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Musical Ear Syndrome: What do we know?

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### Abstract

The purpose of this study was to review the existing literature regarding Musical Ear Syndrome and other related auditory hallucinations. While the existence of auditory hallucinations is evident, their cause is unclear and widely understudied. There was a need for existing information to be compiled for use in the healthcare field. This review of existing literature will aid speech-language pathologists, audiologists, nurses, psychologists, and physicians in understanding this condition and what differentiates it from other various disorders. This will allow these professionals to better understand the experiences and needs of those with Musical Ear Syndrome.

### Musical Ear Syndrome: What do we know?

Musical ear syndrome is a condition that causes individuals to hear music that is not actually present and cannot be heard by those around them. It has also been described as “a condition that causes patients with hearing impairment to have non-psychiatric auditory hallucinations” (Çakmak, Sahín, Çinar, & Karsidag, 2016, p. 91). Bhatt and Carpenter (2012, p. 615) define musical hallucinations as a type of auditory hallucination “characterized by the perception of music in the absence of external acoustic stimuli.” Regardless of which definition is used, Musical Ear Syndrome is a unique and rare condition that affects quality of life and merits additional interest from the medical community.

This condition is primarily important due to the effects it has on those who experience it. Imagine for a moment the inability to control what type of music plays, how often it plays, or at what volume it plays. The experiences of these patients are both terrible and fascinating. Lizzie Ward (2012), a deaf woman who wrote about her experience with Musical Ear Syndrome on her blog, reported that her musical hallucinations would sometimes disappear when she wore her hearing aids, but would return when she consciously remembered she was no longer hearing music. While at times she considers the music as “something of a pest”, she also sees a positive light to her condition. Ward describes her musical hallucinations as “something that entertains me- reminding me of how much I love music” (2012). Another individual reported his musical hallucinations to be “constant”. Commenting on his experience with the disorder, he stated “sometimes it’s very annoying and at other times it’s kind of fun” (Voorhees, 2014). It is interesting to

note that some of those who experience MES are not particularly bothered by it, and may even occasionally enjoy its presence.

Others, however, do not seem to find any enjoyment, even part-time, in their unusual condition. One woman, 71 years of age, reported having difficulty concentrating on household chores and social endeavors. Her musical hallucinations eventually became so severe that she could not “follow a conversation to an end, watch a movie, read a book, or look after her 4-year-old niece” (Focseneanu & Marian, 2015, p. 534). Yet another individual, Wilna Staniszewski (2014) wrote: “MES [Musical Ear Syndrome] is the worst. I can’t live with it. It affects my daily life, my hearing, my sleeping, and how I interact with people. It takes over your life and creates a different person.” It is evident that musical hallucinations can cause an array of effects and a decline in quality of life for those who experience them; for this reason, medical professionals should be aware of what Musical Ear Syndrome is and how it can be treated.

Patient centered care is the cornerstone of treatment. This review of personal comments on hearing non-existing music proves that there is a need for therapists such as speech-language pathologists and audiologists to be aware of this syndrome in order to provide patient centered care. The purpose of this extensive review on Musical Ear Syndrome is to provide an overview that may be useful to healthcare professionals who encounter clients with this syndrome. This will allow these professionals to provide the most appropriate and individualized care possible.

## Methodology

### Procedures and Materials

In order to complete a literature review on Musical Ear Syndrome, an abundance of information was compiled. This information included scientific information as well as personal accounts and anecdotes about Musical Ear Syndrome. To find scientific, research-based data the following sources were investigated: books, journals, library databases such as EBSCO and Pub Med, and open access resources such as the National Institutes of Health. The anecdotal information was collected from social media resources such as Facebook posts, YouTube videos, and online blogs. The combination of these sources comprised the materials for this literature review.

### Analysis of Sources

A total of 22 sources that referenced Musical Ear Syndrome or associated conditions were identified. Of these, two were basic research articles; thirteen were applied articles; five were books and/or other publications. Anecdotal information was collected via social media. Two came from websites, while one was discovered on an online blog.

## Review of the Literature

### Defining Musical Ear Syndrome

Dr. Neil Bauman, who coined the term “Musical Ear Syndrome”, has defined it as “hearing non-tinnitus phantom sounds (that is, auditory hallucinations) of a non-psychiatric nature, often musical but also including voices and other strange sounds” (Simpson, 2014, p. 19). As previously stated, Musical Ear Syndrome (MES)

is a type of nonverbal auditory hallucination “characterized by the perception of music in the absence of external acoustic stimuli” (Bhatt & Carpenter, 2012, p. 615). Musical hallucinations associated with MES are most often “hymns, Christmas carols, and patriotic sounds” (Simpson, 2014, p. 19), but can also consist of other music such as orchestras or popular music.

**History.** Jean Etienne Esquirol, student of famous French physician Philippe Pinel in the early 1800s, described hallucinations as an “intimate conviction of a sensation actually perceived, while no external object capable of exciting that sensation is accessible to the senses” (Kyziridis, 2005, p. 44). While it is difficult to determine the history of Musical Ear Syndrome, it is plausible that this definition could have applied to hallucinations of a musical nature. Studies have shown that schizophrenia, a disorder that causes hallucinations, has been found in all existing cultures (Kyziridis, 2005). Unsurprisingly, each one has its own interpretation of what causes hallucinations, as well as what they could mean. Ancient Hindu documents speculate that “madness” resulted from disproportionate humours and elements of the body, while Chinese texts listed demonic possession as the cause for abnormalities of mental health. In fact, the majority of theories regarding mental disorders throughout history suspected supernatural possession. Unfortunately, this led to various unpleasant and appalling methods that aimed to rid of the demonic entities, such as drilling holes into the patient’s skull or using electric shock to attempt to expel the demonic spirits (Kyziridis, 2005). As time went on, treatment for mental illness changed, but did not necessarily improve. Because the cause of mental illnesses was unknown, families were commonly blamed for the condition of

a patient. This theory continued for many years. In the 1950s, families of patients with schizophrenia were told that the disorder resulted in a problematic relationship between mother and child; data shows that family issues were assumed to be the cause of mental disorders as recently as the 1970s (Drake, Green, Mueser, & Goldman, 2003). Furthermore, patients with schizophrenia and other similar conditions were locked away in their homes or in grim institutions, where they were sometimes kept sedated for the remainder of their lives. While treatments like skull drilling were mostly eradicated, electric shock treatments continued, causing burns, seizures, and sometimes memory loss (Shorter & Healy, 2013). Further down the road, medication became the most prominent treatment for health conditions of all varieties, and mental health conditions were no different. Many drugs were found to improve symptoms of mental illness, but many were given in extremely excessive doses and patients suffered negative effects (Shorter & Healy, 2013). Treatment with medication continues to be a problem even today, as drug prices steadily increase and research on combining various medications is neglected (Drake et al., 2003).

While it cannot be confirmed that any or all these methods were used on patients with Musical Ear Syndrome, it is entirely possible. No patient should have ever been subjected to the painful and traumatizing treatments of the past, but because MES can be found in those without a diagnosis of mental illness of any kind, it is especially disturbing to consider its history (Focseneanu & Marian, 2015). Furthermore, while many of these treatment methods are no longer in practice, the proper treatment for MES is still undetermined. It is imperative to learn more about



MES so that auditory hallucination patients are not being subjected to unnecessary hardships as they have been for hundreds of years.

**Prevalence.** Due to the lack of existing literature involving musical hallucinations, the prevalence of Musical Ear Syndrome is largely unknown. However, one study estimated that auditory hallucinations as a whole affect more than five percent of the population (Leede-Smith & Barkus, 2013). This data suggests that Musical Ear Syndrome and other similar disorders could be more common than expected. Another study found that of 125 elderly patients admitted to the audiology department of a hospital, a significant 32.8% experienced auditory hallucinations. Of this group, 2.5% experienced musical hallucinations specifically (Cole, Dowson, Dendukuri, & Belzile, 2002). Because MES has been associated with hearing loss, the heightened percentage of MES patients in this study could be connected to the population as well as the clinical location of the research. Simpson (2014) cited the work of Dr. Neil Bauman to report that when interacting with a group of people with hearing loss, typically 10-30% admit to having heard phantom musical sounds. This data suggests that MES might be more common than expected, and prompts the question, how many patients are keeping their musical hallucinations a secret? Healthcare providers should be aware that a typical MES patient is over the age of 50, that more than half of patients have some form of hearing loss, and that women are much more likely to be diagnosed than men. Approximately one out of five patients confesses to experiencing depression before being diagnosed with Musical Ear Syndrome (Simpson, 2014), so the connection between these two disorders should be noted by physicians and psychologists alike.

The link between depression and MES showcases the need for further research to be completed in order to make further connections between mental health and MES. The prevalence of musical hallucinations is further obscured due to the suspected large number of unreported cases, “either because [the patient] is not sufficiently troubled by their symptoms, or because they fear a diagnosis of mental illness” (Bhatt & Carpenter, 2012, p. 617).

**Attitudes toward mental illness.** This theory regarding the general population’s fear of being diagnosed with a mental disorder is disconcerting and largely unnecessary. While the cause of Musical Ear Syndrome is unclear, these hallucinations are found in patients with and without a diagnosis mental illness (Focseneanu & Marian, 2015). Therefore, the hesitation to report a condition such as MES, which is not necessarily associated with mental illness, for fear of being diagnosed with a psychiatric disorder is both sad and shocking. Despite the fact that approximately 1 in 4 adults in the United States is diagnosed with a mental disorder yearly, data indicates that those affected tend to be ostracized and could even be feared (CDC, 2012). This is one possible explanation for the hesitation to report hearing music that doesn’t exist. It seems unusual that a group of conditions affecting such a large portion of the population would produce such negative responses, but a lack of education regarding mental disorders continues to be an obstacle for progress. While education about mental health topics is becoming more mainstream, there is still a great deal of improvement to be made in order to eliminate the stigma surrounding mental illnesses and open the door to treatment for patients too ashamed to seek help for their conditions.

Research regarding mental health confirms this stigma. A survey of 1,737 people in the United Kingdom found that 70% of respondents believed that certain mental disorders cause people to be unpredictable and dangerous to others (Crisp, Gelder, Rix, Meltzer, & Olwen, 2000). In another survey, nearly half of recipients stated that they would feel embarrassed if their friends discovered they were receiving mental health services (Jagdeo, Cox, Stein, & Sareen, 2009). Even middle school children reported being hesitant to interact with fellow students who were combatting mental illness (Wahl, Susin, Lax, Kaplan, & Zatina, 2012). While musical ear syndrome is not a psychiatric disorder, these facts regarding society's disposition toward mental illness make it understandable that a person who experiences auditory hallucinations might be hesitant to report their condition to a doctor, psychologist, or audiologist. As conditions like anxiety and depression become more openly discussed by those experiencing them, it is probable that lesser known conditions like MES will ultimately come into focus. Hopefully, the breaking down of the stereotype barrier surrounding mental illnesses will aid future research of the prevalence of Musical Ear Syndrome.

While the fear of judgment may hinder some MES patients from pursuing help from a medical professional, it is also suspected that many simply don't find their disorder to be of enough importance to see a medical professional. The Center for Hearing and Communication states that 14% of people between the ages of 45-64, 33% of people over age 65, and 67% of people over 75 have some type of hearing loss. Those experiencing hearing loss wait an average of 7 years before consulting a healthcare professional, resulting in approximately 15 million United

States citizens who avoid seeking help from an audiological professional. Given these statistics, it is easy to imagine that many people with MES are simply not seeking treatment for their disorder. If a condition is not interfering with a patient's day-to-day life, they understandably may never take the time to investigate the condition further.

Another hypothesized reason for the scarcity of reported cases of musical hallucinations is a lack of physician education regarding Musical Ear Syndrome and similar conditions. Improving physician and audiologist education about auditory hallucination disorders could decrease these cases of misdiagnosis and shine light on the true prevalence of Musical Ear Syndrome. More accurate diagnoses will also assist future research in discovering a more exact record of the prevalence of MES.

### **Musical Ear Syndrome as a Medical Condition**

The existing literature about Musical Ear Syndrome is elusive and ambiguous. The medical-based literature generally focuses on the etiology of musical hallucinations, in addition to what sets it apart from other similar conditions, such as tinnitus or auditory hallucinations.

**Etiology.** Understanding what causes Musical Ear Syndrome is essential to treating it effectively. Unfortunately, however, no single clear cause for the condition has been found. Evers and Ellger (2004) created a comprehensive list of the most prominent suspected causes of musical hallucinations. Hearing loss seems to be the most common factor associated with the condition, but psychiatric disorders like depression, dementia, and schizophrenia have also been linked to the disorder.

Another prevalent theory regarding the etiology behind Musical Ear Syndrome is

that false perceptions of sound can be caused by “hypersensitivity in the auditory cortex associated with sensory deprivation” (Çakmak et al., 2016, p. 91). In other words, in some individuals, the brain is not receiving any outside auditory stimuli, so it adapts by creating its own. Similarly, another theory is that musical hallucinations are the auditory form of Charles-Bonnet syndrome (Evers & Ellger, 2004). This syndrome is a condition that causes “visual hallucinations in individuals without mental disorders” and is also thought to be caused by sensory deprivation (O’Farrell, Lewis, McKenzie, & Jones, 2010, p. 261). A hearing condition called otosclerosis, caused by “abnormal bone homeostasis of the otic capsule” is another possible cause of musical hallucinations (Focseneanu & Marian, 2015, p. 534). Yet another suspected cause is brain lesions, especially those of the temporal cortex (Evers & Ellger, 2004), where most of the brain’s hearing capabilities are housed. One study even reported a patient who began experiencing musical hallucinations after a car wreck that resulted in a whiplash neck injury, but no evident damage to the brain (Bhatt & Carpenter, 2012). Additional theories regarding the source of musical hallucinations include epileptic brain activity, intoxication, and withdrawal from intoxication (Evers & Ellger, 2004). Coebergh, Lauw, Bots, Sommer, and Blom (2015) compiled etiology information from 276 cases of musical hallucinations and found hypoacusis, also known as hearing loss, to be the most common causation. The following table appears in their article on treatment effects for musical hallucinations (Coebergh et al., 2015, p. 4).

Table 1.

*MES Etiology Information From 276 MES Patients.*

Main etiology	N	Percentage (%)
Hypoacusis	96	34.8
Psychiatric disorder	63	22.8
Brain lesion or other pathology	40	14.5
Epilepsy	12	4.4
Intoxication/pharmacology	63	22.8
None of the above	2	0.7
Total	276	100

Clearly, Musical Ear Syndrome is a complicated and perplexing disorder with a multitude of possible causes. Thorough future research will be required to determine the true cause or causes of the disorder. Pinpointing the etiology of the condition would result in improved medical care for MES patients.

**Similar conditions.** Many common conditions are not as different from Musical Ear Syndrome as one would think. Three of these conditions are auditory hallucinations, tinnitus, and earworms. Auditory hallucinations, in their simplest form, are false perceptions of sound (Waters, 2010). Unfortunately, auditory hallucinations are viewed as a red flag for conditions like schizophrenia, which they are most commonly associated with. However, auditory hallucinations are not restricted to schizophrenia-spectrum disorders, and healthcare professionals should approach these diagnoses with great caution (Leede-Smith & Barkus, 2013). Auditory hallucinations can also affect individuals with bipolar disorder, dementia, depression, and posttraumatic stress disorder (Waters, 2010). This is not to suggest

that these hallucinations only occur in those with mental illness; in fact, 75% of patients experiencing auditory hallucinations do not have a history of mental illness and are otherwise unimpaired (Leede-Smith & Barkus, 2013). Auditory hallucinations are widely diverse and can consist of many different perceived sounds. There are three types of auditory hallucinations: verbal, nonverbal, and functional. Verbal auditory hallucinations are the most commonly experienced, and cause the patient to hear voices. Nonverbal hallucinations consist of abstract sounds like music, and functional hallucinations cause an individual to hallucinate only when they hear another environmental sound, such as a car engine or a radio (Waters, 2010). Auditory hallucinations are different from MES in that they consist of a wide variety of sounds, not exclusively music. Essentially, musical hallucinations are a division of the broader category of auditory hallucinations. Further research is needed to determine the connections between the two disorders and their various treatment methods.

If the description of auditory hallucinations sounds familiar, it could be due to a very common and more widely known condition called tinnitus. Tinnitus is extremely common, and is defined as “the hearing of a simple tone or noise” such as a ringing, hissing, or buzzing sound (Vanneste, Song, & Ridder, 2013, p. 373). While these patients don’t typically hear music, these conditions are similar in that they both cause a patient to hear abnormal sounds that are not actually present in their environment. Tinnitus is different from MES because it is more common and it results in more consistent symptoms, while musical hallucinations are assumed to be rare, and the music heard can change endlessly throughout the day. Vanneste,

Song, and Ridder (2013) suggest that tinnitus is a simple form of auditory phantom perception, while musical hallucinations constitute a more complex form. These researchers go as far as to title their article “Tinnitus and musical hallucinosis: The same but more”. Thus, the severity and makeup of the hallucinations differentiates tinnitus from Musical Ear Syndrome.

Yet another condition similar to Musical Ear Syndrome is an earworm, or a phenomenon in which a song repetitively runs through the mind (Williamson, Jilka, Fry, Finkel, Müllensiefen, & Stewart, 2011). Williamson et al. refer to earworms as involuntary musical imagery (INMI), which they define as “the introspective persistence of a musical experience in the absence of direct sensory instigation of that experience” (2011, p. 260). Thus, MES and earworms are similar in that they take place even when no external stimulus is provided. In fact, earworms can be induced by the mention of certain people or words, the experience of different moods, emotions, and stress levels, and even the recollection of a memory that is associated with a particular song (Williamson et al., 2011). Contrarily, musical hallucinations are typically not related to an environmental cue and usually do not go away on their own. Another difference between MES and earworms is their prevalence. While MES is suspected to be relatively rare, earworms are experienced by 90% of people at least once a week (Williamson & Jilka, 2014). The table below appears on page 658 in Williamson and Jilka’s 2014 article on earworms.



Table 2.

*Sample of Six Participants' Varying Experience with Earworms.*

Participant	INMI frequency	INMI length
L1	"On a daily basis"	"For a good couple of hours"
L2	"Every morning it's another one of those tunes"	"they can go all day in and out . . . [it] varies a lot"
M1	"I think the only time I don't have them is I am having to express something I am concentrating on very hard"	"I think that I have one pretty much non-stop"
M2	"I'd say more than once an hour"	"The music keeps going on endlessly, so it might come back 20 times"
H1	"Rather infrequently . . . Maybe twice a month something like that"	"They don't tend to occur too long, maybe an hour and then it'll be out of my system"
H2	"I don't get them that often . . . I probably only get them once a week or something like that"	"Oh they can go on a few hours on and off"

Some of the above participants' reported an inability to control the duration or content of an earworm. At first glance, this experience sounds parallel to that of many MES patients. So what makes earworms different from MES? The answer is surprisingly simple. When experiencing an earworm, one hears the music mentally, but recognizes that it is not actually present in the surrounding environment. Those with Musical Ear Syndrome, however, experience an auditory hallucination, and truly perceive the music as audible. Disorders similar to Musical Ear Syndrome such as auditory hallucinations, tinnitus, and earworms are important for research purposes because they can not only provide

important diagnosis information, but can also indicate possible explanations or treatments for musical hallucinations.

### **Treatment of Musical Ear Syndrome**

The next step in investigating Musical Ear Syndrome is to explore ways in which healthcare professionals can diminish or eliminate its effects. While Musical Ear Syndrome is not a life-threatening condition on its own, it does cause distress to patients, and can be highly detrimental to their quality of life (Çakmak et al., 2016). For this reason, treatment of the disorder is both desired and necessary.

Auditory hallucinations can be frightening to some individuals, and may also affect their social life and increase their risk for suicide and acts of violence (Lutterveld, Diederer, Otte, Sommer, 2014). Due to these effects, treatment for this condition should focus on quality of life intervention. As previously reported, musical hallucinations are seen in patients with and without mental illness (Focseneanu & Marian, 2015), so patients without a psychiatric diagnosis should be assured that they are not mentally ill (Çakmak et al., 2016). Furthermore, the patient should be reassured that their condition is of harmless nature, and does not typically indicate a more serious complication (Colon-Rivera & Oldham, 2014). This information is important so that patients may be comforted and so healthcare professionals can be assured that a patient's quality of life is not negatively impacted any more than necessary. Because the cause of MES is still unknown, proposed treatments face the challenge of lacking direction. Many options have been attempted, all of which vary in success depending on the particular patient and his or her experience with MES. The theory that MES is caused by auditory deprivation is supported by the finding that "increased external auditory stimulation" has been shown to diminish the effects of

musical hallucinations (Evers & Ellger, 2004, p. 61). Providing the patient with hearing aids or conducting surgeries to improve hearing may also diminish or eradicate musical hallucinations. Certain medications such as quetiapine, donepezil, and gabapentin have also been used to treat musical hallucinations with varying success (Colon-Rivera & Oldham, 2014). Contrarily, some drugs have been shown to cause MES (Simpson, 2014), so patients experiencing musical hallucinations should review their medications with their physician and attend to any discrepancies. Masking the unwanted musical hallucinations with alternative noise like televisions, radios, white noise, or nature sounds can also be effective for some patients (Colon-Rivera & Oldham, 2014). While there are several options for the treatment of Musical Ear Syndrome, it is suspected that “the key to successful treatment of [musical hallucinations] might lie in identifying that etiological factor” (Coebergh et al., 2015, p. 6). In other words, finding the cause of a patient’s musical hallucinations might be essential in determining what treatment option will work best for them.

Williamson and Jilka (2014) have completed extensive research on earworms, also known as involuntary musical imagery or INMI. One interesting finding from their research is that the more musical training an individual had, the less frequently they experienced INMI. One participant in their study even suspected that her earworms had grown less and less commonplace as her musical experience advanced. This data suggest that musical imagery can be reduced by increasing musical skill. This information should be considered during future research of MES, and advancing musical proficiency should absolutely be investigated as a treatment option for those experiencing musical hallucinations.

## Clinical Implications

**Physicians.** When patients are experiencing an illness, physicians are often the first professionals in line to assist them. For this reason, physicians should be familiar with conditions like Musical Ear Syndrome. As previously discussed, lack of physician knowledge can lead to misdiagnosis of MES, leading patients to believe they have conditions like schizophrenia or even dementia (Waters, 2010). This puts unnecessary stress on patients, and could drain emotional and financial resources. Furthermore, physicians should be aware of medications that can cause musical hallucinations. This will allow them to identify the cause of the hallucinations while also providing a relatively simple solution. Inter-professional communication is also critical when handling MES. Physicians should be open to referring their patients to an audiologist or psychologist so they can receive the appropriate diagnosis and care for their conditions.

**Audiologists.** Audiologists are very important for an MES patient's line of care, and many patients might consider an audiologist as their first resource when experiencing musical hallucinations. The American Speech-Language-Hearing Association's (ASHA) Scope of Practice in Audiology guidelines state that audiologists should ensure "provision of comprehensive audiologic rehabilitation services, including management procedures for speech and language habilitation and/or rehabilitation for persons with hearing loss or other auditory dysfunction, including but not exclusive to speechreading, auditory training, communication strategies, manual communication and counseling for psychosocial adjustment for persons with hearing loss or other auditory dysfunction and their families/caregivers" (2004, p. 6-7). Thus, audiologists should be aware of Musical Ear Syndrome, its symptoms, its suspected etiology, and its most current treatments. As

discussed previously, some MES symptoms have been alleviated by providing hearing amplification or conducting hearing surgery, so audiologists should be prepared to suggest and attempt these options. Furthermore, audiologists should be knowledgeable in regards to making the most appropriate referral to a psychologist or other mental health specialist so that the most optimal care for their client can be achieved. Perhaps most importantly, audiologists should be prepared to counsel MES patients with the psychological side effects that their disorder could cause. Audiologists should inform patients of the harmless nature of their condition and provide them with the appropriate resources to improve their quality of life.

**Speech-Language Pathologists.** Hearing disorders can affect communication negatively, and for this reason, speech-language pathologists should be educated on Musical Ear Syndrome and the effects it can have on those who experience it. In the Scope of Practice for Speech-Language Pathology, ASHA includes counseling as one of the eight major domains of service delivery. The organization states that “the role of the SLP in the counseling process includes interactions related to emotional reactions, thoughts feelings, and behaviors that result from living with the communication disorder, feeding and swallowing disorder, or related disorders” (ASHA, 2004, p. 9). It is clear that both audiologists and SLPs play a major role in helping MES patients adapt and cope with issues related to their disorder. While the effects of Musical Ear Syndrome on communication have not yet been studied, it is likely that hearing foreign music could interfere with day-to-day communication. Speech-Language Pathologists should be prepared to use therapy as a tool to assist musical hallucination patients in preventing their hallucinations from interfering with their communication.

## Discussion

The goal of this project was to review the literature on Musical Ear Syndrome from the perspective of what is known about the condition's history, its medical implications, impact on quality of life, and possible treatments in order to provide information that can be used by speech-language pathologists, audiologists, and other health professionals. As can be seen from this review of the literature, Musical Ear Syndrome is an intriguing disorder that has significant clinical implications. It is imperative that healthcare professionals are educated on the basics of MES, including its associated conditions such as hearing loss or depression, its symptoms, its cause, and its suggested treatments. Education in these areas could be the difference between a patient receiving unsatisfactory care or high quality care. It is also possible that increasing professional awareness about the disorder will lead to more widespread interest and research, further increasing appropriate treatment for MES patients.

## Limitations

There were some limitations when collecting data for the review. Specifically, there was a need for a larger database. Research on Musical Ear Syndrome is scarce, and this caused difficulties when attempting to define and investigate the disorder. Additionally, the terminology between various researchers differed, making it difficult to analyze the material. For example, the definitions of terms like Musical Ear Syndrome, earworms, and Involuntary Musical Imagery were often very similar and hard to distinguish. This caused some discrepancies when looking at statistics such as prevalence. Furthermore, many of the studies used focused on adults and older adults, while very few mentioned Musical Ear

Syndrome in children or young adults. An increase in the sample size of the literature would enhance the quality of information available and further research on this disorder.

### **Future Directions**

Future studies should be driven by patient-centered care and thus, quality of life research. The most important driving factors should be how Musical Ear Syndrome impacts patients who experience it. Once surveys and interviews have been conducted to identify why the disorder is so important to treat, more quantitative research can be undertaken. This research should be focused on causation of the disorder as well as treatment options.

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Appendix A

