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Building an Evidence Base for Using Music as a Treatment for Children with Autism Spectrum Disorder

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“Music can help kids w/ #autism learn communication skills. We want to know what else it can achieve. #NIH @kencen #SoundHealth”²

This tweet and others heralded the Sound Health partnership between the National Institutes of Health (NIH) and the John F. Kennedy Center for the Performing Arts during the gala celebration of the alliance in June, 2017. Not long after, a study published in the prestigious Journal of the American Medical Association (JAMA), reported that music therapy has no effect in treating the symptoms of autism spectrum disorder. The JAMA article was accompanied by its own media blast, including a tweet that read “Music therapy for children with #autism does not improve symptoms: <http://ja.ma/2fqCIF1> in @CNN <https://t.co/77AqGKHsXi>”.³ What are we to make of such conflicting reports in news outlets and social media?

Public interest in music therapy as an intervention for children with autism spectrum disorder (ASD) has increased enormously in the past decades. Inevitably, public expectations rise alongside confusion and uncertainty about what therapies hold promise for patients with autism. According to the National Autism Center (NAC) the verdict is out. NAC classifies music-based treatment programs as “emerging” therapies [1].

A designation of “emerging” indicates that while there is some support for the efficacy of a treatment, the research is not settled or sufficient at this time to consider it an “established” treatment, the highest level of endorsement from the NAC. Indeed, the National Autism Center’s 2015 report updating treatment standards, included only seven music therapy studies, and their quality and results have been seen as variable. To realize the goals of the Sound Health initiative, more research is necessary to establish a firm evidence base for music therapy as a treatment for ASD.

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² <https://twitter.com/NIH/status/831208719203577856>

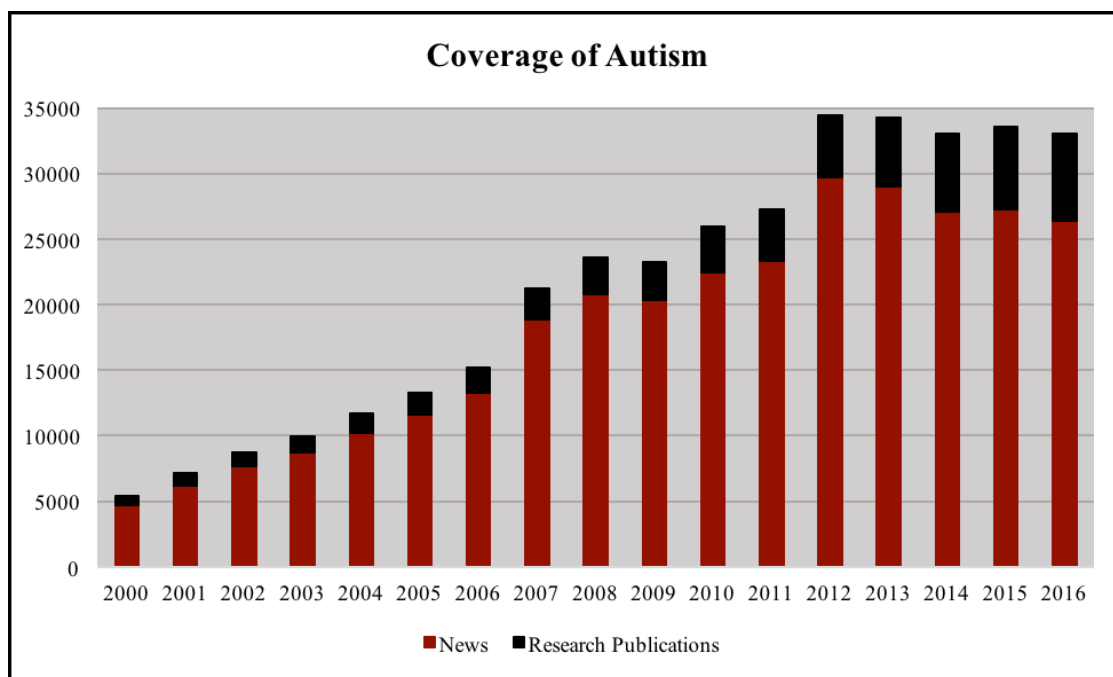
³ https://twitter.com/JAMA_current/status/895026838791172097

Standards such as those set by the NAC are important so that parents and care providers can make informed decisions about allocating scarce resources in this area. Just as with any other treatment, music-based interventions should have a conclusive evidence base constructed through rigorous experimental research. It takes time for scientists to develop and assess treatments, which are crucial steps toward designating an intervention as “established.” When a study suggests promising findings about the efficacy of a particular therapy, the public, policymakers, and the scientific community may be excited about the promise of a new way of approaching an issue. But such excitement should be tempered until a secure body of evidence indicates the potential and the limits of any novel treatments or therapies.

Social Context and Public Interest in Autism Spectrum Disorder

Public awareness of ASD has increased dramatically in the past twenty years, due in large part to increased diagnosis of the condition [2]. Doctors and psychologists have made significant strides in their understanding of and ability to treat children with ASD, though much is still to be learned. While many individual families or providers have been open to complementary and alternative treatments like music therapy, public interest has generally outpaced the necessary evidence base that examines whether and how music and music therapy helps children with ASD.

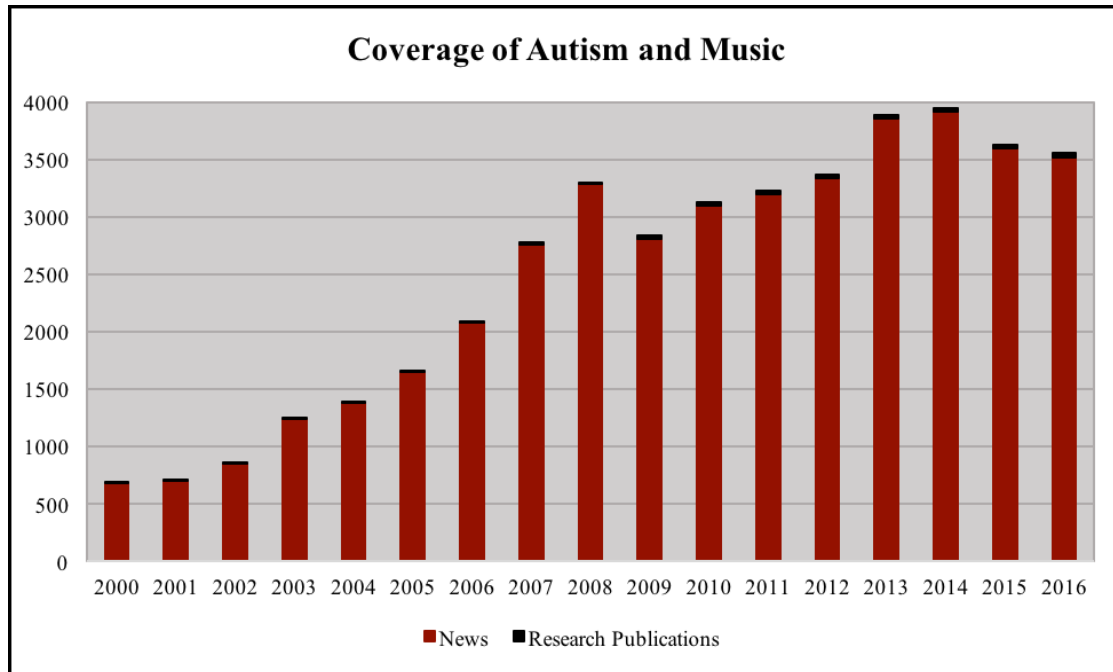
Using counts of news articles⁴ and research publications⁵ from 2000-2016, we examine the rise in attention toward autism broadly along with the rise in attention toward autism and music specifically. Popular news coverage of ASD has jumped considerably since the turn of the century with over 20,000 more news articles published in 2016 than in 2000. At the same time, the number of peer-reviewed research studies about ASD increased from 680 studies in 2000 to 6,578 studies in 2016.



⁴ Collected from the ProQuest database news section

⁵ Collected and compiled from the PubMed and PsycInfo databases

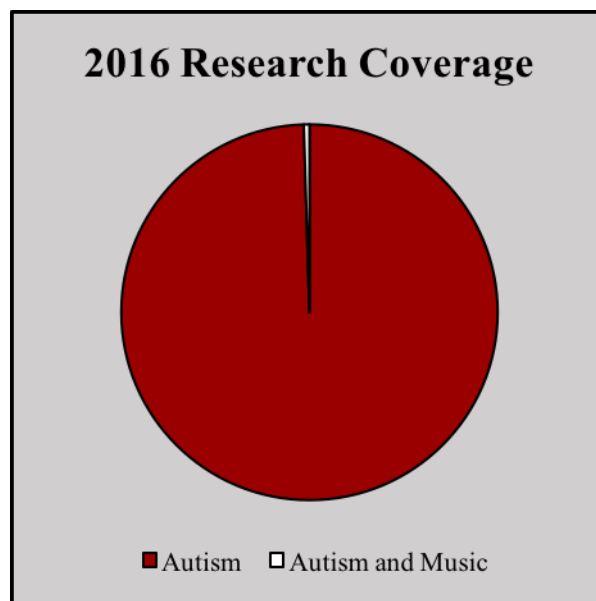
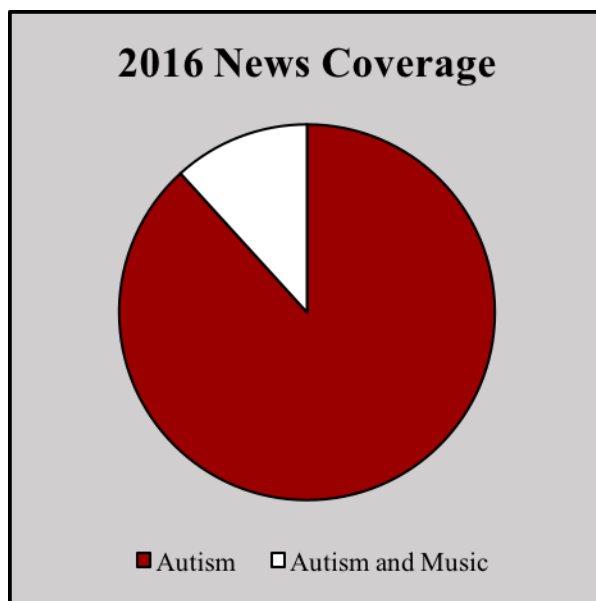
As one might expect, there are far fewer research studies that examine the interplay between music and autism than studies about autism more broadly. In total, from 2000-2016, newspapers published 41,941 articles about autism and music while in the same period, only 296 scientific studies examined the issue. The very small number of studies on autism and music are indicative of the fact that research on the efficacy of music as a treatment or intervention for children with ASD is still at a preliminary state.



Spotlight on 2016

News Media: In 2016, there were 26,415 newspaper articles written about autism. Approximately 13% of newspaper articles (3520 articles) also mentioned music, 136 of which specifically mentioned music therapy and autism. But headlines of the news articles that mentioned music indicated that many did not actually concern research-based conclusions about the efficacy of music therapy for treating autism. Rather, most focused on such diverse topics as announcements of concerts to raise money for autism treatment programs, efforts of local musicians to create a rock album intended for use as music therapy for children with ASD, or “human interest” stories about individuals with ASD who appeared to have benefitted from musical experiences.

Research Publications: To compare, in 2016, there were 6,578 medical and psychological studies published that focused on autism. Of these studies, only 32 examined music as a key component of inquiry. The music-focused studies inquired about such issues as music therapy in the classroom for children with disabilities, cochlear implants for children with ASD, melody perception and ASD, and the effect of background music on verbal expression and engagement for children with ASD. These 32 studies make up one half of one percent of the studies about ASD in 2016.



Popular news coverage includes announcements and human interest stories that go beyond reporting research findings, and to be sure, it is less time and resource intensive to write a news piece than it is to conduct and publish scientific research, which is reflected in the sheer number of news articles covering autism in 2016. Yet the discrepancy between the public attention to autism and music, as measured by the proportion of news articles that cover this topic (13%) and the relatively small amount of research that examines autism and music (0.5%), suggests that a gap is opening up between public awareness of the potential therapeutic use of music for autism and the existing evidence base for such options.

Interestingly, the 136 news articles that mention autism and music therapy make up 0.5% of all newspaper articles about autism in 2016, the same proportion that research about autism and any topic on music (including music therapy) makes up of all research about autism. However, the vast majority of news articles about music and autism are not actually about music-based therapies/interventions or implications of experimental research, but rather cover the broader array of topics mentioned above. This disparity might contribute to a public perception of music as a more established treatment and therapy while the research is still being developed. This is an issue examined in conversation around the recent popular documentary film *Alive Inside* which demonstrates the power that listening to music may have on dementia patients' symptoms; follow-up discussions urged caution in thinking of music as a panacea and note that more controlled studies are needed [3, 4].

The State of Research

Evidence now suggests that music affects mood, aids in social bonding, improves immunity, and helps control stress in different populations [5-7]. There are a number of professional organizations, government initiatives, and interdisciplinary research centers whose work contributes to collective knowledge about the power of music in many arenas of personal and social life. However, when it comes to the state of research on music, therapeutic use of music, and music-based interventions for children with ASD, there are still disparities in research techniques and questions that drive the field. Further, there are lingering questions and

inconsistencies when it comes to which professionals should use music as a treatment in the battery of care for children with ASD, how treatment is paid for, and the spaces that are best suited for treating children with these types of interventions or as enhancements to their other treatments.

The common phrasing of “music therapy” is perhaps just one lens when we think about the varieties of potential treatments and approaches that are embedded in music and the diversity of professionals who may use music-based research or treatment in their interactions with children with ASD. Music therapists, who are specifically trained in using music for targeting non-musical therapeutic goals, treat children with ASD through interactive music making and music listening. The music techniques used vary but can include improvisation, music composed specifically for the therapeutic purpose, and/or previously written music. The approach of music therapy is thought to facilitate therapeutic aims toward communication and social interaction, like timing, understanding the rules of conversation, taking turns, emotion identification, and imitation [8]. Music has also been used to teach specific skills (e.g., vocabulary; behavior management). A variety of music therapy studies have reported positive impacts of music therapy on both generalized social interaction and specific social communication skills such as joint attention [9-11]. These studies, while promising, are generally limited by the small numbers of participants per study, variability in techniques used, variability in outcome measures, and lack of long-term follow-up [9]. In contrast, the only large-scale, randomized controlled trial of music therapy did not report any positive impacts on social skills in ASD [12]. Yet, this study included participants of varying developmental levels, examined only one approach to music therapy, and used outcome measures that generally are not sensitive to detecting symptom change following intervention. Thus, it is evident that additional research is still needed to examine the effects of music therapy.

It is also important to note that music therapy, while perhaps unique in its focus on using music to facilitate a therapeutic relationship and to target specific therapeutic aims, often incorporates practices that are established as evidence-based intervention approaches for ASD. For example, this might include using various behavioral supports and related techniques (e.g., visual aids; reinforcing activities) to best support a child’s engagement in therapy [13]. At the same time, psychologists, speech-language pathologists, behavioral specialists, and occupational therapists are all professionals who might also incorporate music into their ASD research or treatments despite having different training and techniques from music therapists. For example, behavioral treatments for autism such as pivotal response treatment (PRT) emphasize identifying a child’s natural motivation strategies. For a child with ASD who is very interested in music, musical games may provide a natural context for targeting social interaction [14]. Thus, study design and choice of comparison groups or therapies must be carefully considered when examining impact of either music therapy itself or the incorporation of musical techniques in other therapeutic modalities or contexts.

The location and distribution of music-based treatments are varied as well but generally occur in either a medical or therapeutic context or at school through special education services. Many health insurance companies reimburse music therapists for treating children with ASD, but it is a complex and time-consuming process that many music therapists bypass and instead receive payment directly from families at a rate that is often calculated and billed on a sliding scale. Both a strong basis of scientific evidence as well as easily navigated pathways to service provision and payment are needed for treatments to be established in practice.

Current Research at Vanderbilt

In recent years, there have been growing partnerships between music therapists and music cognition researchers. These collaborations aim to better understand the science of music and the therapeutic use of music by combining the clinical expertise of music therapists with novel experimental, behavioral, and neuroscientific approaches. The SeRenade (Social and Rhythmic Engagement in Autism Spectrum Disorder) program is an example of one approach to research that is being conducted collaboratively by psychologists and music therapists toward the goal of improving understanding of the potential efficacy of music-based experiences and interventions for children with ASD. This program brings together parent training and peer modeling, two evidence-based approaches for young children with ASD, in a supportive parent-child community group focused on musical play.⁶

In the classes, which are led by a board-certified music therapist, musical activities and experiences are used to teach parents therapeutic techniques for supporting their child's social engagement in music class and at home. SeRenade uses empirically supported techniques for working with young children with ASD such as the use of visual supports, prompting techniques, and reinforcement to support children's and parents' participation in the music class and in their practice at home. The aims of this program are to examine if and how such a music-based program can promote social engagement and positive behavior in children with ASD, as well as potential impacts on the parent-child relationship and parent stress. To complement the intervention program and research, controlled, experimental studies are also conducted to examine potential mechanisms or explanations for why and how music may impact social engagement.⁷

Future Directions for Inquiry and Treatment

As stated by the National Autism Center's report, the substantial interest in music therapy and related music-based treatments necessitates rigorous research to determine evidence of the effectiveness of music and music therapy for children with ASD [1]. Any research study must specify the theoretical rationale for a given treatment and be sure the intervention is delivered with the intended content, materials, and strategies [15].

Future studies should clearly delineate the type of therapeutic practice and how it fits within a broader treatment regimen, the intended target population and therapeutic aims, and who is included in the treatment context (e.g., individual children only, involving parents and providing parent training, or incorporating peer models). There are multiple approaches to the therapeutic use of music, and different programs may be appropriate for different individuals, especially given the heterogeneity of ASD. Intervention research must consider what outcomes and measures are clinically meaningful in regard to an individual's development and quality of life.

At the same time, in order to establish an evidence basis, research must carefully consider the need for sensitive and reliable markers of change that are also theoretically-grounded. Collaborations among musicians, intervention researchers, basic scientists, and music therapists may be

⁶ SeRenade is affiliated with the Vanderbilt Program for Music, Mind, and Society,

<https://www.vanderbilt.edu/musicmindsociety/>

⁷ For more about SeRenade, see <http://serenademusicclass.org/>

particularly fruitful for identifying biological and behavioral mechanisms by which music may affect individuals with ASD or to help determine which individuals might most benefit from a treatment [16].

Sound Health's call for research that “elucidate[s] how music therapy interventions may be working” [16] highlights an important gap in current knowledge about approaches to ASD. The extensive news coverage discussed above indicates the high level of public interest in music therapy for autism. Because many people have profound experiences with music, belief in its efficacy may have outrun the evidence. Only by advancing our knowledge of when, how, why, and for whom music “works” as a treatment will the public gain access to evidence-based and targeted therapeutic music programs.

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