

Noa B.

Armonk, New York

Untitled

Black and White Darkroom and Inkjet Prints

Quiet chaos. Every line created with purpose, filled with emotion. It is indescribably personal in so many ways. How does music make us feel, why do we like the music we like? What is it about our brains that allows us to process music the way we do? Each scribble represents a different moment in a song and the energy it was translating through me and my pen. Being encapsulated in this chaos of lines, I am somehow brought to a serene place, a warm familiar feeling, although I am finally being reconnected with my brain and my mind. A place that is of peace, and that is mine and only mine. The place where I can be my most authentic self. Music is powerful for this, allowing us to ground ourselves. For this body of work, I wanted to not only include drawings of brain neurons, but also song lyrics in my handwriting, scribbles created while I listened to my favorite music, and sheet music. The final product was made with a combination of mostly darkroom prints and a few inkjet prints. At heart, I am a photographer and I love the 35mm film processes. Being in the darkroom is a very meditative experience for me. I love putting on my headphones and printing hour after hour. The relationship between me and my darkroom prints always becomes much stronger once printed than when they were just small negatives, and the same goes for me and the music I hold close. It felt only fitting to create something in the darkroom for my final project. When stepping inside my installation, it is almost as if one is stepping into my brain for a moment, stepping into this very personal space, hopefully experiencing how music makes me feel for a moment or connecting to their brain whilst listening to music inside this world.

Music and The Brain:
The Relationship from System to Song



Noa B.

The Oxbow School

OS50

Writer's note: Do you ever wonder why music is so powerful? Why do memories and nostalgia become so attached to the music we listen to? Music plays a wonderful role in our lives. It can send shivers down your spine or add an extra level of tension to a movie. Music brings people together and has been doing so since the beginning of time. We all have an innate appreciation for music, but what makes it so universally loved? How does music interact with our memories and emotions in the brain? The connection humans have with music is so strong that the brain experiences the same kind of pleasure from it that they also get from chocolate, sex, and drugs. If 70% of people say that they enjoy listening to music "because it elicits emotions and feeling" (Weinberger, 2004), then what is the root cause of that? Would the human experience and our memories be nearly as strong without the existence of music?

Key Terms: Music, Brain, Memory, Processing, Emotion\

I. The Brain and Music on a Surface Level

It is quite simple to grasp the way music makes us feel on a surface level. We either like a song or we don't. Think of the brain and music as partners. Obviously, we process music to decide how it makes us feel, but it isn't random. The music itself plays a role in how we respond, whether it is the tone, the pitch, the melody, or the lyrics. Musicologist Leonard Meyer once said, "Music is a dynamic process. Understanding and enjoyment depend upon the perception of and response to attributes such as tension and repose, instability and stability, and ambiguity and clarity" (Meyer, 1967). When listening to music, we expect certain patterns to happen within the composition. These expectations play an important psychological role in musical emotions. A song with the expectations of continuation may spark a sense of tension and instability, therefore

causing the listener to feel certain emotions such as fear and anticipation. Music can be described on a level of basic emotions; sad music is slow in tempo with a minor harmony and large pitch variations, and happy music tends to have a rapid tempo with major harmonies and constant pitch changes. In 1997, Krumhansl conducted a study to see what baseline emotions were triggered by a group of instrumental pieces. Each piece of music was chosen to represent a different emotion. The goal was to see if the emotions evoked by the listeners aligned with the emotion of the song. The participants were asked to rate the level of sadness, fear, or happiness felt over the time of the song along with the tension. They found that music had a multifaceted quality. When listeners felt tension was present within the music, they experienced fear, sadness, and happiness (Krumhansl, 2002). The correlation is clear, but this doesn't explain why music has such a strong connection to the brain, and why it evokes such strong feelings.

II. Brain Function and Its Relationship with Music

Before we focus on the brain's relationship with music, we must look at the body as a whole. A similar experiment to Krumhansl's took place, however this time it recorded the physiological responses to music. On an internal level, music caused a spike in cardiac function, blood flow, and the electrical conductance of skin and respiratory function. The level of increase varied based on the type of music. Sad music causes a change in heart rate, blood pressure, and the amplitude of blood flow, whereas happy music causes changes in respiration measures. So not only does music emotionally affect our mental state, but also our physical one (Krumhansl, 2002).

Brain imaging reveals many other areas of activation from music, as well (Krumhansl, 2002). Considering that the individual parts of the brain act together as an interconnected system, researchers have started to dive deeper into which specific parts of the brain are active during all

sorts of musical tasks (whether it is listening to music or performing) through something known as network science. Network science allows researchers to view the entire brain while someone listens to music. With network science, researchers can look at the Default Mode Network (DMN), which is a set of interconnected regions in the brain. The responses to music unfold as the person listens. In general, the DMN becomes less active when a person listens while distracted and is more engaged when focusing inward. This is when we experience mind wandering, introspection, and a resting state of relaxation and stillness. The Default Mode Network also supports conscious and unconscious thought. Self-awareness is involved in the reprocessing of memories and emotions and helps us to imagine and understand the emotions of others. We also process music in the Default Mode Network. A study took place to look at the DMN while young adults listened to songs over long periods of time, from different genres. Participants were asked to give types of music they identify with on a personal level. When someone is exposed to music, the brain shows increased levels of connectivity in the Default Mode Network. Furthermore, they found that when a participant listened to one of their favorite songs, the music sparked increased connectivity to the front of the brain, which is involved in higher-order thinking such as understanding, analysis, and evaluation. In the end, it was found that the change in the patterns of brain connectivity was less due to the genre or the lyrics of the music, but rather whether or not the person actually liked and enjoyed the song. This stronger connection within the DMN supports the hypothesis of listeners not being distracted while playing music they like. Music essentially causes people to look in – back at personal and relevant emotions or memories rather than looking out and paying attention to outside events. This network is considered to be significantly relevant to the development of identity formation,

social learning, personal decision-making, and may even explain why people of all ages identify and associate with certain pieces of music so strongly (Hodges & Wilkins, 2015)

However, the Default Mode Network is not the only thing that has been theorized as being the underlying cause of the human connection to the brain and music. Other studies have taken place to test theories of the underlying cause of why music evokes emotion. A theory from 1992 by Baumgartner stated that episodic memory plays a big role in the emotional responses people have to music. This was explained through a concept called BRECVEMA (Appendix 1). BRECVEMA takes an evolutionary approach to the human perception of sounds and how brain networks evoke emotions from music. BRECVEMA gives more of a breakdown of how we process music and the internal mechanisms that are a part of it (Juslin et al., 2015). Different localized brain regions are involved in the emotional reaction people have to music, and the brain has a functional organization process for it (Weinberger, 2004).

III. Emotions and Memories Attached to Music

Emotions are an important aspect of the musical experience and can affect our physical, behavioral, perceptual, existential, and developmental selves along with our cognitive thinking. We face musical emotions in many different settings of everyday life, in fact, a staggering 55-65% of all emotional episodes are evoked by music. If emotional arousal happens when something is estimated as having the ability to influence the plans and/or goals of the one perceiving, how fascinating is it that music would play such a significant role in our life goals (Juslin et al., 2015). The causes of musical emotion can be regarded as puzzling, but worth exploring further. Music also acquires its emotional meaning through consequential events (Krumhansl, 2002). Specific music is often connected to significant personal memories, therefore causing emotional responses, greatly varying from person to person depending on their personal

past experiences (Hodges & Wilkins, 2015). There are so many occasions to reflect on our past, whether it is remembering those we love or meaningful moments in our lives. Our memory has many practical functions, yet we can remember things without feeling any nostalgia at all. This might explain why sometimes we have memories attached to songs for no reason. On the flip side, you cannot be nostalgic without remembering. Nostalgia is an emotional force that allows certain types of reminiscence to serve distinct psychological functions. It allows people to assess personal change over time, helps young adults cope with the loss of an idealized childhood, helps them adapt to discontinuity in life, restores self-identity, and enhances one's personhood. All of these things can also use the aid of music, therefore attaching nostalgia to the songs (Batcho, 2007).

Most importantly, music and our connection to it through memory and emotion can enhance the quality of our lives. This is truly the root of why music is so powerful. A psychologist from the 1960s named Abraham Maslow wrote about *peak experiences*; experiences that are intense, transcendent, and intrinsic and are important to achieve who we are meant to be, also known as our most complete self. He found that one of the most common ways that people have these peak experiences is through music. Fast forward 50 years, another psychologist named Alf Gabrielsson asked over 1300 people to describe the most intense and strong musical experiences they could remember. Participants reported that they had strong physical responses such as hair standing up on the back of their necks and weeping. The experiences clearly provoked important memories that were emotional and personally significant. Gabrielsson's results drew strong similarities to Maslow's concept of peak experiences. Even more reporting proves that very intense musical experiences can cause changes in a person's values, social relationships, views on the meaning of life, and personal

development. These musical experiences can help people realize and find their true inner selves, allowing them to live a more fulfilled, authentic, and spiritual life. It is a simple way for people to have compelling and emotional transcendent experiences that shape them uniquely in long-lasting ways. Psychologist Adam Croom talked about music's pivotal role in human flourishing and/or well-being. He credits 5 common factors including positive emotion, relationships, engagement, achievement, and meaning. He said, "Musical engagement can positively contribute to one's living a flourishing life." Musical experiences release dopamine and serotonin which is why people experience intensely pleasurable feelings. Music can allow us to "become more fully human," says Sister Wendy Beckett (known for her video series on art history). It can provide people with insights into the human condition regardless of differences in age, gender, ethnic background, socioeconomic status, and more. People can become unified by the fact that we are all human and music can tap into this aspect of humanity to reveal, explore, and share what it is that makes us all the same and also unique (Hodges & Wilkins, 2015).

IV. My Personal Connection to Music

Song 1: In Your Own Sweet Way - Wes Montgomery

Jazz is an underappreciated genre for kids in my generation. The song "In Your Own Sweet Way" practically raised me. For many years, I would need to play the same jazz playlist from my speaker every night in order to fall asleep. Over time, I became familiar with the music on the playlist but nothing struck me as much as this song. As I got into bed, I would make sure In Your Own Sweet Way was at the top of the queue so I could listen to it before drifting off into sleep. Its calming and intrinsic melody gently lulled me to sleep. As I grew older, my appreciation for jazz grew bigger, but this song has always remained my favorite. It is engraved into my brain,

practically a part of my DNA. Whenever I hear the first few notes of the piano, I am suddenly transported back into my cozy childhood bed, slowly drifting to sleep surrounded by stuffed animals, as if I had just been snugly tucked in by my parents.

Song 2: Sextape - Deftones

There is no denying that this song is depressing, but the memory I have attached to it is quite the opposite. It's November of 2023 and I'm on the Lower East Side. The air is filled with the crisp smell of autumn mixed with the slightly sour stench of New York City streets. The sun is setting and I am walking around Manhattan with my friends. The ethereal twang of the intro of Sextape becomes the underlying soundtrack of random conversations, countless laughs, and innocently stolen items. My friends swiped a Citi bike seat off the street and a dinner knife from the table of a sidewalk cafe; a knife that I had hidden because who trusts three teenage boys with a knife on the streets of New York? I had only heard the Deftones' song Sextape once, but for whatever reason it was playing over and over in my head the whole night, from hanging out at the basketball court to dinner at Shake Shack, as if on a loop. The beat is fragmented and jumpy, just as our nighttime adventure had been, and had securely attached itself to the memory of that fun November evening forever.

Song 3: L'amour Dice Ciao (Slow Take) - Armando Tovajoli, Andee Silver

One of my favorite guilty pleasures is listening to Italian Romance music. It makes me so happy. Back in the summer, I made a TikTok where I put all of my good summer memories together to this song. Ever since that post, whenever this song plays I am immediately transported to the first half of summer 2023. Studio days, Coney Island on a 90-degree day, and packed sweaty subway

cars coming back from Brooklyn after the Fourth of July fireworks all float around in my head to the soft, swoony vibe of this song. The dream-like quality of the music is like a giant warm and fuzzy; I can see the flowers blooming around me, the camera flashes illuminating one after another. I hear the birds chirping in Central Park and taste the seemingly bottomless bowls of popcorn I would eat on my dorm room bed. The memories of the summer of 2023 all come rushing back to me whenever I hear this song, all because of a spontaneous TikTok.

Song 4: Kill Switch - Navy Blue

You would think that the last thing this song would remind someone of is sports, but to me, it epitomizes The New York Yankees. There I am, sitting second row along the first baseline with my parents and my best friend, watching two of my favorite teams play each other. We all had so much fun despite being soaked in sweat and rain from the scorching hot humidity and occasional drizzle. The Yankees won and this song played on the radio during the car ride from the Bronx back to Manhattan. This must be how Kill Switch became forever attached to the Yankees and that hot summer day, a day that only got better as it went on. My best friend and I spent the early evening wandering around the streets of Lower Manhattan, eventually ending up in Washington Square Park with two more friends. The beat of Kill Switch never gets too heavy or intense (just like our late-night conversations), as it is a mix of old-school rap and smooth jazz, reflecting the feeling of the day perfectly. This song is filled with baseball, deep talks, laughs, McDonald's and their broken bathroom, and late walks back to my dorm.

Song 5: Hotel California - Eagles

I am not a big Eagles fan, in fact, I rarely listen to their music. This song holds the most special place in my heart compared to any other song I have ever heard in my life, and yet its connection to me is the simplest. It is my papa's ringtone, and it has been for as long as I can remember. Every time I hear the first few chords of the intoxicating guitar intro I wonder if it's my Papa's phone ringing, but I also feel like suddenly he's right there in the room with me. In the blink of an eye, I'm transported to his house in Chicago or La Jolla, watching him sit with my mom and do that day's New York Times crossword puzzle in the heat of the backyard sun. I can hear him calling my brother "The Lev" as if it's his royal title and not his given name, and crying out "Blackhawk down!" whenever something accidentally falls to the ground, all in his enthusiastic voice that is always radiating with energy. I can feel the warm embrace of his hugs whenever this song comes on. The song Hotel California is my Papa and always will be, no matter what.

V. Appendix 1

Each letter in BRECVEMA stands for one of the 8 following mechanisms:

1. Brain stem reflex: attention response to extreme/increasing volume or speed
2. Rhythmic entrainment: gradual adjustment to internal body rhythm towards the external rhythm in music
3. Evaluative conditioning: a pairing of a music piece and positive/negative stimuli → conditioned association
4. Contagion: internal, mimicry of personal perception of voicelike emotional expression of the music
5. Visual imagery: inner images of an emotional character created by the listener through a mapping (metaphorical) of the musical structure
6. Episodic memory: conscious recollection of an event from the past that is triggered by the music
7. Musical expectancy: response to the gradual unfolding of the music and its continuation (expected/unexpected)
8. Aesthetic judgment: subjective, and evaluation of the aesthetic value of the music based on individual criteria (Juslin et al., 2015)

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