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Music and the Baby's Brain: Early Experiences

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# MUSIC AND THE BABY'S BRAIN

## *EARLY EXPERIENCES*

*Do young children benefit from early childhood music instruction?  
Here is a research-based answer.*

BY DONNA BRINK FOX

In recent years, popular understanding of the importance of the early childhood years has increased dramatically. Studies such as the Perry Preschool Project, which followed children in different preschool programs from age three through adulthood, have shown us that these early educational experiences significantly impact the long-term direction of children's development.<sup>1</sup> Documentation of the role of early intervention through compensatory programs such as Head Start has prompted the federal government and other funding sources to consider how best to direct resources to the care and development of our nation's youngest population.

Along with this increased awareness of the fluidity and flexibility of these early childhood years has come recent information on brain development, providing a seemingly new rationale for the support of early experiences. A 1996 conference on "Brain Development in Young Children," sponsored by the Families and Work Institute,



File photo

Research points to the importance of active musical engagement as a factor in brain development.

brought together one hundred and fifty leading brain scientists, experts in child development and early education, business leaders, and policy makers. This cautionary statement appeared in the conference's final report: "New insights into early brain development suggest that as we care

for children in the first years of life and as we institute policies or practices that affect their day-to-day experience, the stakes are very high. The research tells us that the 'quiet' crisis of America's youngest children may have even more serious, lasting consequences for children and families, and for the

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nation as a whole, than we previously realized.”<sup>2</sup>

In response to these types of seemingly authoritative statements, politicians have created legislation and public figures have produced commercial music materials that provide families and educational centers with recorded music for babies, and the Florida legislature recently approved a requirement for playing recorded music in early childhood centers.

Just what is happening here? What evidence suggests that music is actually involved in any kind of brain development? Is there published research that tells us whether the strategies recommended by these public projects have real potential for changing the musical lives of America's children?

### Past Research

First, and most important, the actual research evidence on music and the baby brain is very limited. Most of the statements that are made in support of these initiatives are generalizations from research with college students and conjecture based on studies of adults. For example, consider this line of research inquiry that moves from animal research to adult investigation, and then proposes a probable link to early behavior: Animal studies have shown that learning can increase the area of the auditory cortex that responds to behaviorally important sounds. Researchers decided to extend this line of inquiry to humans by using functional magnetic source imaging, a brain scanning technique that can pinpoint responsive areas of the brain. Researchers compared the overall area of the brain that responded to piano tones with the area that responded to noninstrumental pure tones of similar frequency and loudness. Researchers found that the area of the brain responding to piano tones was 25 percent larger in highly skilled adult musicians than it was in subjects without instrumental experience. Among the musicians, the responding area was larger in those who began studying music at an early age. Therefore, the researchers report, it seems that music making in humans may increase the area of the brain that is allocated to processing music sounds.<sup>3</sup>

Although no actual investigations involving young children were conducted, these research findings have been quoted repeatedly as if they are fact by those promoting the importance of music in early childhood. Findings from other studies, such as the effect of listening to Mozart on college students' test scores, have been used by teachers to support the existence of music education programs in schools and used by advertising companies to convince parents to enroll their children in piano lessons.



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Public statements made in the spring of 1999 have begun to temper the rush to apply these brain research findings in support of music initiatives. Writing in the *New York Times* on March 4, 1999, Harvard University researchers Ellen Winner and Lois Hetland caution: “Since 1997, we have been analyzing the research relevant to the claim that the arts lead to academic success. So far we have found no actual scientific evidence on the effect of music on infant brain development and subsequent school success.”<sup>4</sup> Norman Weinberger, University of California at Irvine professor and author of the *MuSICA Research Notes*, a quarterly report devoted to sharing the latest scientific findings on musical development, warns us in the spring 1999 issue: “Do the findings support the assumption

that listening to music increases brain development in infants and young children? ... There are no direct findings on children. ... At this time, there is not yet evidence that listening to music in infancy increases brain size in adults.”<sup>5</sup>

Are there any reported findings that could inform our practice while the research on the relationship between music and brain development is in its infancy? What have researchers discovered about the connections between music and brain activity in infants and toddlers? Based on studies of music perception, along with observations of behavioral responses to music from infants in cultures all over the world, it is very clear that babies are musical, that they have innate musical behaviors, and that they use music as meaningful communication in their earliest years of development.<sup>6</sup>

A growing body of evidence is confirming that even before birth, fetal brain development and perceptual learning are affected by experience, including a fetus's own sensory and motor experiences.<sup>7</sup> Developmental psychologist John Lynch reports that full-term infants' performance in detection of melodic alterations appeared to be influenced by perceptual experience from six months in utero up to birth, and an experiment with infants born prematurely supported the hypothesis that experience affects music processing in infancy.<sup>8</sup> A study of premature babies in intensive care environments demonstrated that infants responded with differentiated changes in heart rate, blood pressure, and respiration when listening to recordings of contrasting musical styles.<sup>9</sup>

Researchers have adapted adult research that investigated cerebral lateralization (usage of the left and right hemispheres of the brain) for processing musical contour, and now report that this brain specialization is present at a very early age. In the adult studies, changes in contour were detected by the right hemisphere, while the preservation of contour was noticed by the left hemisphere when the same pattern was repeated in another key. To determine the developmental stage

at which contour processing is lateralized, eight- to nine-month-old infants learned to respond to melody changes by turning their heads to see an animated toy. Their pattern of responses was the same as adults, indicating that brain specializations for the processing of musical contour are present at a very early age.<sup>10</sup>

Some evidence suggests that early music experience may arise from a fundamental bond between group members—the bond between mother and child.<sup>11</sup> This information is reported by Canadian psychologist Sandra Trehub, whose earlier research focused on systematically testing infant perceptions of melodic and rhythmic elements in laboratory environments.<sup>12</sup> Babies cannot understand the meaning of words, but mothers speak to them anyway, and the *baby talk* they instinctively use is drenched in musicality: higher pitches; big, sweeping pitch contours; simple, melodic little ups and downs; singsong rhythms; and drawn-out vowels rich in overtones. Perhaps infant brains are predisposed to soak up and decode those universal musical structures. The compelling urge to speak in “motherese” in the presence of a baby appears to be universal, too, especially during emotive interactions such as smiling or crying.<sup>13</sup> Trehub has also found that the actual music sung to infants shows many similarities across cultures: lullabies everywhere seem to employ few pitches, simple repeated melodic patterns, and rhythms linked to the rocking and swaying motions used to soothe a fussy child. According to Trehub, studies have even suggested that the rhythmic characteristics of a given culture’s music have their roots in the way its infants are carried and rocked.

So for now it is safe to say that while brain research itself may be too immature to be trusted as the singular rationale for music in early childhood education, there is other very powerful evidence that prompts us to respond with appropriate programs and experiences. Trehub’s move from studying laboratory musical behavior to documenting cultural musical connections around the world supports the proposition that, to understand a child’s

musical development, researchers and educators have to look at the whole child in order to examine music making in its natural context.

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### **Parental Involvement**

Historical rationales for early childhood music study can be traced to Swiss educator Heinrich Pestalozzi and Frederick Froebel (the founder of kindergarten), whose study of music in the home and in the early childhood classroom demonstrated the importance of this special time and content for learning. Froebel collected musical materials for his book on “mother play” and incorporated didactic songs into the kindergarten curriculum.<sup>14</sup> Pestalozzi’s chronicle of home teaching by a young mother named Gertrude became the basis for much of his “experience before theory” pedagogy, which still impacts music teaching today.<sup>15</sup>

The role of “parent as teacher” is once again coming to the forefront as parents are confronted with the barrage of information from the media on the importance of early childhood

development. Parents, in response to this information, want to know which music experiences are the most important for their children and how they can provide such experiences.

Both brain research and current childhood education indicate the type of music experiences that impact brain development. These two sources have shown that *active* engagement, not passive response, is what changes brain development. Any changes in brain structure that have been reported in adult musicians appear to be related to the level of usage, with the active making of music as the defining factor. Thus, when developing activities in music, it is important to recognize that providing music for entertainment or for passive listening may serve to change the mood or emotional climate, but these strategies should not be viewed as significant pedagogy for enhancing music learning. Parents, caregivers, and teachers should involve children in active and expressive modes of music making, that is, singing, moving, and playing sound-making objects, including instruments. Listening activities should be designed to actively engage the children, through attending to sounds and the changes in sound as they occur, in much the same way that babies learn language through models of interaction.

Parents are increasingly eager to be involved in early music experiences with their children, and teachers must continue to offer opportunities for this shared music making in their communities. School music educators who are accustomed to teaching only children should consider advocating parental involvement in music classes, as well as offering family music classes after school, in the evening, or on the weekend—whenever parents are available for participation. Schools as a whole are moving in the direction of becoming community education centers that address the needs of pre-kindergarten and post-high school learners. Music making is a natural component of this type of community education model. Parents should be considered a target group for music learning—both regarding music for their children and music for them-

selves. Parents should learn about the connections between music and language development, particularly the facilitation of conversation and speech. Music educators should consider offering a class or a talk for parents on the musical development of children, perhaps at a PTA meeting or similar event. Music educators could even provide an evening workshop for parents to engage in personal music-making activities and learn about musical parenting strategies to use with their children.

### Integrated Instruction

What are the best times to get children involved in music? For young children, music is not separated from other components of their lives. The National Association for the Education of Young Children proposes that children learn through play and that they learn through positive social interaction with others.<sup>16</sup> Music is woven into social encounters and relationships, into routine home and classroom behavior, into transitional times, into isolated play times, and into cooperative play in classrooms and child-care settings. Observation of children in these environments reveals that children find music making an ongoing individual and social part of everyday life.<sup>17</sup>

This everyday and everywhere feature of children's music making suggests that educators need to find multiple avenues for addressing children's musical development, multiple sites for instruction, multiple strategies for involvement, and multiple programs for delivery.

The arena of practice and curriculum is shaped by the shared involvement of professionals and parents in early childhood education. Community centers and health care agencies should present music in parenting classes, addressing the importance of musical interactions in bonding and attachment and in communication skills for parents. A portion of the "well child" health review should include attention to the musical development of the child. Social service and medical models of integrated delivery systems could be applied to ensure musical instruction for each child.

These models include the Parents as Teachers program, based in St. Louis, Missouri, which provides information to parents of young children through home visits, parent groups, and referrals for needed services.



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### Teacher Preparation

Teacher preparation is a crucial factor in early childhood music education. The past thirty years have shown us that children learn differently when they are very young—a fact that MENC has acknowledged by publishing separate and differentiated standards for the prekindergarten music program. In collegiate music training, prospective teachers, including early childhood education majors, music education majors, and other pedagogy majors, need to study early childhood music development as a foundation for teaching.

California's early childhood music educators developed a consortium of community colleges with early childhood programs in response to a challenge from Carolyn Lindeman, the California Music Education Association president at that time and now past president of MENC. The collaboration of these music educators

resulted in new degree requirements for students in early childhood majors, specifically targeting their preparation for teaching music in early childhood classrooms. This successful model of a statewide collaboration should be replicated across the United States as one initiative to improve the quality of music education programming for our youngest children.<sup>18</sup>

### Future Collaborations

An integrated system can come about only if researchers and educators focus on collaboration as the primary strategy for implementation. John Bruer, critic of the brain research rationale for educational programming and author of the controversial 1999 book *The Myth of the First Three Years*,<sup>19</sup> comments that "the neuroscience and education argument does not offer much support for the conclusions and recommendations its advocates attempt to draw from it. What we know about synaptogenesis, critical periods, and complex environments cannot provide much guidance for educational policy, classroom practice, or early childhood education. The primary reason the argument fails is that it attempts to link what happens at the synaptic level in the brain to development, learning, and instruction. Our emerging understanding of the brain may eventually be able to contribute to education, but it will require us, at least initially, to take a different, less direct route, a route that links brain structures with cognitive functions and cognitive functions with instructional goals and outcomes."<sup>20</sup> Music educators need to continue to involve researchers in cognitive science, in neuroscience, and in developmental psychology to address issues of basic musical responses and expressions. Music educators with expertise in early childhood are, in fact, working collaboratively with other researchers to build a foundation of understanding of the structures and templates in the brain for musical processing and perception.<sup>21</sup>

Other successful models of early childhood music collaborations and community partnerships have emerged in the past few years. Here are three examples:

■ A Wisconsin kindergarten keyboard program, developed by early childhood music researcher Lori Custodero, was recently implemented to test an experimental curriculum.<sup>22</sup> While the findings of the school-based program showed that the children involved in the keyboard classes improved in many areas of their development, it is crucial for educators and parents to understand that this outcome was not just about taking lessons at the piano. What made the project successful was the developmentally appropriate content and objectives of the keyboard curriculum itself, which included extensive movement and singing components along with keyboard skills. Keyboard instruction alone will not produce these results. The curriculum has to be appropriate, and the teacher must be knowledgeable about the best musical and instructional path to use with young children.

■ The Texaco Foundation has created a new corporate funding initiative specifically to address early childhood music education. Proposals for funding through the TEMPO (Texaco-Eastman Music Partnership Opportunity) program required early childhood classroom teachers to work together with music teachers and community agencies or university partners to create new approaches to music learning. The collaboration now involves investigations of ten early childhood music education programs in sites around the country.

■ Documentation and assessment of children's musical development forms the heart of the Rochester (New York) City School District's collaboration involving district assessment professionals, early childhood educators, classrooms of children, and an early childhood music teacher. The Building Blocks program is a component of the City's Universal Pre-K initiative, funded by New York state. Evidence from the first year of the program was gathered using the *Child Observation Record* (published by High/Scope), along with an additional section of "extended musical behaviors," developed by music teachers to address skills in singing, playing instruments, and musical representations. Informa-

tion is currently being analyzed to determine the impact of the music component on the overall developmental behaviors of children in the Pre-K program.

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## Final Comments

The integrated delivery systems proposed here for music education address the importance of accepting a shared responsibility to provide the highest quality experiences for young children. By bringing together funding sponsors, researchers, early childhood educators, parents, and music educators, the lives of young children—and their families—can be enriched for the long term. Researcher Norman Weinberger reminds us to "keep an open mind on the subject of brain anatomy and music. We have to realize that research in this field remains at a relatively early stage. While it is understandable that any findings increase media attention, as consumers of information we need to resist the temptation to jump to conclusions and assume that there are simple answers to complex questions. We also need to be patient ... good science takes time. As for what to do about children and music now, expose them to music and the arts and promote their involvement in a supportive but not overbearing manner. Whether or not gross anatomical changes in the brain will result, they will benefit and so will you."<sup>23</sup>

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