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Music on the Brain

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Between the Rhythm: The Effects of Music in the Brain

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Abstract

This research project combined two areas of study: psychology and music in order to understand the effect in dance. For this project, I conducted research into the effects of music within the brain in order to integrate the research into a creative process resulting in a piece of choreography. Through the framework of research and choreography, I drew relationships in order to relate science to the art of dance. The results of my research were presented in this report as well as in a piece of choreography entitled *Between the Rhythm*. This piece was to be presented in Terpsichore Dance Club's annual spring concert, Spring into Dance on April 30-May 2, 2020. This project was focused on creating a connection between the two majors I studied while here at the University of Akron in order to demonstrate my intellectual and artistic abilities.

Introduction

Music is an integral aspect of modern society, becoming a part of our daily lives from morning till night. While there are various forms of music, it is a unifying aspect of culture. Music can connect even the most diverse groups and bring to life the creative aspects of humanity. As music opens creativity within an individual, dance is brought to life. Dance relies on music to be its guide and to bring emotions and themes to a physical representation. Music and dance intertwine to create a seamless demonstration of the creativity that can be created from the human mind. While dance can function by itself, music uplifts dance to come full circle. The body is moved by music and in turn, so is memory.

Music can remind one of a past memory, an important moment in life where a song or melody defined that time. Memories are interwoven with the music of our lives, and the capacity of the brain to remember is astonishing. The neural networks and regions of the brain that work harmoniously to allow us the ability to remember music and our lives is not only important for heuristic value, but also for learning, teaching, and choreographing dance.

From a young age, dance students are expected to recognize the beats and melodies within music and connect them to movement. The movement is memorized in accordance with the music, which connects various forms of learning: kinesthetic, auditory, and visual. Psychology is an important aspect of dance that is often overlooked for the benefits that research can provide dancers and teachers. If psychology can continue to have breakthroughs in understanding how music impacts memory, imagine what this knowledge could do for a dancer.

The motivation for this project came from a desire to combine my two majors: dance and psychology. Both of these subjects are highly influential to each other and in this project, I wanted to demonstrate the relationship of the two and their benefits to each other. This is why I

have chosen to title the piece *Between the Rhythm*. The audio I used in *Between the Rhythm* was *Bari Improv* by Kaki King with intermittent silence throughout, cut and edited myself. I chose this particular piece of music because of the rhythms. Seven dancers were cast in this piece for the purposes of formation and spacing. The lighting for this piece was to be designed by Christopher J. Ha. The presentation of my research project was to be performed in Terpsichore Dance Club's Spring into Dance, April 30th through May 1st and 2nd.

Research

Stevie Wonder said “music, at its essence, is what gives us memories. And the longer a song has existed in our lives, the more memories we have of it” (Sacks, 2017), illustrating the everlasting effect of music on our brain. Music is a combination of silences and sounds that create rhythms, melodies, and patterns (Stein, 2007) that could not exist without the existence of memory (Sacks, 2017). Music relies on a key association within the brain's neural networks to recognize patterns, rhythm, and structure (Sacks, 2017).

Because of these associations, music has been an important construct in autobiographical memories (Jäncke, 2008), also known as music-evoked autobiographical memories (MEAMs) (Cuddy et al., 2017). It has been discovered that for older adults, there is a positivity effect which is recalling memories with more positive content over negative content (Cuddy et al., 2017). In a study designed to test the positivity effect of MEAMs in adults with Alzheimer's Disease, it was discovered that the positivity effect strengthens the response of involuntary memories to musical cues (Cuddy et al., 2017). This is considered to be linked to the idea of self-identity in which an individual view themselves and their actions with a more positive construct rather than negative, especially in older adults. This study demonstrates the positive benefits of music on the brain in

older adults, but also illustrates the importance of memory formation in accordance with music. This aspect in turn directly correlates to the physical representation of a dancer's brain and the training a dancer undergoes.

As stated by Chiara Giacosa in a recent study, "We found that dancers and musicians differed in many white matter regions, including sensory and motor pathways, both at the primary and higher cognitive levels of processing" (Newman, 2016). In dancers, the fiber bundles linking sensory and motor regions as well as the corpus callosum were broader, suggesting the overall connectivity and fiber overlaps in dance training (Newman, 2016). During training, a dancer utilizes their entire body, learning how to intricately connect movement within the capacity of the human body. This is an important detail when studying the effects of dance on the brain. The overlap of fiber bundles and increase in size is broadly represented in the neural cortex of a dancer, which reflects how a dancer trains (Newman, 2016).

As the physical movement of dance is represented in the neural cortex, the importance of the musical aspects of a dancer is a key component. Learning how to manipulate one's own body is the essence of dance, but integrating music into this intertwines the psychological aspects of dance and music. While the majority of dancers are not as highly trained in music, they are taught the proper terminology and develop an ear for the layers within a piece of music. Choreographed works are tied to the music and a dancer connects the music to remember movement. If music has a profound impact on a dancer's memories, in what other ways does music impact the brain?

Several studies have been conducted studying the various effects of music on the brain, one of which is engaging portions of the brain involved in updating memory, attention span, and making predictions (Bryant, 2014). In dancers, music is used to teach choreography and in turn is

used to recall movement. Dancers link movement with music which aids in the learning process. In a dance studio, the classroom setting is strongly influenced by kinesthetic, auditory, and visual learning components. A teacher plays the music as well as detailing specific terminology associated with the music, eventually connecting the movement with music. When entering a dance studio, the first sensory stimulus is always music and rhythm. Without music, dance could not be as impactful of an art form. Dance and music live harmoniously which is reflected in the neural networks within the brain.

Much is still unknown about memory. Psychological research is constantly pursuing the question of memory and the functions it plays in the brain. Further discoveries in the understanding of memory leads to more questions than answers; subsequently leading me to pursue music effects on the brain. My entire dance training has been centered around music and while there are still unknown aspects, music impacts brain development. Along with known musical impacts on the brain and the neural networks, a dancer's brain is also molded due to the physicality and learning components of dance. One cannot exist without the other, as the brain could not exist without the impacts of music.

This research was conducted to further increase the understanding of how music affects the brain in order to inform the template for my piece. The research provided me with several ideas on how to translate the scientific facts into an abstract piece of work that will demonstrate how science can inform art and vice versa.

Choreographic Process

Integrating the theme of the musical effects of memory was the theoretical layout for the creation of my piece. I chose to use one piece of music entitled *Bari Improv* by Kaki King with

three intermittent silences throughout. This particular piece of music is highly rhythmic and has several layers that create the singular piece. As I chose to choreograph using tap, I wanted a piece of music that would represent the complexity of music in rhythms and beats.

Tap is a style of dance that relies on rhythm, an integral part of music, which is what has always drawn me to it. The various sounds that a single tap dancer can create is stunning and reflects the skill of the brain to recognize pitch, tempo, and rhythm. The piece of music and the style of dance were chosen for specific reasons, as I wanted my piece to reflect the integration of music in the brain in an abstract fashion.

I chose to integrate silence throughout the piece for the specific purpose of demonstrating to the audience the rhythms they could hear without the aid of music. Tap in itself is its own form of music, so by adding silence within the soundtrack, the style of dance became its own rhythm. While this may seem counterintuitive for the research question of the project, I believe that it was an important artistic choice. The levels of complexity of the piece of music were taken away with the dancers' own internal breath and heartbeat as their guide. The dancers kept the rhythm of the choreography as one unit, using each other as guides to maintain the same tempo and seamlessly join with the music when it would begin again.

The fading in and out of the music was representative to me of how the memory strengthens and weakens throughout one's lifespan. Music has been found to increase the retrieval of a specific memory, which I connected to when the music would begin again after fading into silence. The rhythms of the choreography and the music would entwine to create a strong memory; when the music would begin to fade with the choreography as the only sound, the memories would be at their weakest point.

In both sections of silence, there were two dancers that were on stage. In the first silence, the two dancers started the movement with others integrating throughout the choreography, joining all together for a moment before the music would fade back in. This was to represent how memories are aided by several biological features within the brain. Hearing music starts a chain reaction that ends with an understanding of the music as well as the possibility of a memory being evoked for the individual. While conducting research, a study looked into music-evoked autobiographical memories which this section of silence demonstrated. The dancers are remembering a specific memory of themselves through the rhythms they are creating, and as the memory includes more people, the stage begins to add more people into the space. Autobiographical memories are representative of ourselves, but other people shape who we become. The purpose of this particular section was to show the importance of our memories and the learning that occurs in a lifetime, but also the importance of the people who are included in the memories as well.

The second section of silence consists of two solos, both of which rely on the dancers' own internal rhythm. Another important aspect of music-evoked autobiographical memories is the self-identity which inspired me to give two dancers the chance to be alone on the stage. To be able to stand proudly and confidently on a stage by yourself truly evokes a sense of self-identity. As a dancer, the stage is home and is a place where we feel the most ourselves. We are shaped as humans by our experiences throughout life, including music and its ties to memories, and coming to the end of my time here at college, it was fitting to have a moment in the piece that could speak to the self-identity that occurs in college with the silence allowing the dancers to fill their own minds with the music of their lives.

I have always been fascinated by the simplicity yet complexity of music. The simplest strum can be the most profound moment of a single piece of music which is why the dancers began in a single line. As the music builds, the dancers begin to divide and move from the line into another formation. The dancers move between one another to create a formation that reflects the movement of the music.

Another key formation in the piece was a circle. Circles represent wholeness and completion which I believe connects to music. From beginning to end, a piece of music comes full circle and leads our brain through steps to process the music from the first note to the ending beat. I developed a section of choreography that played with the idea of a circle that continued moving and directionally changing in order to reflect the unity, but also fragmented aspects of memory. While conducting research, the effects that music can have on people diagnosed with Alzheimer's Disease or Dementia was a topic that I came across the most. Our memories are not perfect and oftentimes can be completely inaccurate, but the complete loss of memory is the hardest of all. Studies have found that hearing music aided multiple patients in their ability to recall a memory, even if that specific memory was an arbitrary one (Bryant, 2014). Memory is not concrete, but rather is fascinating in its ability to exist without our true understanding of how it manifests within the mind.

This particular formation I wanted to reflect how memory brings together our lives from beginning to end, but is also affected by the ups and downs of our ability to recall. I played with the movement of choreography in a circular formation to illustrate these ideas and to also provide the dancers with a moment of interaction. Facing each other in a circle, everyone can build off of each other, creating a moment on stage where the dancers can only see one another. Our memories are constructed with several people influencing us which is a topic that I found to

be very important when choreographing. Music connects people across generations, societies, and cultures which was why I initially chose my research topic. Music is at the core of dance and has had a profound impact on its development. Creating connection across various areas of study was the purpose of the research and was an idea I contemplated thoroughly for purposes of choreography.

Within the choreographic process, elements of rhythm, formations, and use of space were considerations when creating a piece of work that would reflect the research conducted. Creating a unified element that would combine intellectual and artistic capabilities, delving into scientific research can result in art, which was what culminated in the choreographic process.

Reflection

The development of this piece has pushed me as a choreographer to incorporate different elements into my creative process. In general, choreography is an aspect of dance that causes fear and anxiety for me which often reflects in the amount of time that I spend in the studio creating a piece of choreography. My pieces have always been driven by the choice of music, as I like to use several layers within music to create a piece. Since the piece of music I chose not only had silence, but also had repetitions in the rhythm, it made the choreographic process uniquely difficult. I had to be creative in the way that I listened to the music and choreograph to the same rhythm, but incorporated different rhythms for the dance. Several times I knew exactly what I wanted the rhythm to be, but was lost on creation of formations to emphasize the rhythm or music or vice versa, an artistic formation not in context of the music. This leads me to question the momentary disconnects between specific music and formations and if they are driven by memories of other music and formations.

The incorporation of my research into the piece was not difficult, but taking all the ideas and images in my mind to fruition was the difficulty. I am a person who naturally thrives on order and structure which means that when I would have rehearsals for past pieces, I knew exactly what I wanted to happen. For this particular piece, I learned that coming to rehearsals with only a small section of choreography and a few ideas that allowed for experimentation during the time was not detrimental. My rehearsals would typically start with me teaching planned, then experimenting with counter rhythms and formations. My cast was very flexible and open to the process during rehearsals which helped me to remain calm and experiment with the notion of memories, music, and dance.

During the process of this research and choreography, I not only enhanced my knowledge about my chosen topics, but I also gained insight into myself. While this actual piece of work was unable to be performed, I was able to create in a comfortable space with the people I care about the most. I learned more about who I am as a person and as a dancer, as well as how to face the aspects of choreography that I fear the most. This research project forced me to be honest with myself about what scares me as a creator and how to articulate what I needed in order to be successful. The project also emboldened my belief in the positive psychological aspects of dance, music, and memories and my desired career path to integrate dance and psychology. This would benefit not only dancers, but others in ways outside the standard methodology of psychiatric care.

Often in psychology, research does not always yield the results that are expected, much like the process and outcome I experienced for this project. Being able to draw connections between my two majors in an intellectual and artistic way has demonstrated the importance of disciplines working together in order to be successful as well as support one another. Psychology

and dance both have an intriguing and complicated history with several people who have had an impact over the years. Art and science can influence and connect with one another, through understanding the brain and in practice. The goal of this project was not only to understand how music affects the brain and how this can be used in dance, but also to illustrate the strength in the interaction of science and art.

Conclusion

Through this research project, I have gained important insights into my two chosen fields of study. Through the use of research, I was able to draw connections between the effect of music on the brain and in turn connect this to an artistic and physical representation. By having a framework for choreography, I was able to explore my own capabilities as a dancer, choreographer, and teacher that will be important for furthering my knowledge of dance and psychology.

Throughout the process of research and choreography, I was able to integrate psychology and dance into a seamless reflection of each other. During my coursework at the University of Akron, my majors were separate, but this project provided me with the opportunity to explore how other disciplines can influence one another and tie psychology and dance together.

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