then compared to our knowledge of learned rules of musical structure, and the music's consistency or inconsistency with these rules can lead to a perception of emotion. Even listeners without musical training learn these structure rules over time and can perceive musical emotion in this way. Interestingly, there also seems to be a connection between the perception of emotion and actions that are often associated with music, such as foot tapping or dancing, on a neural level. There is evidence that the neural networks associated with the late stages of perceptions overlap with those responsible for the early stages of movement (Koelsch and Siebel 2005). This means that those viral videos challenging people to listen to music without singing along, tapping their foot, or moving to the beat might be harder than it seems at first.

There is also evidence that particular aspects of music may encourage listeners to perceive specific emotions. For example, it has been well documented that music in major keys

with an upbeat tempo are perceived as conveying happiness, whereas music in minor keys with slow tempos are perceived as being sad songs. Likewise, it has been found that loudness increases the chances that anger is perceived. Specifically, changes in loudness cause the listener to have a change in their arousal level, which is one of the dimensions of emotion in the circumplex model of emotion (Hunter and Schellenberg 2010). In addition, various other aspects of musical structure such as mode, harmony, interval and rhythm have been shown to impact the perceived emotion in consistent ways. It is pertinent to point out, however, that no one cue is directly and exclusively mapped to any one emotion; it requires a set of cues for a listener to perceive emotion in music (Juslin and Laukka 2004).

Musical structure also plays a role in the phenomenon of chills, which many would consider to be the pinnacle of emotional perception in music. If a piece of music can give you chills it is likely to be considered supremely emotional or moving in some way. The songs that give you chills are the ones you remember, and at least for me, it is the ultimate sign that I was moved by a piece of music, and it is something I strive to experience in my music listening. This experience, however, seems to be mostly due to musical structure. Studies show that chills may be mostly due to a sudden or extreme change in volume, which would change arousal, producing chills. The same is true for a sudden or unexpected change in harmony, dynamic, or texture in the music. Music, however, is the most common source of chills, possibly because it has the greatest opportunity for the correct conditions to induce chills (Hunter and Schellenberg 2010). This is a case where we, as listeners, put large emotional emphasis on an aspect that is based in musical structure. Essentially, as listeners, we are drawn to music that spans the spectrum of volume in a structurally relevant way. That is not to say that performers or artists have nothing to do with this phenomenon; it requires a skilled musician to structure music in a way that gives

listeners chills. However, instead of interpreting chills as music that the performer put a lot of emotion into, it is more accurately interpreted as music that was skillfully structured to pack an emotional punch.

There are consistencies in how specific auditory structure cues influence the perceived emotion, however not everyone necessarily uses the same cues. In the study done with children who have cochlear implants, the researchers found that listeners can use different cues to arrive at the same emotional conclusion. Due to their cochlear implants, the participants in the experimental group of the study were unable to process complex auditory cues such as mode. They had to therefore rely on other cues, such as tempo, to perceive emotion in the music. Although it took slightly longer for the participants with the implants to perceive the emotion, both groups of participants were able to identify the emotion in musical pieces with above chance accuracy. It is also interesting to note that when only mode was changed in an effort to change perceived emotion, participants with normal hearing outperformed those with the implant, however when only tempo was changed, those with the implant outperformed those without it (Hopyan, Manno, Papsin and Gordon 2016). The takeaway from this study is therefore twofold. First, listeners can perceive emotion accurately while putting emphasis on different cues that are then combined to convey an emotion. It is possibly why two people can listen to the same song and come up with the same basic emotion but two different specific emotions if they each put the emphasis on a different cue or analyzed the music differently. Second, these findings seem to indicate that while we can focus on slightly different cues and still get a similar emotional experience, we do tend to focus on acoustic structural cues if possible, more so than cues related to the performance of the music.

The structural aspects of the music are arguably more important to the perception of music than other aspects, considering studies that have demonstrated that computer-synthesized music can convey emotion to the same extent that performed music can. Many people would argue that in order for emotion to be felt in music, it must be felt in the creation of the music. Music is seen as a way in which to convey emotion, and yet a more accurate interpretation may be that the music itself is creating at least some of the emotion. Sounds organized in a way that aligns with musical structure associated with different emotions can accurately convey emotion, exemplifying a case where music creates emotion, in a sense (Juslin and Laukka 2004). On the flip side, there have been programs created that can recognize emotion in music using machine learning. The program can learn the structural rules of music and apply them in order to determine the emotion in music with a fairly high degree of accuracy (Bai, Feng, Jun, Jinliang, Kan, Zuojin, Lu and Wang 2016).

While listeners of music may be getting much of their emotional information from musical structure, there are aspects of a performance that can alter the emotion perceived. Anecdotally, it is the reason why covers of songs sound different, and why you may change the emotion listeners perceive in music based on performance cues while keeping the melody and actual musical structure the same (Juslin and Lindström 2016). I actually have personal experience with this. In an improvisational theater class that I took, our final project was to take a song and perform it in two different ways; once with the intended emotion and once with the opposite emotion. I unknowingly employed all of the performance changes that have been linked to specific emotional perception, such as volume, attack of notes, tempo, articulation, timing and vibrato, to change a song full of love to a song full of anger (Juslin and Lindström 2016). Interestingly, it is thought that these aspects of music relate to the ways in which we change our

speech to convey emotion. Performers can change their music to alter the emotion conveyed in the same way that they would change their speech to change the emotion conveyed in a sentence (Juslin and Laukka 2004). The performance of the song can add just a little something that can change the way a listener interprets the emotion in the song. This could explain why hearing live music is different, and for many people preferred, to recorded music. At the very least, the performer is probably altering at least some aspect of the performance of the emotions, allowing the listeners to hear it in a slightly different way and perceive or feel a slightly different emotion than what they are used to. This may be why even recorded live shows, arguably more obvious high fidelity recordings than studio albums, sell well. When that was played live, the performers changed the emotion in a subtle way, and listeners are drawn to the new emotion found in a familiar song.

There is also increased emotion in the performance of music due to the kinesics and proxemics associated with being at a performance. In addition to the emotion in the music itself, those in the audience can gain emotional knowledge from the positioning of the performers to each other and the audience, as well and what their body language conveys during the show. I have been at concerts at very small venues, and the close proximity of the audience to the performer makes the show feel more intimate and the emotions more powerful. You feel as though they are just like you, and they are performing just for you. When you feel as though you are similar to a person, emotion is conveyed more easily. I have also been to crowded shows at large venues, in which not quite as much emotion can be obtained from the performer themselves, in part due to the fact that you are further away, and partly due to the fact that a larger, more set apart stage makes you feel separate from the artist and therefore may make the emotions less directly relatable. In addition, the performer's body language can convey emotion

to the audience. I have found that I more powerfully feel an emotion in a live performance if I believe the performer is feeling it as well. If, during a tender song that may convey tenderness due to its slower tempo, low volume, major key, and low pitched melody among other things the performer is closing their eyes and slowly swaying to the music with a largely expressive face, that tender emotion is likely to be amplified. If, during a happy song that conveys happiness through a fast tempo, major key and other musical cues, a performer is standing completely still and looks bored, I am likely to not perceive or feel the happy emotion as strongly.

The cues for emotion given to the listener through music structure and performance can both be incorporated into the extended lens model of musical communication of emotions, as laid out by Juslin and Lindstrom (2003). This model can be used to explain the weight an individual listener puts on different cues from the composer and the performer to evaluate the music and perceive an emotion. The interaction between these cues, and the weight with which the listener values these cues, is considered in this model as well. This brings together a couple of different ideas about emotion perception from music. First, emotional perception comes from multiple cues. It is not one cue, but the detection of many cues working together that influences the emotion a listener takes from a piece of music. Second, when looking on an individual basis, you can see that different people weight different cues differently, leading to different specific emotions within the same emotion family when two different people listen to the same piece of music. Finally, it reconciles cues coming from two different areas, structure and performance, and looks at how they each impact perception of emotion as well as how they may interact to influence perception.

There is an additional aspect of music listening that has not yet been considered; context. The context of the music listening can impact what emotions are perceived or induced, and can

explain why a song can make you feel one way on a Tuesday on the way to a job interview while the same song can make you feel a different way on a Friday when you are getting ready to go out to dinner with friends. This context can include things such as culture, previous experiences with the music, social setting and state of mind. Looking broadly at culture from the study done with participants from Western and Asian countries, we see that while some emotions are perceived similarly across cultures, others are not. Argstatter (2016) uses this study as evidence for the cue-redundancy model of emotional communication. This model states that listeners use musical as well as culture specific cues to determine emotion in music. For example, listeners from any culture are likely to consider an upbeat song to be happier than a slow song. However different cultures have different standards when it comes to scales and intervals that are commonly found in music. Therefore a song may use a scale that does not fit with the musical structure rules Western music usually adheres to and be interpreted as eliciting a different emotion than the same song would to listeners who are accustomed to that scale. This may explain why, in this study, participants from all cultures identified some emotions in songs similarly, such as happiness and sadness, and other emotions in other songs differently, as was the case for surprise (Argstatter 2016). In this way, the music that we are accustomed to hearing contributes to how we analyze and perceive emotion in other music that we hear.

Previous experience with music may also affect the way in which we perceive emotion in music in the future. We tend to create associations for songs that we listened to or heard during important times in our lives. A song heard often during the beginning of a new relationship might become that couple's song, and hearing it will bring back the memories of the relationship later in the relationship or after it has ended. Hearing a happy song that you associate with a past significant other can make you feel sad, even though the song itself is not conveying sadness. It

is these same associations that make people believe that the best music ever came out when they were an adolescent. The music listened to during adolescence is associated with the intense emotions that occur during that time, as well as the excitement of growing up, and this music is then looked back on as 'the best music.' This helps explain the generational cycle of each generation thinking their music is the best, and believing that the current generation's music is horrible (Williamson 2014).

On a more specific level, evidence from music therapy sessions leads some to believe that the current mental state of the listener can impact the emotions conveyed through the music. A meta-analysis done by McFerran (2016) examined 16 research and 7 therapy studies and found that it may not be the music itself that has an impact on the listener, but how the music interacts with the listener's existing state of mind. They argue that when in a good state of mind, any music can be and is used to help process challenges or cope with stresses. However when pessimistic or distressed, the same music can lead to rumination and an exacerbation of an already negative state of mind. This finding would then back the claim that a certain genre of music cannot make anyone turn bad, however any musical genre can be used in a way that worsens a state of mind. McFerran (2016) also found that because listeners interact with emotions in music is fundamentally different when in a positive state of mind rather than in a negative one, the support of another person during a negative listening experience can be beneficial. When using music to ruminate or intensify a negative emotion, it seems as though support from another individual can be used to help sort out emotions to acknowledge them rather than intensify them. In this way, the base level mindset a listener is in when they are interacting with music can impact the emotion they get out of it, and how they use that emotion.

The fact that music can and does convey emotion to a listener is not news for the average listener of music. While most people do not know the specifics of how it happens, the everyday listener is aware that music can hold some kind of emotional component, and we use it accordingly. We can accurately perceive intended emotion in music, and so we know what we want to listen to when, depending on the emotions we may want to feel. Similarly, we can pick music that fits and reinforces our current mood. We *like* the music that makes us feel something. We go to live performances for the added emotional component that they contain, and we use it personally and socially every day. We do this automatically and without even thinking about it. And yet more information about how this happens may do more than just be interesting to those that seek it out. When brought to our conscious attention, the information could, conceivably, change the way that we create, perform, and listen to music. If we know what makes a song sound happy, we can really run with it and make happier songs, sadder songs, etc. But this could also change the way we hear music, and change the attitude from music being a piece of art that makes you feel something to music being a series of notes constructed in a way designed to make you feel something. And while this is technically what it is, I would argue that this knowledge would change the general perception of what music is and what it is used for in our society.

Music has been shown over and over again to convey emotion to listeners, if not make them actually feel the emotion itself, through the structure of the music, the performance, and the context. The common perception is that music holds emotion in some artistic indescribable way, and it transfers emotion from the artist to the listener. When asked, "many listeners believe that a performer has to *feel* the emotion he or she wants to convey in order to communicate it reliably to listeners" (Juslin and Laukka 2004, 229), and yet this does not seem to be the case.

Synthesized music can make a listener feel something, and music can be created in a way that conveys a specific emotion. However this is not the whole story; performance and context do play a role in how a listener perceives and interprets the emotion in music that they hear, in addition to how they use music in their lives. Ultimately we are a social people, and music is an outlet to socially experience another feeling or emotion apart from ourselves, and possibly make it ours. While music conveys this emotion to us in a multitude of different ways, we use that emotion in so many more.

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