The IMPACT OF MUSIC EDUCATION ON A CHILD'SGROWTH AND DEVELOPMENT

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The IMPACT OF MUSIC EDUCATION ON A CHILD'SGROWTH AND DEVELOPMENT

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The purpose of this chapter is to present a review of the research pertaining to the impact of music education on several aspects of a child's growth and development. The topics to be explored include: perception and cognition, motor development, emotional development, social development, at-risk students, and special needs students. The research cited was found by searching Dissertations Online, ERIC, Music Index, RILM, PsycINFO, Social Sciences Index, and the two handbooks of music teaching research (Colwell, 1992; Colwell & Richardson, 2002). Due to the space limitations of this document, the research cited in each topic area is a representative sample of the ideas found rather than a presentation of all existing research. Some topics have been studied less extensively over the years than the others and, as noted, are in need of continued research to be able to make specific recommendations for policy-makers. I will summarize the findings and will identify areas in need of future research.

PERCEPTION AND COGNITION

In this section, I will approach the topic of perception and cognition from two discrete perspectives: (a) the impact of music listening and (b) the impact of music instruction. Schellenberg (2001, 2003) argues that each activity (listening vs. taking instruction) has a unique impact on perceptual and cognitive function. I would add that as such, the implications for research, practitioners, and policy makers would also be distinctly different.

Music Listening

Infants

The first indications of a response to musical stimuli occur in the last three months of pregnancy. During this period, the auditory cortex and neurons of a fetus have stabilized and are functioning (Lecanuet, 1996; Moore, Vareyar, Fulford, Tyler, Gribben, Baker, James, & Growland, 2001). Researchers have found clear evidence of fetal responses to musical stimuli (Abrams, Griffith, & Huang, 1998; Blum, 1998; Staley, Iragui, & Spitz, 1990). Furthermore, it is thought that musical sounds introduced in utero, after the auditory cortex has developed, can affect subsequent infant behavior (Olds, 1985). O'Connell (2003) found that infants who were exposed to a music timbre prenatally were able to discriminate, as measured by heart rate, between their prenatal timbre and other similar timbres through one week of age postnatally. In an experiment examining infants born prematurely, Lynch, Short, and Chua (1995) found that experience affected musical processing in infancy. Similarly, in a study of premature babies in intensive care environments, Lorch, Lorch, Deifendor, and Early (1994) found that infants responded with differential changes in vital functions including heart rate, blood pressure, and respiration when listening to recordings of contrasting musical styles.

The results of studies with infants at varying points within the first twelve months provide much supportive evidence for the existence of sophisticated musical functioning. Trainor, Tsang, and Cheung (2002) found that two- and four-month-old infants preferred consonant rather than dissonant intervals. Further, the researchers found it difficult to recapture subjects' interest after a series of dissonant interval trials. They concluded that consonance perception could provide a means of learning the pitch structure of the musical system to which an infant may be exposed.

Hannon and Johnson (2005) employed a habituation strategy to examine whether seven-month-old infants could categorize rhythmic and melodic patterns on the basis of the underlying meter. Infants presented with metrical melodies detected reversals of pitch and meter while infants presented with non-metrical melodies expressed no preference. The researchers concluded that infants can infer meter from rhythmic patterns and that they can use this metrical structure to secure their knowledge acquisition in music learning.

Ilari (2004) investigated infants' preferences and long-term memory for two contrasting complex pieces of music. Eight-and-a-half-month-olds were found to distinguish the two pieces in orchestra timbre and could discriminate between the piano and the orchestra timbres. Ilari concluded that contrary to the belief that infants are ill equipped to process complex music, infants could encode and remember complex pieces of music for at least two weeks.

Saffran, Loman, and Robertson (2000) found that infant subjects retained familiarized music in long-term memory. The infant's listening preferences were affected by the extent to which familiar passages were removed from the musical contexts within which they were originally learned.

Schmidt, Trainor, & Santesso, (2003) examined EEG and heart rate responses to affective musical stimuli development of infants' at the third, sixth, ninth, and twelfth month. The distribution of EEG power was found to change across age. Younger subjects demonstrated no difference in activity between two specific regions of the brain while older subjects exhibited relatively more activation in one region than the other. This likely reflects the normal maturation of frontal lobe function. Further, when compared with a baseline, the presentation of emotionally-expressive music significantly increased brain activity at the third month, had little effect at the sixth and ninth month, and significantly lessened brain activity at the twelfth month.

The researchers concluded that there was a distinct developmental effect of music on brain activity in the first year, with music having a "calming" influence on infants by the end of the first year of life.

The array of musical responses demonstrated by infants in the first year of life is considered to be more a reflection of innate capabilities made available through normal brain development than through learning (Imberty, 2000; Trehub, 2000). Further research is needed to determine whether or not there exists a point after the first year at which music learning begins to support and possibly enhance natural brain development to result in enhanced musical capabilities. Similarly, it is important to examine whether there exists critical periods during which particular types of exposure must occur for future musical development to take place.

Music and Memory

Music, originally associated with specific information, has been found to significantly improve the recall of that information (Balch, Bowman, & Mohler, 1992; Boltz, Schulkind, & Kantra, 1991; Wallace, 1994). However, this effect can be explained easily by stimulus generalization, a fundamental tenet of psychological theory that concerns the transfer of a response learned to one stimulus to a similar stimulus. Research is needed that includes comparisons with other (non-music) stimuli to determine whether a music-dependent effect can be retained.

The "Mozart Effect"®[1]

Since 1993, when Raucher, Shaw, and Ky (1993) published their initial findings linking an improvement in IQ after listening to 10 minutes of classical music, the music education profession has had to wrestle with a phenomenon labeled the "Mozart Effect."® The notoriety created by associating a simple passive music-listening task to such a highly coveted result as

improved intelligence is something with which the music education community has not been entirely comfortable. This is true for several reasons. First, valuing music education for its collateral benefits is considered to be a questionable philosophical foundation (Duke, 2000; Reimer, 1999). Second, the effect has been difficult to replicate consistently. In the body of research that employed spatial-temporal reasoning as a dependent variable [the specific IQ subtest found by Rauscher, et al. (1993) to be linked to music listening], some researchers found significant positive results supporting the effect (Rideout, Dougherty, & Wernert, 1998; Rideout & Laubach, 1996; Rideout & Taylor, 1997) while others did not (Carstens, Huskins, & Houshell, 1995; Chabris, 1999; Steele, Bass & Crook, 1999; Steele, Brown, & Stoecker, 1999; Steele, Della Bella, Peretz, Dunlop, Dawe, Humphrey, Shannon, Kirby, & Olmstead, 1999). Further, when examining alternative measures of IQ such as working memory (Steele, Ball & Runk, 1997) or abstract reasoning (Newman, Rosenbach, Burns, & Laitmer, 1995; Stough, Kerkin, Bates, & Mangan, 1994), no support was found for the effect.

Some resolution to the questions surrounding the "Mozart Effect"® may be found in a series of studies that were systematically conducted to uncover understanding about the underlying mechanisms driving the effect. The effect was found not to be limited to the music of Mozart (Jackson & Tlauka, 2004) nor even to music in general (Nantais & Schellenberg, 1999). Rather, spatial ability was consistently found to be a consequence of subjects' emotional states, specifically higher arousal levels and positive moods being associated with improved spatial ability (Husain, Thompson, & Schellenberg, 2002; Thompson, Schellenberg, & Husain, 2001). Further, this arousal and mood effect could be generalized to non-spatial ability measures of IQ as well as to measures of creative ability (Schellenberg, Nakata, Hunter, & Tamoto, in press). In short, music has been found to affect IQ, creative ability, and other cognitive functions, but only

to the extent that it does so by affecting arousal and mood. In essence, consistent supportive evidence has been found for an "arousal and mood effect" rather than for a "Mozart Effect"® *per se.*

Musical Training

Evidence from Neuroscience Brain Research

There are a growing number of studies that have used electroencephalogram (EEG), functional magnetic resonance imaging (fMRI), and to a lesser extent, positron emission tomography (PET) to track brain activity in children in an effort to uncover connections between such activity and music learning experiences. Music is a widely-distributed system in the brain with various musical tasks processed differentially in the hemispheres. In general the left hemisphere tends to be more sensitive to pitch processing (e.g., melody) and the right to temporal processing (e.g., rhythm); there are some indications that these hemispheric specializations may develop with age (Overy, Norton, Cronin, Gaab, Alsop, Winner, & Schlaug, 2004). Further, exposure to different styles of music produces varying types of brain activity in children (Flohr & Miller, 1995). Altenmüller, Gruhn, Parlitz, and Kahrs (1996) found that a five-week period of musical training, compared to other types of instruction, produced unique cortical brain activation patterns. Flohr, Persellin, and Miller (1996) found EEG activity differences in children receiving music instruction compared with those receiving non-music instruction. Similarly, when comparing three distinct types of notation used to represent music (musical, verbal, and numerical), Schon, Anton, Roth, & Besson (2002) found that reading musical notation produced activity in unique regions of the brain, indicating that the visuo-motor transcoding pathways used for reading musical notation may differ from those used with reading verbal or numerical notation.

Evidence from Operational Indicators of Intelligence

A larger number of studies have used various operational indicators of intelligence to examine the connection between music learning and cognitive development. Music instruction is positively associated with a number of cognitive functions including spatial-temporal abilities (Hetland, 2000), visual-motor integration (Orsmond & Miller, 1999), selective attention (Hurwitz, Wolff, Bortnick, & Kokas, 1975), memory for verbal stimuli (Chan, Ho, & Cheung, 1998; Ho, Cheung, & Chan, 2003; Jakobson, Cuddy, & Kilgour, 2003; Kilgour, Jakobson, & Cuddy, 2000), reading ability (Butzlaff, 2000), and mathematical skills (Vaughn, 2000).

In the effort to venture beyond correlational research and explore a causal connection between music instruction and various relevant independent variables, several researchers have employed a random subject assignment to various music and non-music instruction treatments to insure that extraneous variables (socio-economic background, involvement in other extra curricular activities, etc.) would not affect the results. When using a randomized sample with an experimental design, Lu (1986) found no significant effect of music instruction on the reading ability of first-grade students. In contrast, several researchers have found a causal influence of music instruction on spatial ability using random subject-assignment procedures (Gromko & Poorman, 1998; Rauscher, 2002; Rauscher & Zupan, 2000). However, their results could not support the notion that the influence of music instruction is unique among other types of instruction or that the influence would be not found with other, more general indicators of intelligence because these issues were not examined.

In a more recent study, Schellenberg (2004) sought to examine the unique effect of music instruction on a global indicator of intelligence by comparing the effects of music instruction, drama instruction, and no instruction on intelligence as measured by the entire Wechsler

Intelligence Scale for Children Third Edition (Weschler, 1991). The Weschler test is comprised of four indices, verbal comprehension, perceptual organization, processing speed, and freedom from distractibility that are combined to provide an overall IQ score. Compared to the drama group and the no instruction control group, the music subjects produced greater increases on all four indices. These findings support the notion that music instruction when compared to drama instruction or no instruction has a unique positive influence on intellectual growth as measured by a global indicator that included dimensions other than spatial ability. Further research is needed to examine the effects of music instruction on additional global indicators of intelligence. There is also a need to continue comparing music instruction with other types of instruction to determine the degree to which music is unique in this regard.

Assimilating Evidence from Brain Research and Operational Indicators of Intelligence

When reviewing brain research using EEG and other neuroscientific tools, it is clear that musical experiences and music instruction produce specific and predictable patterns of activity in the brain. What is not so clear is the exact meaning of those predictable patterns of brain activity regarding cognitive function. Conversely, there is substantial correlation evidence linking music instruction to improved performance on a number of operational indicators of cognitive function. Further, researchers are beginning to establish *causal* connections between music instruction and improved performance on some of those operational indicators. The challenge to this line of research is that operational indicators, no matter how reliable, constitute indirect measures of a phenomenon. Perhaps the next logical step in exploring the effect of music instruction on cognitive function might be to combine the use of neuroscientific tools and operational indicators to determine whether predictable and directly observable patterns of brain activity can be associated with specific cognitive abilities. In fact, such a study is now underway (Schlaug,

Norton, Overy, Cronin, Lee, & Winner, 2004). Beginning instrumentalists are undergoing brain scans during the first three years of study along with taking a battery of cognitive assessments. Ideally, this study will provide critical information concerning the effects of music instruction on brain and cognitive development. More research is needed that combines the use of neuroscientific tools and operational indicators to explore the effects of music learning effects of music learning on cognitive and perceptual development with a variety of population demographics (age, area of study, experience, etc.).

MOTOR DEVELOPMENT

Many researchers have examined how motor skill development affects music learning (Campbell, 1991; Sidnell, 1986; Synder, 1988 Turner, 1998;) and performance, especially that of conductors (Kun, 2004; Neiman, 1989; Neidlinger, 2003) and pianists (Ragert, Schmidt, Altenmüller, & Dinse, 2004; Waters, 1992). Phillips-Silver and Trainor (2005) found that even healthy seven-month-old infants learned to distinguish between duple and triple meter with the aid of accompanying bouncing movements significantly more accurately than with a passive listening treatment.

Far fewer have examined how musical stimuli and musical learning impact motor development. Although the two approaches seem to be inextricably intertwined, it is the expressed purpose of this section to feature the latter. The small amount of existing research concerning the impact of music education on motor development uses subjects grouped in the following categories: (a) early childhood and preschool, and (b) school-aged children.

Early Childhood and Preschool

Gruhn, (2002) conducted a longitudinal study that was designed to examine the phases and stages in children's early music learning. A group of 12 children (six male; six female) aged one

to two years was recruited from an urban, upper middle class area in Freiburg, Germany and observed with respect to their musical behavior in a stimulating musical setting for 15 months. This group was compared with a control group aged one-two years (N = 9; three male, six female) from a local nursery school. All children were videotaped and then evaluated by two independent judges using a criterion-based observation form with ratings for the categories attention, movement and vocalization (imitation, improvisation, audiation). Although children in both groups displayed a similar developmental level at the start of the study, differences between the two groups became evident throughout the observation period. The control group, which was exposed to no particular music except the songs of the daycare program, developed body movement and vocal performance at a significantly lower level than their counterparts. The most significant effect within the experimental group was a strong interaction between flow of movement and motor coordination, and vocalization of tonal and rhythm patterns.

Gilbert (1980) designed the Motoric Music Skills Test (MMST) to examine how young children utilized motor tasks with music. The MMST consisted of five subtests: (a) motor pattern coordination, (b) eye-hand coordination, (c) speed of movement (d) range of movement, and (e) compound factors. Gilbert administered the MMST to 808 children, ages three through six. Girls significantly out-performed boys on the subtests of motor pattern coordination, eye-hand coordination, and compound factors. This result is consistent with findings of Flohr (1991) on tests of maintaining steady beat and those of Schleuter and Schleuter (1985, 1989) on three specific motor skills (clapping, stepping, and chanting). Gilbert (1981) conducted a follow-up study utilizing a stratified random sample from the population of 808 original study subjects to determine whether or not the original findings could be confirmed and to examine whether motoric music skills stabilized with age. The gain scores of four-year-olds were significantly

greater than those of seven-year olds in every subtest of the MMST. Gilbert asserts that these results substantiate the idea, common among motor theorists, that most fundamental motor patterns emerge before age five and stabilize beyond that point. However, in both of Gilbert's investigations, it was unclear whether the improvement was due in any part to music instruction.

Brown, Sherrill, & Gench, (1981) examined two approaches to facilitating perceptual-motor development in four-six year old kindergartners (N = 30). The experimental group received 24 sessions of integrated physical education/music instruction, while the control group received 24 sessions of movement exploration and self-testing instruction. An analysis of covariance indicated that significant improvement occurred only in the experimental group with changes in the motor, auditory, and language aspects of perceptual-motor performance as well as in the total score.

Kalmar, (1982) examined the effects of a method of singing instruction involving the accompaniment of music with rhythmic movements and the verbal or physical representation of songs on the development of young children. Twenty three-year-olds were pretested and assigned to either the experimental group, that received twice-weekly special singing lessons based on the Kodaly method over three years, or the control group, that attended only regular nursery school programs. The experimental group showed greater improvement than the control group on measures of motor development, particularly dynamic coordination, abstract conceptual thinking, and play improvisation and originality. On an adaptation of the Torrance Tests of Creative Thinking, the experimental group demonstrated superior performance on subtests requiring verbal responses, but not on those involving drawing. Further, no between-group differences in IQ were found.

Pollatou, Karadimou, & Gerodimos, (2005) examined gender differences in preschool students regarding musical aptitude, rhythmic ability, and motor performance. Subjects ($N = 95$), including five-year-old girls ($n = 50$) and boys ($n = 45$), were administered the (Gordon) Primary Measures of Music Audiation, the High/Scope Rhythmic Competence Analysis Test, and the Gross Motor Development Test. Although no significant gender differences were found in musical aptitude and gross motor skills performance, girls outperformed boys in four of the six movements of rhythmic ability test.

Zachopoulou, Tsapakidoub, & Derric, (2004) compared the effect of a music and movement program to a physical education program on the development of jumping and dynamic balance in children ages four through six. Subjects ($N = 90$) were placed into either an experimental group ($n = 50$) that followed the music and movement program or a control group ($n = 40$) that followed the physical education program. All subjects received instruction two days a week for 35-40 minutes each day over a two-month period. Pretest and posttest data were analyzed using a multivariate analysis of variance with repeated measures. The control group showed no improvement. The experimental group improved significantly in both the jumping and dynamic balance tasks. According to the authors, rhythmic ability is the ability to observe, control, and differentiate the rhythm of a movement according to the environmental demands at a given time, enabling the quick motor adjustments of the performer in an unpredictable environment and assuring success in performance. The authors conclude that music and movement education facilitates development of rhythmic ability in motor skills execution.

School-Aged Children

DeVries (2004) sought to investigate the extra-musical effects of a music education program in one preschool classroom over a period of six weeks. The class had not previously been

exposed to regular music lessons. Among increases in other variables including socialization, expression, sociodramatic play, and listening skills, engagement in music-movement activities were found to develop motor skills in children.

Baer (1987) sought to examine the strength and nature of the relationships (a) between music aptitude and motor development and (b) between instrumental music achievement and motor development utilizing, as subjects, 136 middle school students in grades seven through nine who were members of their school band or orchestra. A low-moderate positive correlation was found between music aptitude and motor development (r = .33) and between instrumental music achievement and motor development (r = .26). Further, higher correlations between motor development and musical performance achievement were found for string instrument players as compared to wind and percussion instrument players, and for girls as compared to boys. Music aptitude was related to music gross motor skills more so than to fine motor skills; however, musical performance achievement was related to fine motor skills more so than to gross motor skills. Results need to be interpreted with caution due to the intact nature of the subject sample.

Although a small number of references were found for studies examining the effect of music and music education on motor development, a few clear patterns appear to emerge. For preschoolers, girls tend to outperform boys in music-related psychomotor tasks such as maintaining a steady beat, specific music motor skills, and movement tests of rhythmic ability. They also do better on general motor tasks with music such as measures of motor pattern coordination and eye-hand coordination. More research is needed to determine whether those differences persist or fade as students age and/or mature in other ways. Such developmental information would be helpful to practitioners when planning for the use of instructional materials.

Another emerging pattern is that a stimulating musical environment has a positive effect on motor coordination and perceptual motor development, as well as on general motor skills. For school aged children, less is apparent due simply to the paucity of research on this level. Currently, most of the conclusive evidence is with samples drawn from younger populations, foreshadowing the possibility that music involvement at an early age may have a fundamental impact on a variety of different resultant skills. More research is needed at all levels of development to determine the extent to which musical experiences affect motor development.

EMOTIONAL DEVELOPMENT

Nelson (1983) addressed basic issues concerning the dual nature of music learning by defining the relationships between cognitive and affective growth in children and by discussing aspects of music learning in relation to its aesthetic nature. A theoretical model of affective development proposed by Giblin (1981) was compared to the Piagetian theories of intellectual development. Nelson concluded that such a comparison "falls short" in accurately describing the personal nature of aesthetic responsiveness to music. He stated the need for specific definitions of affective learning as it might relate to music concept development.

Emotional Response to Music Listening

Since the early 1990's, attention has been afforded the Continuous Response Digital Interface (CRDI) as a tool for synchronously measuring subjects' emotional responses to musical stimuli (Madsen, Brittin, & Caperella-Sheldon, 1993; Madsen, Caperella-Sheldon, & Johnson, 1991; Madsen & Fredrickson, 1993). With advent of the CRDI, researchers investigating emotional response to music have examined a variety of variables, including among others, visual/aural conditions (Adams, 1995; Frego, 1999), preference for music of other cultures

(Brittin, 1996), the effect of performer use of rubato on listener perception of tension (Fredrickson, 1996) and tempo modulation (Sheldon & Gregory, 1997).

Of particular interest to the present review are those studies in which subjects of varying levels of music experience or education have been compared. Brittin (1996) compared college music majors' (n = 75), non-music majors' (n = 75), and junior high school musicians' (n = 75) preferences for music of other cultures. Further, subjects from each group were randomly assigned one of three response modes: (a) Likert-type scales, (b) one CRDI device indicating preference only, and (c) two CRDI devices, one indicating preference and the other indicating complexity of the excerpts. No differences were found between subjects using one CRDI and those using two CRDIs. Subjects using one or two CRDIs rated sections significantly higher than did subjects using paper-and-pencil rating scales. No significant differences in preference for music from various cultures were found among any of the three levels of music experience.

Frego (1999) compared college-level musicians (n = 81) and non-musicians (n = 81) when examining the effects of aural, visual, and combined aural/visual conditions on the emotional response to music and dance. Subjects were randomly assigned to the three conditions and asked to respond to three dance and music performances by indicating the degree of perceived artistic tension using a CRDI device. No significant differences were found among the three conditions. Further, no significant differences were found in perceived artistic tension between musicians and non-musicians.

Fredrickson (1999) examined whether musicians who rehearse and perform a musical selection perceive tension in the music differently than do listeners who have not had the performance experience. Visual inspection of CRDI graph results was used to confirm that

experience of performing the music did not seem to greatly affect perception of tension as measured in this study.

Forty college music majors and thirty non-majors were asked to use a CRDI device to record their perceptions of tension in two selections of jazz music (Fredrickson & Coggiola, 2003). Each selection was a uniquely stylized version of "St. Louis Blues" by W. C. Handy. Music majors' responses did not seem to differ markedly in overall contour from non-music majors' responses, which is consistent with previous research. The authors noted that subjects had no trouble performing the task or using an existing internal definition of musical tension.

Common to all of the studies above is that level of experience or education does not seem to be a factor when asking subjects to provide an emotional response to a variety of musical stimuli. Those with less music experience seem to have similar emotional responses to musical stimuli as do those with more music experience. Further, when presented two or more distinct musical stimuli, subjects, regardless of experience level, offered distinctly unique responses to each stimulus. Perhaps, as Fredrickson and Coggiola (2003) assert, people tend to employ an existing internal definition of musical tension and that definition does not seems to be affected by a general level of music experience or education.

Emotional Response as a Result of Musical Learning

Parisi (2004) assessed fourth- and fifth-grade students' (N = 102) affective response and ability to discriminate between melody and improvisation after receiving instruction in singing and/or playing a piece in the blues style. To facilitate responses being differentiated across time rather than in aggregate by use of arithmetic means, an *a priori* decision was made to analyze the data graphically and descriptively. Subjects receiving specific instruction in melodic and

improvisatory discrimination responded with a higher level of discriminatory skill and positive affective response than those receiving non-specific instruction.

Coggiola (2004) compared the aesthetic responses of jazz musicians (n = 64) and non-jazz musicians (n = 64) when listening to jazz music selections that vary in level of conceptual advancement (melodic complexity during improvised solos). Data were gathered as participants manipulated a CRDI dial to indicate the magnitude of their aesthetic responses as they listened to four audio selections. Of the four examples, a significant difference between the two participant groups was found only for the most conceptually advanced selection. Jazz musicians rated this selection significantly higher than did non-jazz musicians. Coggiola concluded that greater instrumental jazz ensemble experience is related to greater aesthetic interest when listening to a jazz selection containing a high level of conceptual complexity.

Misenhelter and Price (2001) asked undergraduate non-music majors (n = 32) and undergraduate and graduate music majors (n = 42) to listen and manipulate a CRDI dial to indicate their affective responses to excerpts from a sophisticated piece of music (Igor Stravinsky's *Le Sacre du printemps*). Significant differences were found in the responses between music and non-music majors. Visual analyses revealed that the variability between the groups most often corresponded with changes in musical texture. The authors concluded that non-musicians in particular may have insufficient musical background or exposure to "absorb the nontraditional (non-tertiary) harmonic and textural palettes of a work such as *Le Sacre du printemps,* resulting in a lower overall affective response" (p. 327).

Emotional Response from Musical Performance Participation

Ruggeri (2003) sought to describe the experience of adult amateur musicians as they pursued their passion of playing chamber music. Ruggeri also explored the importance and meaning of

this activity in their lives. Musicians in the study reported the ability to express their identity in a non-verbal conversation, producing a pleasurable sound and engaging their faculties in a state of deep concentration often approaching transcendence, resulting in an aesthetic response. The musicians' conscious experience of enjoyment was accompanied by a less conscious learning process involving perceptual, emotional, intuitive and kinesthetic development and pattern comprehension as well as a sense of deep fulfillment derived from sustained attention. These alternative modes of understanding seem to support the assumption that learners create their own knowledge and meaning. Ruggeri concluded by arguing that aesthetic experience is central to adult education and learning. I would add that such an experience can and should be central to children's education and learning as well.

Summary of Impact on Emotional Development

Sloboda (1985) suggests that "untrained musicians have implicit knowledge of that which musicians can talk about explicitly" (p. 5). Perhaps such "implicit knowledge," similar to Fredrickson and Coggiola's (2003) "existing internal definition of musical tension," is self-evident when responding to common musical stimuli. The results found by Coggiola (2004) and by Misenhelter and Price (2001), however, support the idea that responding to musical stimuli that exceed a particular level of musical or compositional sophistication might not be implicit to the less experienced or less knowledgeable listener. Similarly, musical instruction in much younger students seems to influence how they might respond emotionally to musical stimuli (Parisi, 2004). Perhaps what may be concluded from this portion of the review is that although most people respond emotionally to music, music instruction seems to have a positive effect on the level of sophistication with which one is able to experience that emotional response.

From a broader perspective, however, there is a need to study the impact of music education on emotional response and development using a wider range of tools than only the CRDI dial. Although the CRDI provides rich and vast amounts of quantitative information, it is but one way to examine a topic that is highly complex and inherently multifaceted. Research, using additional tools, is needed to verify the "sophistication effect" mentioned above. Nelson (1983) noted the need for specific definitions of affective learning as it might relate to music concept development. That work is yet to be attempted. Further, emotional development toward achieving what Maslow (1964) describes as the self-actualizing individual or what Rogers (1961) describes as the fully-functioning adult is often at the heart of what many philosophically offer as a primary benefit of music and music education. Policy makers tend to reward or support initiatives that demonstrate some sort of measurable pragmatic benefit. What is needed is convincing philosophical inquiry as well as other types of research into the benefits of emotional development and an exploration into the unique contributions that music and music education may provide.

SOCIAL DEVELOPMENT

Many researchers exploring the connection between music learning and the social development of children have utilized special populations as subjects; however, very few social development investigations have been conducted using normal populations. Forrai (1997) conducted a three-year longitudinal study comparing children, aged six months to three years, exposed to a greater number of musical influences with children of the same age exposed to little singing or music. The group with more musical influences exceeded the other group over several dependent variables, including initiations of social contact. Hood (1973) examined the effect of daily music instruction on nonmusical personal and school activities and found that students

receiving daily music instruction had a significantly lower rate of absenteeism than did students in the control group.

Suthers (2001) conducted a case study of a one-year-old child's responses to a program of music experiences. The program was implemented in the toddler playroom of a daycare center for ten months. The music experiences provided in the program included free music play, sociable music experiences, and music incorporated into care-giving routines. The subject's responses were recorded and changes in the physical, language and social development were documented. Based on the findings the researcher concluded that much of the learning occurred through imitation and social interaction and that participation in self-selected music experiences may encourage toddlers to develop a disposition to engage in music making.

McCusker (2001) qualitatively examined the graphic invented notations created by eleven children, ages five to seven, in an effort to gain an understanding of the cognitive processes underlying emerging musical literacy. The researcher found that the difference between children responding only to teacher-initiated activities and those using familiar music materials for creative self-statements was a stronger influence than age. An unexpected theme that emerged from the data was subjects' development as a community of learners and the influence this social context had on children's music making. Miller (1983) found a similar phenomenon when examining behaviors that young children demonstrate naturally and describing how these behaviors manifested in social interactions with peers. Three-, four-, and five-year-olds served as subjects (N = 95). Subjects were found to be capable of creating music without teacher intervention. Further, three-year-olds tended to be involved in symbolic solitary play, while the older children exhibited more social interactions such as imitating each other.

Summary of Impact on Social Development

From the scant literature that exists concerning the effect of music on normal populations' social development, there appears to be several positive effects. Those include an increased initiation of social contact, lowered rates of absenteeism, and an emerging propensity for self-directed and group-directed learning, rather than teacher-directed learning. Though this information provides some new knowledge, it is disparate and, as such, difficult to draw useful conclusions. To generate more conclusive information, systematic lines of research over a number of studies are needed to examine particular aspects of music's effect on social development. For example, the existing literature provides a start to examining connections between musical involvement and self- and/or group-directed learning. Investigations could be conducted into how and why such connections occur as well as effects on the development of subsequent skills such as leadership, dynamic cooperative learning, and independent and creative thinking. Additionally, there is a need to examine how music-learning experiences impact diversity awareness. In an increasingly pluralistic society, it is important for students to develop a greater awareness of others around them. Research is needed to examine how music learning may facilitate such awareness for students as well as long-term impacts on society in general.

IMPACT ON AT-RISK STUDENTS

Much has been written about the positive effects of participation in extra curricular activities, the arts in particular, and music specifically on at-risk students, precious little of it being research. Authors of books, book chapters, and journal articles tend to describe programs, projects, and particular situations in which participation in the arts have positively affected specific students and groups of students. Although a good many of these descriptions are rich with detail and may provide a vast number of potential researchable ideas, none can be said to

have undergone the rigor associated with systematic inquiry. In the following section I will review the small amount of research that exits in this area and highlight trends, draw conclusions, and make suggestion based on this review.

The Role of Extra-Curricular Activities

There is consistent empirical support for a positive correlation between being involved in extra-curricular activities and staying in school. Bowman and Matthews (1960) conducted a longitudinal study and found that dropouts were involved in fewer extra curricular activities than those who remained in school through graduation. Similarly, Brooks (1989) found that Hispanic females who remained in school participated in extracurricular activities more often than dropouts. Two studies commissioned by state organizations found similar results. The New York State Education Department Bureau of Guidance commissioned a study in which questionnaires were mailed to 2,448 graduates and 1,286 dropouts. Graduates were found to participate more in all activities and services than dropouts and they placed more value on the activities than did the dropouts (Developing Work-Study Programs, 1971). More dramatically, in a study commissioned by the West Virginia Department of Education, 93% of dropouts were found to never participate in extra curricular activities (West Virginia School Dropout Prevention Task Force, 1991).

The Role of Early Intervention

Another trend is that early intervention has a strong positive effect. Gudeman (1987) studied the Union School District of New Jersey as a model in the area of dropout control with a population of over 6,000 students and a dropout rate of 1 percent. He concluded that dropping out of school can be prevented with reduced effort and expense when strategies are implemented during the preschool years and the first several grades of elementary school. Simner and Barnes

(1991, Winter) found that 70% to 80% of those children who are at risk for early school failure can be identified one to two years *before* they enter first grade. Similarly, Wilcynski, (1987) sought to determine the extent to which selected characteristics that exist among elementary age children are accurate predictors of students who will leave school prior to high school graduation. There were significant differences between dropouts and graduates in 18 of 20 selected characteristics. A regression analysis was used to determine that an academics/intellect cluster had the greatest relationship with dropouts and graduates. Adding either student behaviors or demographics to the academics/intellect cluster increased almost equally the explanatory power of the analysis.

The Role of Participation in the Arts

Several researchers have found that participation in the arts has positive effects on at-risk students. Acer (1987) concluded that integrating the study of language, music, drama, and dance for at-risk students could address many recommendations for juvenile delinquency prevention. Teachers from 43 urban and ten suburban elementary schools, subjects in the study, noted increases in self-esteem, academic success, self-discipline, and in school commitments among their at-risk students. After comparing self-concept scores of before and after participation in a project providing experiences in dance, drama, music, and visual arts, Barry (1992) found significant improvements in self-esteem for underprivileged children. When comparing interests between achieving and underachieving students, Ciborowski (1986) found that achieving students expressed more interest in life activities that involved music and drama, among other variables, than did underachieving students. In a study published by the Center for Music Research (1990), at-risk students were found to remain in school solely because of their commitment to music programs such as band, choir, and orchestra, as well as other arts including

dance, drama, painting, and sculpture. Bond, Smith, Ross, Nunnery and Goldstein (1992) investigated the effectiveness of a reading program that incorporated singing. The program was found to be more effective for younger children (K-first grade) and for children of low economic status (many of them being at risk). Coronado (1999) investigated the effects of a summer performing arts program, *Summer At The Center*, on at-risk students' school attendance, GPA, and arts participation among other variables. No significant increase in school attendance rates was found; however, the grade point averages of the students increased significantly between before and after participating in the program. Further, arts participation was also found to have significantly increased after *Summer At The Center* finished. Taetle (1999) investigated the relationships among daily school attendance, grade point average (GPA), and enrollment in fine arts electives. Students with lower absentee rates tended to have higher GPAs, Further, students not enrolled in fine arts electives had significantly higher absentee rates than those students with at least one fine arts elective. Finally, students with low GPAs who were not enrolled in fine arts electives had significantly higher absentee rates than those students who were enrolled in at least one fine arts elective.

The Role of Music Learning

There are very few investigations in which the specific role of music learning is examined for its effect on at-risk students. Jenlink (1993) conducted a qualitative study of a school's attempts to raise the self-esteem of its at-risk students by emphasizing the school's music program. The author concluded that the music program lessened students' feelings of alienation, promoted individual growth, and provided a common bond between the home and the school. Further, participation in the select musical performing group promoted goal attainment, teamwork, leadership, academic achievement, feelings of success, and cultural exposure.

Nelson (1997) investigated participation in choral music as an affective intervention for high-risk adolescent males. The choral program was found to be an affective intervention for high-risk adolescent males. Shifts in self-perceptions and in how the choir members grew to value their choral experience emerged in three categories: status, co-musical benefits, and inner rewards. Affective assertions included: (a) performing in choir was special to them, (b) the relationships they developed in choir were different than those they had with other residents, and (c) there were moments in choir that were wonderful, difficult to verbalize, and for many, deeply personal.

Leidig (1983) sought to describe a successful inner-city high-school instrumental music program and attempt to account for such success. The three primary factors appearing to affect the success of the program were (a) teacher commitment, (b) suitability of curriculum, and (c) effective classroom and programmatic management.

Ebie (1998) conducted a qualitative investigation of two music educators' perspectives on students who were successful in music but not in other classes. Five conclusions were drawn from the results:

1. Music is an important factor in the lives of at-risk and other children.
2. Participation in the music ensemble appears to provide students with feelings of personal accomplishment.
3. Participation in a music ensemble can provide students with leadership roles and give them feelings of responsibility.
4. Music itself seems to be a salient factor in improving the lives of at-risk students.
5. The extent to which the music teacher becomes involved in the life of the music students seems to be a factor in their success. (p. 63)

Shields (2001) investigated the role and importance of music education as an intervention for at-risk urban adolescents through participation in performance groups and being mentored. Significant improvements were found in students' self-perception of musical competence. Further, students' ranking of music as being important in their lives improved from 76% to 82 %. Interviews provided evidence of the importance of music, music education, and the music teachers in the students' lives.

Summary of Impact on At-Risk Students

From the research, it is known that involvement in extra-curricular activities is consistently positively correlated with staying in school. Further, precursors to dropping out can be detected and effective interventions implemented during the preschool and early elementary school years. Participation in the arts, as a specific extra curricular area, is consistently found to (a) affect self-esteem, (b) be correlated with lower absenteeism, and (c) be associated with staying in school. Of the studies in which the effects of music instruction on at-risk students are examined, the results are positive but difficult to use as a basis from which to draw conclusions. This is due to the few number of investigations and the disparate variety of approaches across the investigations. Similar to the suggestions for further research into the impact of music learning on social development, systematic lines of research over a number of studies are needed to examine specific aspects of music's effect on at-risk students. Such lines of research need to be of sufficient length and similarity so as to provide the depth of inquiry needed to draw appropriate and valid conclusions. One example of such a line might be to examine whether music learning is an effective early intervention. In what ways might music serve as an early intervention that other disciplines might not? Another line might be to examine each of the

affective assertions proposed by Nelson (1997) to determine the degree to which involvement in music learning might be unique.

IMPACT ON SPECIAL NEEDS STUDENTS

Researchers exploring the connection between music and special needs students have examined the topic in a variety of different ways. In a substantial number of studies, researchers have examined attitudes toward and acceptance of those with special needs using music students as the population from which samples were drawn (Jellison, Brooks, & Huck, 1984: Johnson & Darrow, 1997, 2003). Others have examined the effect of inclusion on the music learning of those with and without disabilities (Jellison, 2002; Force, 1983). Still others have tested the effectiveness of various musical instructional methods especially modified for students with special needs (Colwell, 1995; McCord, 2002). Each of these perspectives is worthy of study because music class is typically where students with disabilities are initially mainstreamed. Knowing more about attitudes toward special needs students, how their inclusion affects learning, and how instructional strategies might be best designed is beneficial to music teachers who tend to encounter special needs students more regularly than their non-arts peers. Nevertheless, none of these common research tacks actually examine the impact of music and music education on special needs students, which is the purpose of this section.

Music Therapy and Special Needs Students

Similar to the studies associated with social development and at-risk students, there are few investigations into the effect of music and music learning on special needs students. Most of those researchers who have examined how special needs students are impacted by music learning experiences have specifically investigated the effects of music therapy (as the music learning variable) on special populations. Aldridge, Gustorff, & Neugebauer, (1995) examined the effects

of music therapy on developmental changes of developmentally delayed (DD) children. Five DD children, ages four to six and a half, receiving three months of music therapy were compared with three DD children serving as waiting-list controls. The researchers noted that (a) focused listening in a structured musical improvisational context without language demands provided a platform for improved communication, (b) musical dialogue seemed to bring about improvement in the ability to form and maintain personal social relationships in other contexts, and (c) eye and hand coordination was a vital component in developmental change, especially drumming activities.

Conversely, Duffy and Fuller (2000) compared subjects in music (n = 16) and in non-music interventions (n = 16) and found that significant improvement in five target skills (turn-taking, imitation, vocalization, initiation and eye contact) to be independent of either eight-week interventions.

Frick (2000) conducted a case study designed to describe the classroom music activities and communication patterns of four young children with disabilities in an early childhood special education classroom, and to explore how types of music, methods of music inclusion, and children's individual differences may contribute to the process of communication development. The researcher noted that music, presented in a routine manner and supportive of instruction, resulted in more vocalization. Additionally, Frick noted that music created a social context for child-to-child interaction.

Robb (2003) studied the behaviors of six visually impaired children between the ages of four and six years. Subjects participated in four, 30-minute instructional sessions. Two instructional sessions were music-based and two were play-based with the four sessions equally distributed

across a two-week period. Each session was videotaped to facilitate collection of behavioral data. Attentive behavior was found to be significantly higher during music based-sessions.

Humpal (1991) examined the effects of an integrated early childhood music program on social interaction among children with handicaps and their typical peers. Interaction among the children increased following the music therapy intervention phase. It was also concluded that the program had facilitated peer interaction and had fostered acceptance of differences among individuals.

Summary of Impact on Special Needs Students

Although there is fairly consistent support for use of music as an effective therapy for special needs students, the profession needs more research. Music therapists are in the unique position of having to substantiate the worth of their practice to non-musicians (e.g., those in the medical field). Similar to previous recommendations, the research in this area needs to be conducted in lines of sufficient length to provide practical information for the therapist as well as clear, objective, patterns of results to the medical and educational fields.

AREAS IN NEED OF FUTURE RESEARCH

Perception and Cognition

The first indications of responses to musical stimuli occur in the last three months of pregnancy. Once an infant is born, however, there is a flurry of brain activity and associated musical functioning. At first, most of this functioning is considered to be the manifestation of innate capabilities and normal brain development. Research is needed to determine whether there exists a point after the first year of life at which music learning begins to support and enhance brain development. Similarly, it is important to examine whether there are critical periods during which particular types of exposure must occur for future development to take place.

Due to the notoriety of Rauscher, Shaw, and Ky's (1993) research, measures of spatial ability have been used as operational indictors of intelligence in a large number of studies. Additional research is needed to examine the effects of music instruction using other global indicators of intelligence. Further, there is also a need to continue comparing music instruction with other types of instruction to determine the degree to which music might be unique in this regard.

Brain research using neuroscientific tools substantiates predictable patterns of brain activity, but without providing the meaning of that activity. Operational indicators, on the other hand, provide rich meaningful information, but employ indirect measures to gather that information. Perhaps the next logical step in exploring the effect of music instruction on cognitive function might be to combine the use of neuroscientific tools and operational indicators to determine whether predictable and directly-observable patterns of brain activity can be associated with specific cognitive abilities.

Motor Development

Although, at the preschool level, girls tend to outperform boys in music-related psychomotor tasks, more research is needed to determine whether such differences persist or fade as students age and/or mature in other ways. Currently, most of the conclusive evidence is with samples drawn from younger populations, foreshadowing the possibility that music involvement at an early age may have a fundamental impact on a variety of different resultant skills. More research is needed at all levels of development to determine the extent to which musical experiences affect motor development.

Emotional Development

Research is needed that investigates the nature of various types of music instruction and how they may impact emotional response. Performance, as explored by Ruggeri (2003), is one type of

instruction that, due to its participatory nature, evokes a particular type of emotional response. Judging from the number and popularity of performance-oriented music learning settings, especially at the junior high and high school levels, emotional response associated with this type of learning is quite strong. There is a need, however, to investigate other types or hybrid types of instructional approaches to see how they may impact the emotional development of children. It would also be helpful to revisit Nelson's (1983) work in which he compared Giblin's (1981) theoretical model of affective growth to Piaget's theories of intellectual development. A series of investigations could be conducted to see how a possible alignment of the two theories manifests in the observed emotional development of children.

Beginning in the early 1990's, researchers investigating emotional responses to musical stimuli began using the CRDI as a tool for synchronously measuring responses to musical stimuli. From a broader perspective, there is a need to study the impact of music education on emotional response and development using a wider range of tools than only the CRDI dial. Although the CRDI provides rich and vast amounts of quantitative information, it is but one way to examine a topic that is highly complex and inherently multifaceted. What is needed is convincing philosophical inquiry as well as other types of research into the benefits of emotional development and an exploration into the unique contributions that music and music education may provide.

Social Development

Systematic lines of research over a number of studies are needed to examine particular aspects of music's effect on social development. Investigations could be conducted into how and why such connections occur as well as effects on the development of subsequent skills such as leadership, dynamic co-operative learning, and independent and creative thinking. Additionally,

there is a need to examine how music-learning experiences impact diversity awareness. In an increasingly pluralistic society, it is important for students to develop a greater awareness of others around them. Research is needed to examine how music learning may facilitate such awareness for students as well as long-term impacts on society in general.

Impact on At-Risk Students

Of the studies in which the effects of music instruction on at-risk students are examined, the results are positive but difficult to use as a basis from which to draw conclusions. This is due to the few number of investigations and the disparate variety of approaches across the investigations. Similar to the suggestions for further research into the impact of music learning on social development, systematic lines of research over a number of studies are needed to examine specific aspects of music's effect on at-risk students. Such lines of research need to be of sufficient length and similarity so as to provide the depth of inquiry needed to draw appropriate and valid conclusions.

Impact on Special Needs Students

Similar to previous recommendations, the research in this area needs to be conducted in lines of sufficient length to provide practical information for the therapist as well as clear, objective, patterns of results to the medical field.

CHAPTER SUMMARY

The purpose of this chapter was to present a review of the research pertaining to the impact of music education on several aspects of a child's growth and development, including perception and cognition, motor development, emotional development, social development, as well as on at-risk students, and special needs students. Although individual music education researchers have explored each of these aspects, very few sustained lines of research exist that can be used to

support the effects of music education on a child's growth and development. One exception can be found in the area of perception and cognition; however, most of the work in that area has been contributed by non-music researchers.

Perhaps the paucity of investigations from our own research community stems from an effort to avoid substantiating the worth of music and musical education on extra-musical benefits. Such a philosophical "line in the sand" loses merit when adherence to it results in less knowledge rather than more. It is important to continue pursuing new information about the impact of music and music learning on all aspects of a child's growth and development so that we are fully equipped to provide the greatest support to our profession. We, as members of the music education research community, must be equally vigilant that our work be consistently characterized in accurate and proper contexts.

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Footnotes

[1] The Mozart Effect is a registered trademark of Don Campbell, Inc.