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Expressive Arts Therapy as a Supplemental Treatment for Schizophrenic Symptoms Through a Neurobiological Lens

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Expressive Arts Therapy as a Supplemental Treatment for Schizophrenic Symptoms Through a

Neurobiological Lens

Schizophrenia and Expressive therapies, a literature review

Capstone Thesis

Lesley University

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Expressive Arts Therapy

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Abstract

This literature review seeks to investigate 3 modalities under the expressive therapies umbrella, music, art, and dance as possible interventions for reduction of intensity and frequency of symptoms of schizophrenia. By reviewing available literature on the effects schizophrenia has on the brain and comparing that to the available literature on these modalities as they have been studied neurologically, and any literature available on the intersection of these topics, this review attempts to make a case for the use of the arts as in addition to antipsychotic medication to alleviate schizophrenia symptoms. What was found is that music, art, and dance, may produce change in parts of the brain that have been observed to deviate from the structure and functioning of a neurotypical brain in individuals with schizophrenia.

Purpose of the Review

This review of the literature aims to explore potential neurobiologically informed expressive arts therapy (NIEAT) interventions as a treatment for symptoms of schizophrenia and identify areas for future research. Through the literature that I was able to access on Lesley University's network of academic databases, I will be looking for ways in which the expressive arts could reduce the intensity and frequency of symptoms associated with schizophrenia, and psychotic disorders, which include but are not limited to, a reduction in cognitive functioning, a reduction in fine motor skills, false sensory experiences, and false beliefs about generally accepted versions of reality.

My focus in finding the connection between the arts and schizophrenia will be on comparisons of the effect each condition has on the brain. Where there is evidence that the arts may balance out adverse effects of schizophrenia, I am suggesting further research be done to connect the link that I am seeing in the research that is currently available.

This paper is using the term expressive therapy to engage the senses as opposed to other forms of sensory engagement because of the arts connection to the improvement on the quality of life, and the connection between the arts and emotions. The arts are also a way through which the therapist can target and control sensory engagement instead of bombarding the senses.

Integrating the expressive therapies into community-based treatment, as opposed to more traditional behavioral or psychodynamic methods, could potentially alter brain morphology and neural activity through the engagement of the senses. While talking and feeling emotion may engage some of the brain, the arts incorporate the systems in the brain responsible for sense of space, awareness of the body, perception of sound, tactile senses, and so on, in addition to talking and feeling emotion.

Lastly this review of the literature aims to lay the groundwork for future areas of research and add to the literature available on the place the expressive arts can have in mental health. Expressive therapies are relatively new and understudied fields. I was able to find very little information is available regarding expressive arts therapy and physical observable changes in the brain. The arts can engage all the senses, express that which cannot be communicated verbally, and include the holistic experience of a person in the therapeutic space, so the notion that expressive arts therapy could possibly change brain morphology and neuronal activity is within the realm of possibility.

Introduction

Schizophrenia is a serious mental illness for which evidence-based treatment is often limited to pharmaceutical intervention. For negative symptoms associated with the disorder the National Collaborating Centre for Mental Health (UK)'s guideline for treating adults with schizophrenia recommends art and expressive art therapy to reduce symptoms, however there is little research relating to the expressive arts and schizophrenia, especially beyond the case study method. As of 2016, schizophrenia affected more than 21 million people worldwide, and more than 50% of people with schizophrenia are not receiving appropriate care (Schizophrenia, 2016).

There is evidence to suggest that traditional mental institution style treatment is not effective, and often a violation of human rights, however there is a desperate need to expand access to community-based treatment (Schizophrenia, 2016).

To bring about the availability of the much-needed care in the community, more research should be done into supplemental treatment to medicine, to provide more comprehensive care. Additionally, more patient buy-in to treatment could prove beneficial to those seeking treatment. Engaging treatment is important in working with peoples with schizophrenia, as they are far less likely to seek treatment than those with other mental illnesses ("Schizophrenia," 2016).

Additionally, there is so little known about the neurobiology of schizophrenia (Allen et al, 2008), and there is little neuroimaging that has been done to observe the effects of the expressive arts on the brain. When looking for resources using Lesley's online data base, I used search terms including "schizophrenia", "expressive arts therapy", "dance therapy", "art therapy", "music therapy", "psychosis", and "psychotic disorders". What little information I could find had to do with one modality on its own.

While most all the best information I came across asserts that psychopharmacological interventions are paramount to successful treatment of schizophrenia, most treatment of the disorder can be costly and inaccessible, while the expressive arts often need few materials, and can be performed just about anywhere.

Literature Review

The Senses and the Brain

The thesis of this paper suggests that specifically targeted sensory experiences could change the brain in ways that may work to reduce intensity and frequency of symptoms in

schizophrenic and psychotic patients. The studies being provided in this paper are examples of the arts being a beneficial outside influence on the organization of the synopsis of the cortical brain, as those areas of the brain relate to what is known about the neurobiology of schizophrenia.

The research presented in this review is meant to argue the case for the arts as a viable treatment option worth investigating further. What follows in this literature review is an in depth investigate neurologically supported connections between schizophrenia and music, dance, and art, and the connection between the senses and brain development. While expressive therapies include several different modalities not specifically looked at in this literature review, they have not been excluded due to a lack of connection to the topic. It is the limitations of this paper that have led me to omit them in the present thesis, with the intention of arguing for more investigation in future research.

The brains of humans, as well as other mammals, have the capacity to change. Through a process known as neuroplasticity (sometimes referred to as brain plasticity, or neural plasticity), the nervous system reorganizes itself based on behavior and thought in addition to outside influences, such as injuries and other external sensory influences. It was long thought that brain development ceased at the end of adolescence (Pascual-Leone, 2005).

The study titled *Neurogenesis in the adult human hippocampus* by Eriksson, P., Perfilieva, E., Björk-Eriksson, T., Alborn, A., Nordborg, C., Peterson, D.A., & Gage, F.H.. (1998) was an earlier research study done on the phenomenon of neuroplasticity. In the scope of neurological research, 1998 is a subjectively recent study, there is a lot that remains unknown about how it occurs and what exactly it means for our ability to change through it.

Diamond, Krech, and Rosenzweig (1964), published a study that observed the brain of young rats who grew up in a sensory enriched environment, and found that the rats who lived in environments of sensory complexity, and underwent training, had an increase in weight of their cerebral cortex. Diamond et al. (1996) again studied the brains of rats in sensory rich environments and found higher cell count and size of their cerebral cortex, in addition to more cortical depth.

Similarly, to the previously described studies, there is evidence to suggest that sensory diverse and complex environments are paramount to the healthy development of the brain, and plays an important role in cortical growth. Other research suggests that bombarding one's senses can lead to several unwanted results in behavior and brain development.

Christakis, D. A., Zimmerman, F. J., DiGiuseppe, D. L., & McCarty, C. A. (2004) found that in their longitudinal study of early exposure to television, children at age 1 through 3 who had been watching television more daily hours than their peers were more likely to have attention issues like ADHD at age 7. This information is relevant to the thesis because children's television is a medium through which one can engage the senses. In addition, Nino Ramirez, PhD the Director of the Center for Integrative Brain Research and Principal Investigator for Seattle Children's hospital, presented a relevant study at a press conference during the annual meeting of the Society for Neuroscience. According to his presentation, his team has investigated the neurological effects of bombarding young rats with sensory experiences and found that they too had problems with attention and focus (Ramirez, 2016).

Expressive Therapies

In the book *Expressive Therapies*, expressive therapies are defined as “the use of art, music, dance/movement, drama, poetry/creative writing, play, and sand tray within the context of psychotherapy, counseling, rehabilitation, or health care” (Malchiodi, 2005, pp. 2). There are similar terms that may be used interchangeably by some, however this paper will be referring to expressive therapies, as opposed to expressive art therapy, because the research is broken down by specific modalities, being music, dance, and art.

Music Therapy

Music therapy is arguably the most studied of the expressive therapies modalities in its connection to neuroscience. Neurologic Music Therapy is a field by itself. As I will be discussing below, music and music therapy engages the senses in more ways than might be immediately apparent. Hearing is engaged through music, but in addition, fine motor movements, and rhythmic movements also play a huge role in music as a therapy as well.

The German Center for Music Therapy Research created a neuroscientifically informed model of music therapy, which is called the Heidelberg Model of Music Therapy. This treatment is meant to alleviate distress for individuals suffering from tinnitus, a chronic ringing in the ears (Krick et al., 2015).

The Heidelberg model is designed to occur over a five-day period, in most cases this means it runs Monday through Friday. There are eight sessions which include music therapy and one session that consists of counseling. All nine sessions last for 50 minutes and typically there are two sessions a day. The 50-minute music sessions were split in half between therapy that involved music listening and therapy that involved music playing, or as they refer to it in the model, receptive and active. Two separate music therapists lead the therapy, one for the receptive

aspects and another for the active. The sessions are categorized into three modules that will be explained shortly (Argstatter et al., 2015).

In the study done by Argstatter et al. (2015), the Heidelberg model was being compared to a single psychoeducational counseling session. Within the Heidelberg model, a counseling session of a similar nature is also built into the model and is the first module of the model. According to Argstatter et al. (2015), the counseling for both the control group and those doing the complete Heidelberg model involves “comprehensive personal instruction”.

The second module was all about resonance training. The resonance training had to happen 3 minutes every hour. These trainings were carried out as a vocal exercise and they were meant to “stimulate the cranio-cervical resonating cavities” (Argstatter et al., 2015). The theory behind this stimulation has to do with the way brains perceive sound, and somatosensory input. The somatosensory system is a part of the nervous system that detects changes on or in the body, meaning that it responds to the resonating cavities mentioned above. The process to be certain that the cranial resonating is occurring is relatively non-invasive. Both therapist and participant can feel at the base of their nostrils, a joint on the cheeks, and a muscle on the back of the neck. At all three locations, when the cranial resonating is occurring, an obvious vibration can be felt with the hands (Argstatter et al., 2015).

The third module surrounded Intonation Training. This module is an active form of music therapy in which the participants had to imitate tone sequences played on a piano by the music therapist, using their voices. The training started with just two tones but made its way up to five. The purpose of this module is in part to increase the ability for auditory stimuli. In addition, the

participants had now increased their ability to tune out irregular auditory information, and only focus on the relevant acoustic sounds (Argstatter et al., 2015).

Finally, the fourth module sought to affect participants by way of tinnitus reconditioning. This module consisted of receptive music therapy. Participants were instructed to use relaxing background music. Music and relaxation are thought to activate the sympathetic nervous system, and the parasympathetic nervous system (Argstatter et al., 2015).

Also, in the fourth module, participants were instructed on habituation by way of music. The tinnitus sounds were embedded in the relaxing music, but not so much that it was overbearing. The music was put at a level where participants could listen to it and follow verbal prompts (Argstatter et al., 2015).

The last aspect of the fourth module was stress management. For this they had patients make a tinnitus map. They were asked to recall situations that aggravated and intensified their tinnitus. Occasionally throughout the relaxation exercise, the therapists would ask the participants to recall this situation, to disassociate them with the increase in tinnitus distress (Argstatter et al., 2015).

The neurobiology of tinnitus is still somewhat a mystery, however there is strong evidence that the phantom noise is linked to grey matter reduction in cortical areas of the brain associated in auditory processing, such as the Heschl's gyrus, where the primary auditory cortex is widely accepted to be located (Krick et al., 2015).

Gray matter is a kind of tissue that makes up parts of the brain and spinal cord (Gray matter, 2012). As was discussed above, gray matter can increase in density and volume with behavioral interventions because of neuroplasticity, which is a phenomenon where the brain

undergoes structural changes because of repeated use or inactivity of neural pathways, and in some cases, this results in more of the gray matter tissue (Neuroplasticity, 2017).

In a neuroimaging study of individuals with tinnitus, Schecklmann, et al., (2013), found evidence that a reduction in grey matter of the bilateral auditory parts of the brain, which includes the primary auditory cortex, negatively correlated with the distress the individuals being observed experienced from their tinnitus. The less gray matter found in these areas of the brain, the greater their reported distress was (Schecklmann et al., 2013).

The clinical study done by Krick et al., (2015) was measured with both fMRIs and the Tinnitus questionnaire (TQ) developed by Goebel and Hiller (1998). The participants of the study were all in the early onset of their tinnitus, and the intervention lasted a week, as is the typical length of the traditional intensive Heidelberg model. The high-resolution voxel-based fMRIs were administered to observe potential structural changes in the brain that could possibly be associated with the treatment. Participant's brains were scanned twice, once on the weekend prior to the start of treatment and then again on the weekend following its conclusion. The treatment group's brain structure was also compared with the brain scans taken from a passive control group and an active control as well (Krick et al., 2015).

The finding of interest to this literature review is the increase of gray matter density to the Heschl's gyrus, an important player in the cortex that process auditory hearing. This finding does not just appear on the images of this observation of the Heidelberg model, but is seen consistently throughout the brain scans of this model of music therapy in a few different studies (Krick et al., 2015).

By comparison, those in the active control group, who did get the psychoeducational session but no music therapy, had no significant growth in the Heschl's gyrus. Though there were some changes in the brain that the active control and the treatment group shared, only the treatment group showed an increase in grey matter in the primary auditory cortex (Krick et al., 2015).

As psychosis was one of the few disqualifiers for participation in this treatment and study, so there is no way of knowing if this method is a viable option for individuals with schizophrenia (Krick et al., 2015). If treatment for this population were to be inspired by the Heidelberg model, there would need to be modifications, both for the population and individual ability to complete tasks as directed, as that may be impacted by the disorder. However, as I will discuss below, there is a suspected correlation between low volume in the primary auditory cortex, which is located on the Heschl's gyrus, and auditory hallucinations.

A study written by Gaser, C., Nenadic, I., Volz, H., Büchel, C., and Sauer, H. (2004), gathered neurobiological data on 85 individuals with schizophrenia (Gaser et al, 2004). These researchers were looking to find if there were detectable differences in brain morphology (the structure of the brain and changes to that structure) of those who report auditory hallucinations, and those who do not. In this study, as in the last, a high-resolution MRI machine was used to look for these detectable differences. The primary finding of this study was that there was a significantly lower volume of grey matter in the primary auditory cortex than that of the control group (Gaser et al, 2004).

It is important to note that the primary auditory cortex is not the only part of the brain to show a reduction of grey matter in those who experience auditory hallucinations, as will be

discussed later in this review. Though it was described as the main finding of the study, other significantly less voluminous regions include a right prefrontal region comprising parts of the middle and inferior frontal gyri and the inferior part of the left supramarginal gyrus (Gaser et al, 2004).

The neurobiology of schizophrenia or other psychotic disorders remains largely unknown; however, this finding is one of the most consistent in those who have studied it. Since lower volume and density of the primary auditory cortex and Heschl's gyrus is consistently found in those who experience auditory hallucinations because of schizophrenia and other psychotic disorders.

Dance Movement Therapy

Dance and Movement therapies require participants interact with their bodies in a way that other arts cannot. The act of physically moving one's-self to create art sets this modality apart from others. In a Non-Impact Aerobics (NIA) workshop mentioned in the newsletter for the ADTA, or American Dance Therapy Association, Tina Erfer described dance movement therapy as “the psychotherapeutic use of movement to promote emotional, cognitive, physical, and social integration of individuals” (The Official Newsletter of the American Dance Therapy Association, 2012). Given what I have found in existing research, it is possible that with the appropriate resources and research, dance therapies could potentially impact symptoms of schizophrenia.

Self-talk is a part of normative cognition. Hearing your mother's voice in your head as you do something she has always hated, for example, is an experience one can have without it being a hallucination. One theory existing on what differentiates self-talk, such as the example just given, from a genuine hallucination has to do with the involuntary vs voluntary nature of the

presence of the voice. Running with the example used above, while your thoughts are being presented to you in your mother's voice, you were in control of that thought being created. In

Allen, P., Larøi, F., McGuire, P. K., and Aleman, A. cite a large study finding volume reduction in in the dorsolateral prefrontal cortex of individuals who experience hallucinations in their review *The hallucinating brain: A review of structural and functional neuroimaging studies of hallucinations* (2008). The dorsolateral prefrontal cortex functions as a part of the network that allows humans to make decisions. Moral, risky, intellectualized choices all activate the dorsolateral prefrontal cortex. One theory for why that is, has to do with the dorsolateral prefrontal cortex being responsible for the voluntary and involuntary nature of what the brain produces (Boksa, 2009). Essentially, the reduced grey matter of the dorsolateral prefrontal cortex in persons with schizophrenia found by allen et al. (2008), could have something to do with the "voices" auditory hallucinations produce, being perceived as an external source.

In a study of age 45 and older men, Prakash et al. (2012) investigated a possible correlation between aerobic exercise and executive functioning. Most all the executive function skills come from the prefrontal cortex. Healthy adults lose gray matter in the areas of their brain responsible for executive functioning, such as the dorsolateral prefrontal cortex, as they age. The study involved several cognitive and fitness assessments in addition to the fMRIs. Participants were tested for things like attention, inhibitory control, spatial working memory, and cardiorespiratory fitness (Prakash, 2012).

As predicted, the study found that higher cardiorespiratory fitness levels correlated in parts of the brain typically associated with executive functioning that naturally loses tissue as people age. One of the studies primary areas for brain growth was the dorsolateral prefrontal

cortex. Although the biological systems through which this augmentation of that gray matter because of aerobic fitness remain largely a mystery, it is thought that the exercise enhances synaptic activity and encourages plasticity (Prakash, 2012).

Dance and movement therapy has had a longstanding relationship with the aerobic dance community of NIA. The relationship between NIA and the dance therapy community is shown by a post published on American Dance Therapy Association's newsletter titled *Dance/Movement Therapy & Nia: More Than Just Dance* (The Official Newsletter of the American Dance Therapy Association, 2012)

In NIA classes, there is no requirement for a level of physical fitness. The name NIA might be misleading, as it does not mention dance, however a typical class involves a few choreographed moves in combination with freeform movement. NIA's dances have an emphasis on the sensations in the body and the awareness of them. These factors are used to create the dance in the free space between the choreographed moves. All dancing is done barefoot to enhance this awareness and sensation in the body ("The Official Newsletter of the American Dance Therapy Association," 2012).

Aside from Dance Movement Therapy associated activities that are already labeled aerobics, many forms of DMT could bring about the same benefits of aerobic exercise on their own. The Salem Press *Encyclopedia of Health* defines aerobics as “sustained moderate physical activity during a specific period of time that requires an additional effort from the cardiovascular system—that is, heart and lungs—in order to increase the transport of oxygen to the muscles” (Mercada, 2015).

While not all dance movement therapy involves a work out, and exercising is certainly

not the goal of engaging in dance movement therapy, there is often a substantial amount of movement and consequential physiological responses such as those described in the definition of Aerobic fitness. With the definition used at the beginning of this section of dance movement therapy, most any form of the modality could potentially see the same benefits as NIA for targeting the dorsolateral prefrontal cortex. A part of the potential effectiveness of dance movement therapy is the encouragement to get up, increase the heart rate, and indulge in the sensations that occur through movement. A lot of traditional dance movement therapy, and not just dance aerobic fitness, are going to act on the body in much the same way that aerobic fitness does.

In addition to studying grey matter, electroencephalographic data is another method researchers use to observe the brain. Electroencephalography (EEG) is a process in which electrodes are attached to an individual's scalp to measure electrical activity. The firing of neurons is responsible for thoughts, feelings, and behavior, and it is the communication between neurons being observed with the use of EEG. There are limits to this method of brain activity observation worth noting. Since the instrument used in this method is a cap of sensors placed along the exterior of the cranium, an EEG can only read electrical signals a few centimeters below the surface of the brain. Most of the information that has been gleaned from research done using EEGs is about cortical areas of the brain, as that is what can be accessed through this tool. The EEG allows for the observation of the brain under far less constrained situations. For an fMRI to occur, the person being studied must remain completely still in a narrow magnetic tube. MRI's are extremely loud, and not an option for anyone who has had surgery that involved having metal placed in their bodies. (Electroencephalogram (EEG),2012).

Ventouras, E., Margariti, A., Chondraki, P., Kalatzis, I., Economou, N., Tsekou, H., and Ktonas, P. (2015) conducted a pilot study which collected EEG data to observe brain connectivity in psychotic patients who underwent treatment with the use of dance therapy. Specifically, participants engaged in Primitive Expression. In its origins, primitive expression came to the dance therapy universe from an anthropologist, Katherine Dunham.

In the interest of potential future research finding a foundation on good existing research, I would like to address some problematic components of this branch of DMT. In 2007 the Association of Social Anthropologists, a body of professional anthropologists based out of the UK condemned the use of the word primitive to describe people living today (Tribal peoples not stone age and primitive say experts, 2007). For the purposes of this conversation, I will assume this condemnation extends to practices or adapted practices that are still being performed by tribal people alive today being described as primitive. The ASA is far from the only opposer of the use of the word primitive in such a way, but considering the origins of this practice, I wanted to get the perspective of anthropologists.

While primitive expression was thought up in the 50s, the study referenced was done in 2015, and it is still practiced by modern dance movement therapists. While this research is by no way a means to advocate for its continuation as it is, I have chosen to include this research because, there is not an abundance of relevant research on brain structure and dance, and it is possible for adapted experimental treatments to take from primitive movement. In addition, Katherine Dunham herself had native American heritage on her mother's side and west African heritage on her father's and was therefore not entirely removed from the cultures she drew inspiration from.

The methods birth occurred in the 1950s when Dr. Dunham was studying for her doctorate in the Caribbean. There she observed traditional dancing in Haiti, Jamaica, and Trinidad. Upon her return to the United States she started the Chicago based dance company, The Ballet Negre, whose unique dancing style informs much of modern Primitive Expression practices in dance movement therapy (Margariti et al., 2012).

Primitive expression is a highly symbolic method of dance therapy, with the goal being a “transcendence.” Characteristics that primitive expression are known for include African inspired movement, foot stomping, and percussion produced rhythms. Primitive expression uses play and reenactment to connect participants to different parts of themselves. Through the dance, the participants get to physically embody different well-known archetypes including characters like, warrior, hunter, thief, and animals, as well as their own imaginary characters, or imaginary animals (Margariti et al., 2012).

The object of these characters in the ceremony of primitive expression is to explore all dynamics associated with the persona they are embracing. Ideally the imagination and play allow participants to indulge in hidden desires, take on a perspective they have not before, and feel power, anger, fright, and the whole spectrum of emotions within a therapeutic and safe space, by distancing themselves through the use of characters.

The research by Errikos-Chaim et al. (2015) mentioned earlier, focused on interhemispheric connection and coherence as it is affected by primitive expression. There are several studies that have observed a decrease of interhemispheric coherence in individuals with schizophrenia. Henshall et al., (2012) noted significantly different interhemispheric coherence using alpha and beta waves, between the control group and the group of individuals with

schizophrenia. Particularly, this study noted a decrease interhemispheric coherence in the areas of the cortex that are important in auditory processing.

Frequencies that are measured using EEG are put into categories named after Greek letters according to what range of cycles per second (hertz) they fall into. Delta and Gamma are the highest frequency categories and occur in the brain most when the individual is very mentally engaged and fully awake and alert (Ventouras et. al, 2015). Ventouras et. al. (2015) compared EEG coherence in a sleep study as well as prompted participants to engage in rapid eye movement while awake. This study found a decrease in EEG coherence for delta, and gamma frequencies in the wake stages in their study of schizophrenic patients, when compared to their control group.

From this research, connections can be made between dance movement therapy and parts of the brain that are also found to be atypical in individuals with schizophrenia. Both brain morphology and connectivity have been observed to change using movement. It is also worth mentioning here that I was able to find less information on dance movement therapy and neurobiological research than I was with music therapy.

Art Therapy

Visual arts also have the potential to be beneficial to the neuropsychology of persons with schizophrenia. Art can come in many forms of sensory experiences. There is a theoretical framework used with in the art therapy community dedicated to categorizing the kinds of sensory experiences (creative, symbolic, cognitive, perceptual, affective, kinesthetic, sensory) that can be utilized as an art therapist into a hierarchical structure, called the expressive therapies continuum.

This framework suggests ways in which the therapist can use different sensory experiences deliberately to elicit different responses from their clients, and what kinds of problems each kind of sensory experiences would be beneficial to what kinds of problems (Hinz, 2009). Although visual arts may seem restricted to sight when it comes to enriching sensorial experiences, visual arts engage all the senses. As the expressive therapies continuum describes, even within sight there are complex subcategories of sensorial experiences that also shape the brain. As was the case with music and dance, the places that are affected by art and schizophrenia may have some overlap worth researching further.

In their study, Fortunato et al. (2011) examined how expression of art affected the brains of their participants. They were investigating the claim that individuals who look at actions in paintings feel as though they are embodying that action. They used transcranial magnetic stimulation throughout their experiments, which is a device that sends an electrical current to activate a targeted part of the cortex, to observe the connection of the brain to the body, and, the spine and muscles (Fortuanto et al., 2011).

What the researchers were looking to find out was if corticomotor excitability was increased when looking at action in art. All participants of the study were normative from 29 to 30 years old. Participants were sat in front of a computer and watched a video, giving them instructions on what to do for the current experiment. The visual stimuli in the test was also displayed on the screen.

For the first experiment, Fortunato et al. (2011) sought out to observe cortico-spinal excitability during both rest and during the observation of a painting using disc electrodes placed

on tendons. The selected painting for the first experiment was *Expulsion from Paradise* by Michelangelo, displayed on the Sistine Chapel (Fortuanto et al., 2011).

The second experiment observed corticospinal excitability while participants were instructed to study the hand positions of three paintings Michelangelo's *Expulsion from Paradise*, his *Creation of Adam*, and Giovanni Bellini's *Dead Christ*. The TMS was then sent to the appropriate muscles, at which point excitability could be measured (Fortuanto et al., 2011).

In the third experiment the participants had to watch a rest video which instructed them to relax in addition to an imagery video which told them to rehearse in their heads the observation of the paintings. They then had sessions of image viewing. Prior to the TMS being administered the participants underwent an imagery training protocol and achieved the target muscle relaxation. At the end of each session, the study participants rated the intensity and clarity of the painting they were imagining. They ended the training when the participants reported a clarity score of 4 (Fortuanto et al., 2011).

What was found through these experiments clearly suggested that art that depicted movement increased corticomotor excitability. Even when compared to photographs of the same poses, corticomotor excitability was not increased, as it was when presented with paintings that suggested movement. Art that did not suggest movement also did not increase corticomotor excitability (Fortuanto et al., 2011).

Through looking at the research on transcranial magnetic stimulation (TMS), a brain stimulation technique, Kaskie & Ferrarelli (2018) put together a meta-analysis of the neurobiology of schizophrenia and other psychotic disorders. One of their findings included reduced cortical excitability. As was mentioned previously, all our thoughts and behaviors

happen because of communication between neurons and synapses. Those communications can either be excitatory, or inhibitory depending on if those signals are being fired off or not. Healthy and normative behavior and thoughts require a well working balance of inhibitory and excitatory systems (Kaskie & Ferrarelli).

In this section I was only able to find information on what looking at art does for the brain. This more than anything may speak for the need to do more research though. The impact on the brain may be far more profound when an individual is engaging with the art and creating it.

Discussion

My intention through writing this literature review was to investigate the expressive therapies as a viable option for treatment of schizophrenia. I did so by looking at what information I had available about the brain, and how the brain is affected by schizophrenia. I applied that to three different modalities that fall under the expressive therapies umbrella, music, dance, and visual arts.

What this thesis gathered, is that sensory stimulation can change the brain, and diverse sensory experiences are important for proper brain development. Given what is known about brains developing into adulthood, this environment of sensory complexity is likely important to continue healthy brain growth.

The arts command the engagement of the senses. While they engage the commonly known 5 senses, they also engage more nuanced senses, such as those discussed in the expressive therapy continuum. As was stated before, the cortex is largely responsible for the perception of the world via the senses, and as a result that ended up as a secondary focus of this literature review. Most all the literature presented had to do with the outermost layer of the brain.

The arts are a particularly good candidate for altering the brain by way of activating the areas of the brain that process sensory experiences, because the level to which we experience the sensory complexity can be controlled and maintained. The arts can create a container for the senses. That container and appropriate control over the level of sensory exposure is far more likely to happen when in the hands of a professional, which makes the expressive therapies desirable over individual artistic exploration for these purposes.

Music Therapy

Studies looking into the potential of music therapy as a treatment for tinnitus distress found that a music therapy regimen increased gray matter volume and density in the primary auditory cortex (Krick et al., 2015). From the studies that have been done on the neurobiology of auditory hallucinations, the most common finding in comparison to normative brains is the reduction of gray matter in the primary auditory cortex (Gaser et al, 2004).

The regimen referenced above, the Heidelberg Model of Music Therapy, created by the German Center for Neuro-Music therapy, was highly specific to tinnitus sufferers, and therefore, if it were to be used as a reference for future studies into the potential of music therapy for individuals experiencing psychosis, and auditory hallucinations, a lot of alterations would have to occur.

Aspects of schizophrenia may cause a limitation on how much some individuals may be able to participate in the Heidelberg model as it is in its current form. In addition, the Heidelberg model requires participants to engage with the phantom noise of their tinnitus, which is not a symptom of schizophrenia, and not the target of this paper (Krick, 2015). However, the Heidelberg model is not a singular intervention, it was an intensive week-long program, which involved a variety of interventions, and therefore, it is impossible to know what within that model could be responsible for the morphological changes in the brain.

It is possible for example that the vocal imitations of tonal sequences were in part the cause of the observed change. If this is the case, there are ways to prompt even non-verbal individuals to sing along to notes played on the piano. The voice is a therapeutic tool available to most everybody. Additionally, it is low budget and accessible, making it a desirable supplemental treatment for schizophrenia if shown to be effective. With proper training being made available

to professionals, this treatment could in theory be available to individuals with schizophrenia who do not have sufficient financial means for other treatment options.

It cannot be stated with certainty what aspect of the music therapy caused the desired brain augmentation. The questions left by the gaps in what is known are reason to invest in further research. All the modules of the Heidelberg Model can be adapted for lower functioning persons, and in addition, many individuals with schizophrenia could follow the modules as they are currently.

Dance Movement Therapy

Current theories suggest that the dorsolateral prefrontal cortex may be responsible for the involuntary and voluntary nature of what the brain produces (Boksa, 2009). There is also research in which individuals with schizophrenia had lower gray matter volume in the dorsolateral prefrontal cortex (Allen et. al, 2008). With this believed connection between reduced grey matter and symptoms of schizophrenia, professionals looking to treat schizophrenia with what is known about its neurobiology will likely want interventions proven to increase grey matter in brain areas such as the dorsolateral prefrontal cortex. Research presented in this study by Prakash (2012) suggests that aerobic fitness increases gray matter volume to the dorsolateral prefrontal cortex.

Dance movement therapy, as the name suggests, gets the participants moving. In this way, its physical effects often resemble that of aerobic fitness, and therefore the benefits that can be gained to the brain will likely appear similar, unless the changes are occurring due to the intention of the practice. Even in this unlikely scenario, it is impossible to tell if dance movement

therapy would have the same outcomes. The research that is available through should draw enough of a connection to warrant further research.

This literature review also presented research on movement therapy and its relationship to interhemispheric coherence of brain waves. In many cases, interhemispheric coherence of brain waves has been found to be lower in those with schizophrenia than those who do not have schizophrenia (Henshall et al.,2012).

A study was presented that observed psychotic individuals taking part in primitive expression dance movement therapy, which is a specific method of the DMT community that uses play, symbols, rhythm, and body experiences. The participants were observed through EEG data, which is information collected by a series of electrodes attached to the scalp to measure the cortical firing of neurons and consequential communication between areas of the brain. In this study it was found that primitive expression with psychotic participants increased interhemispheric coherence.

Dance and the body are therapeutic tools available always by default. The primary obstructions to bringing this method to more people and places would be training professionals and finding a space to practice in. Movement therapy can also be adapted to anyone. If someone has schizophrenia but also suffers from diabetes to the point where they are a wheelchair user, dance movement therapy is still an option.

Art Therapy

The literature presented on the potential affect art therapy could have on the neurobiology of schizophrenia, had little to do with art therapy, but rather the observation of art. While this means its relevance to the topic at hand may be decreased, it also means that further research on

actual art therapy and the brain could yield even more relevant results. Since art viewing as a far more passive activity than the act of creating art, its effects on the brain could be more substantial.

The study in this section by Fortuano et al. (2011), looked specifically at art viewing and corticomotor excitability, which relates to the excitability of the parts of the cortex responsible for motor movements. Through a series of viewing and relaxation experiments these researchers were able to determine that corticomotor excitability increased when looking at paintings that suggested movement and did not when looking at paintings that did not suggest movement nor did it increase when looking at photographs of people in similar positions to the art that suggested movement (Fortuano et al., 2011).

Kaskie & Ferrarelli (2018), conducted a study in which reduced cortical excitability was found in individuals with schizophrenia. The mere act of looking at art producing the opposite should incite curiosity into what engaging with the art can produce. Visual art is found cross culturally, it is a staple of childhood, it can be found on the streets of less affluent neighborhoods, and in fine art museums. It is familiar to a whole spectrum of people, and potentially more appealing to engage with as a result.

Conclusion

Ideally, this literature review will get the reader asking questions that prompt further research into the possibility of the expressive therapies having a place in the treatment of schizophrenia. This review only provides information on three modalities of the expressive therapies, but there is more to be asked about the topic, and more to be learned.

In relation to the literature that was found and presented for this thesis, most of the connections made were not direct. In the music therapy example, the growth related to music therapy was studied with the context that the individuals receiving the treatment were doing so to alleviate tinnitus distress. However, the result is directly related to what is already known about the neurobiology of schizophrenia in that the area of the brain that increased in volume, is the same area that has consistently been observed to be lower in volume in schizophrenic individuals than average brains. Ideally, with this link having already been made, neuroimaging studies specifically on music therapy and schizophrenia can occur.

This literature review presented several specific methods of the art therapies, such as the Heidelberg Model of Music Therapy and primitive expression, as well as expressive arts therapy related techniques such as NIA, and the specifically instructed viewing of the art. Perhaps a new structure, specifically catering to the target population and issue can grow out of research that uses the information in this review.

Even skeptics of mental health as a field would have a hard time disputing physiological data that the neurobiological perspective of this paper provides. Mental health professionals can use latest information on schizophrenia and the brain to inform their work with clients, even if they have little interest in the medical aspect of the disorder. Knowing for example that the primary auditory cortex is reduced in size for people who experience auditory hallucinations, while also understanding that music may increase the size of the primary auditory cortex, could lead a professional to use more music in their sessions with a patient.

There is a gap in the care for those suffering from psychotic disorders and the expressive arts would make an excellent candidate to fill it. The expressive arts are often cost effective and

easily accessible. With the aid of further investigation, the expressive therapies could also have brain imaging information to both promote and further its use as treatment for individuals with schizophrenia.

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