

Music Preferences and the Adolescent Brain: A Review of Literature

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Abstract

Music plays an important part in the transitional period of life for adolescents as they define their personal and social identities and build their preferences for music. Recent neuroscientific research into the adolescent brain has produced developmental models that work to explain the neural reasons behind teenage behavior and development. These neural responses and developments of the brain provide some understanding for many of the social, as well as musical, choices that teenagers make during this period. By examining processes in the adolescent brain, we can begin to understand some reasons behind choices for music preference, which can aid music educators in determining the best ways to present music to teenagers in the music classroom. The purpose of this article is to present a review of previous research in adolescent brain development, music preference, and the application of such research in the musical education of adolescent students.

Keywords

adolescent, brain, cognitive development, music activities, music preference

Adolescence is often a turbulent time for many teenagers, as well as for their parents, family, and teachers. Music plays an important part in this transitional period of life for teenagers as they define their personal and social identities and build their preferences for music. Recent neuroscientific research into the adolescent brain has produced developmental models that work to explain the neural reasons behind teenage behavior and development. These neural responses and developments of the brain provide some understanding for many of the social, as well as musical, choices that teenagers make during this period. By examining processes in the adolescent brain, we can begin to understand some reasons behind choices for music preference, which can aid music educators in determining the best ways to present music to teenagers in the music classroom. There is often a great divide between what adolescents perceive as *school* music and *their* music. As music educators, one of our goals is to help children become lifelong music learners, whether that means as music performers, music composers, or simply music listeners. Understanding how the adolescent brain develops, and the processes behind the behaviors and choices of teenagers, can give music educators insights to help them provide music activities that facilitate lifelong music learning. The purpose of this article is to present a review of previous research in adolescent brain development, music preference, and the application of such research in the musical education of adolescent students.

Brain Development

Children are born with the ability to understand music in general and they develop an awareness of their specific culture's music through everyday experiences. As the brain grows and develops through early childhood, from birth to around age 12, the structure of the brain is changed by environmental factors, such as learning experiences, as well as the genetic makeup of the child's brain. As the brain develops, synaptic connections are formed between the neurons, or brain cells, based on sensory experiences, learning experiences, and the genetic code that sets up systems in the brain (Joseph, 2000). The synaptic connections in the brain that are strengthened during this time through repeated behaviors, such as word repetition and other language skills, are made permanent. The connections that are neglected and unused begin to wither and die at around age 11, in a process called neural pruning (Brotherson, 2005). The brain will continue to change throughout life by making connections or pruning unused connections in a process called plasticity (Galvan, 2010).

Basic system blueprints for things such as setting up the structure of language or music are encoded in the

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genes. Together with genes, experiences help shape the brain to certain specifications based on the kind of learning that takes place, such as the type of vocabulary a child learns, or the musical skills a child gains (Ito, 2004). During the early childhood development period, axons, which are fibers from the brain cells that carry electrical impulses or messages across the brain, begin to go through a process called myelination (Fields, 2005). Myelin is a fatty substance that covers the axons to make message transfer more efficient (Knickmeyer et al., 2008). This substance happens to be white in color, which is where we get the phrase *white matter* of the brain. Learning experiences that occur during this developmental period influence the myelination process, which continues into early adulthood (Lenroot & Giedd, 2006). This efficiency comes with a price because after myelination it is harder for neural connections to be made, which makes learning new things, like a second language, for example, a little harder. During the early childhood period, a child's brain begins to develop a system of executive functions that regulates working memory (also referred to as short-term memory where information is briefly stored), inhibition (the ability to control impulses), and mental shifting (the ability to effectively switch tasks and have flexible mental control; Best, Miller, & Jones, 2009). The executive functions are housed in the prefrontal cortex, which is a region of the brain that is critical to skills such as planning, organization, and emotional control. These executive functions depend on the maturation of the frontal lobe, which continues to develop into adulthood (Garon, Bryson, & Smith, 2008).

As the adolescent brain continues to develop, systems mature in a back to front (lower order to higher order) fashion, so that the frontal lobe is the last to develop fully. The limbic regions of the brain (e.g., the amygdala), are located under the cerebrum and are almost completely developed by the time a child reaches adolescence (Yurgelun-Todd, 2007). The limbic system is composed of regions of the brain, including the hippocampus and the amygdala, which are involved in memory, and social and emotional processing (White, 2009). The limbic system is also highly connected to the nucleus accumbens, which is the brain's pleasure and reward center (Spear, 2000).

Since the limbic system matures before the prefrontal cortex, which involves decision making and long-term planning, adolescent behavior often illustrates these developments through risky activities, arrogance, and moody and emotional behaviors (Casey, Getz, & Galavan, 2008; Sturman & Moghaddam, 2011). Powell (2006) stated, "Neuroscientists probing the teen brain have found that it undergoes a major remodeling that may be responsible for the teenager's propensity to take

risks, seek out new experiences and fail to restrain inappropriate responses" (p. 865). The main difference between the adolescent brain and the adult brain is the level of myelination, which is still increasing during the adolescent development period (Feixa, 2011). Since adolescents have less myelination than adults, adolescent brains are more flexible to receive new learning and to choose their preferred neural response pathways, but their cognitive reactions are less efficient and reliable (Sercombe & Paus, 2009). An understanding of this developmental process can help educators better understand some of the reasons for the musical choices adolescents make during this period.

Music and the Adolescent Brain

There is a lack of neuromusical research with adolescent participants, compared with the amount of research involving other age groups (Edwards & Hodges, 2007). Reasons for this dearth may include lack of interest from adolescents to participate in studies, busy extracurricular schedules, or a myriad other reasons. Further research involving adolescents is necessary for a more in-depth understanding of the relationship between music and adolescent brain function.

Recent functional magnetic resonance imaging brain scans indicate that the nucleus accumbens, the reward center in the limbic system, is extremely responsive to immediate rewards in adolescents, compared to children and adults (Galvan et al., 2006; Giedd, 2004). These scans also indicate that the prefrontal regions of both children's and adolescents' brains had a less mature response compared with adults (Casey et al., 2008). This information provides an explanation of the developments in the brain and how those developments may affect many choices and decisions made by teenagers, including musical preferences. However, it should be considered that there are individual differences with how teenagers respond to rewards and emotions. Some teenagers have different neural responses that may predispose them to risky behavior, while others may not be prone to taking risks (Dahl, 2004).

This information may help explain some of the musical choices that teenagers make, as well as the emotional and social associations to music that are made during this period. Emotional responses to music have been shown to involve brain areas such as the neocortex and the limbic structures (Hodges, 2008). Peretz and Sloboda (2005) stated, "Under certain circumstances, music can access neural substrates that are associated with either primary reinforcers, such as food and sex, or with anticipation of danger" (p. 410). This gives some indication as to why teenagers may be drawn to certain types of music that fulfill risk or reward-seeking emotions.

Adolescent Music Preferences

A teenager's view of himself or herself, his or her identity, can be shaped by musical experiences, social interactions, school, family, culture, and life experiences. Teenagers who study music can often identify themselves by the instrument they play or by the music group to which they belong. Musical preference, which is frequently a part of a teenager's identity, can change according to age, mood, social situation, or many other circumstances that are often in flux. There is a great deal of literature available regarding musical identity (Folkestad, 2005; Green, 2011; Kelly-McHale, 2013; Lamont, 2011; MacDonald, Hargreaves, & Miell, 2002; McPherson, Davidson, & Faulkner, 2012; Partti & Karlsen, 2010), but an in-depth discussion of that topic is outside the scope of this article.

Miranda (2013) indicated that music can be very influential in adolescent development, especially in areas such as socialization, emotion regulation, personality, motivation, and positive development. While young children are fairly open to listening to different kinds of music, teenagers have developed a definite preference for certain styles and are usually drawn to music that has similar features as their preference, such as upbeat tempos in pop music. Lamont and Webb (2010) stated, "adolescence is a critical period for developing entrenched musical preferences" (p. 224). As presented earlier, the limbic system, which is involved in emotional processing and is associated with the reward and pleasure center, matures before the prefrontal cortex during adolescent brain development. Adolescence can be a very emotional and passionate stage in development, and intense connections between emotions and music can be made during this time due to the developments occurring in the brain. Many teenagers identify with others who like similar music and tend to group themselves accordingly. Social cliques are often formed in high school among teens with similar music preferences. For example, teens who prefer heavy metal music are more likely to socialize with those who have similar tastes, as opposed to socializing with teens who may prefer different styles, such as jazz music (North, Hargreaves, & O'Neill, 2000). Many teens feel a strong need to fit in and be accepted socially, so their musical preferences may change depending on their social situation.

Adolescent music preference sometimes serves as an outward identifier to other teens, indicating to a certain extent their ideals and personality. North et al. (2000) stated, "an expressed preference for a particular style may carry an implicit message to other adolescents regarding a range of attitudes and values" (p. 258). While teenagers are developing their identities, their emotional and reward systems in the brain are at peak development, which often

takes precedence over their cognitive reasoning. Their musical preferences may have a lot to do with their urge to take risks or to find a means for emotional release.

Many theories and models have been developed to explain the formation of musical preferences. Canadian psychologist Berlyne posited in 1971 that there is an inverted-U relationship between music preference and its arousal potential. According to this theory, when familiarity and complexity of music approaches or reach optimal levels, preference increases. However, when familiarity and complexity exceed optimal levels (e.g., listening to a song too many times), preference will decrease. Repeated listening to a song can lead to more familiarity and understanding of the complexity or structure in the music, which at a certain point can result in liking a song that was not preferred previously (Berlyne, 1971). Many researchers (Hargreaves, 1984; Hargreaves, North, & Tarrant, 2006; LeBlanc, 1982; North & Hargreaves, 1995) have found similar conclusions that support this premise.

LeBlanc's (1980) music preference model was based on a hierarchical system of input variables and listener characteristics that influence music preference to increasing degrees. The input variables include physical conditions, cultural influence, and physiological conditions. Listener characteristics include affective state, personality, attention, preference judgment, and brain processing. Among these variables, musical training, music education, and cognition can be found within many levels of this model. LeBlanc's model suggests that the input variables influence the listener's decision about preference after the variables are sorted through the listener's characteristics. All these factors can play a part in determining the listener's music preference.

A model proposed by Martindale and Moore in 1988 called the preference for prototypes theory was founded on the idea that people classify stimuli based on already known schemas. For example, if a teenager has developed a preference for pop music, the music he or she listens to and prefers will be compared with the prototype of pop music, based on its features, such as fast rhythms and repetitive melody (Martindale & Moore, 1988).

Hargreaves and North (2011) proposed another model in 2005, called the reciprocal feedback model, in which there are three main determining factors in music responses: (a) the music, (b) the listening situation, and (c) the listener. The type of musical response that is elicited is affected by the type or genre of music, the social situation of the experience, and the type of listener (including variables such as gender, age, musical training, etc.). Each of the three factors is also affected by the other factors. For example, the teenage listener is affected by the type of music heard and by the listening situation. A teenager would likely have a different musical response if he

listened to his preferred pop music in a situation with his friends, as opposed to a situation with his parents.

Music preference of adolescents may be influenced by moods, emotions, or social interactions. Miranda and Gaudreau (2011) posited that adolescent music listening motivations can be categorized into two systems: (a) satisfaction of individual needs, such as regulation of emotions and (b) satisfaction of social needs, such as social or musical identity. The researchers suggested that adolescents sometimes choose music because it fulfills an emotional need or provides an emotional outlet. For example, a teenager may listen to heavy metal music as an expression of his or her own internal anger, thus fulfilling an emotional need for release. In addition, adolescents may choose music because of the need to identify with a certain group. For example, a teenager may listen to dance music because the rest of his or her friends listen to that type of music. The need to fit in and to share in the same experiences as the rest of the group can be a powerful motivation in adolescence, and music preferences can often change because of that motivation. Music preferences can change over time and throughout life, but they are especially malleable in adolescence, due to their emotional and social associations.

An adolescent's personality type can also be a factor that influences his or her musical preference. Schwartz and Fouts (2003) studied the music preferences and personality styles of adolescents to determine whether there were commonalities among preference and personality types. Their findings indicated that teenagers who preferred heavy music, such as heavy metal or rock music, were generally more independent and often questioned authority. They found that teenagers who preferred light music, such as pop music or dance music, were often very conscientious and somewhat emotionally reserved. Teenagers who had eclectic preferences, such as liking rock music and pop music, had less difficulty expressing their emotions, and had fewer problems in social situations than teens in the other two groups. The researchers indicated that the eclectic group used music "according to mood (e.g., to reflect and validate, to change), context (e.g., alone, with peers), and particular needs at the time (e.g., relationship, autonomy)" (Schwartz & Fouts, 2003, p. 212).

Music preference can be a way for adolescents to relate to and help deal with their emotions. Their choice of music can also be a form of self-expression and serve as an outward display of their beliefs and identities. Campbell, Connell, and Beegle (2007) examined essays from adolescent students that were submitted to a national essay contest about music education in schools in order to determine the meanings of music to adolescents. The researchers found that many adolescents used music as a way to relieve the academic and social pressures of school

life, as well as the pressures they felt from family and authority figures. Campbell et al. (2007) stated, "Music's power to control negative emotions, in particular anger, also emerged in the essay sample" (p. 228). This indicates that the function and meaning of music can play a part in determining music preference in adolescents.

Schäfer and Sedlmeier (2009) examined the functions of music in relation to music preference and found that, especially for adolescents, music was related to developmental issues, expression of their identities, and conveying their personal beliefs and perceptions. Most participants in the study indicated that their preferred music functioned as a way to influence or regulate their moods. Since the limbic system (emotions and memories) and the nucleus accumbens (reward and pleasure center) develop before the prefrontal cortex (decision making and planning), adolescents may choose music based on emotions or pleasure. The researchers also noted that "the most important reasons why people like their music . . . are its capability to express their identity and their values and its ability to bring people together" (Schäfer & Sedlmeier, 2009, p. 296).

Implications for Music Education

Music educators have many goals in teaching students in the classroom, including broadening students' musical tastes, increasing preferences, increasing the level of musicianship, creating positive attitudes toward music, and retaining students in their music programs (Droe, 2006). When designing lessons and choosing music, educators should consider their students' musical preferences as well as the developments that occur in the brain. Since adolescence is characterized by emotional and reward-seeking behaviors, due largely to the development of the limbic system and nucleus accumbens regions in the brain, the choice of music repertoire in the classroom can be very important to encourage student enjoyment.

One type of classroom activity that can aid music educators in broadening students' musical tastes and preferences is active music listening. Research has suggested that young children and adolescents spend 3 or 4 hours each day listening to music on their own, through radio, CDs, mp3 players, television, and other sources (Rideout, Foehr, & Roberts, 2010). Schwartz and Fouts (2003) noted, "Between Grades 7 and 12, the typical adolescent spends over 10,000 h listening to music, an amount of time similar to that spent in class by the time they graduate from high school" (p. 205). Music listening is an integral part of most everyone's lives, beginning as infants and developing throughout our lifetime. Music is connected deeply to emotions, tied to social contexts, and can influence a person's self-identity, especially in adolescence. Listening skills are fundamentally important to the

development of musical understanding and can encourage creative thinking when presented as active, imaginative activities. When students are provided with frequent and meaningful music listening experiences, they can think about musical style, patterns, and meanings of music, which can help them to gain a greater understanding of music. Most people interact with music as listeners, so it should be of the utmost importance for educators to help students become creative in this fundamental music behavior and help develop their musical preferences and identities.

Based on music preference and brain development studies discussed in this article, music educators might find it useful to incorporate familiar music into classroom listening and performance activities. These kinds of familiar music could include some popular music, but also classical music that students have experienced in movies and on television (Todd & Mishra, 2013). Todd and Mishra (2013) suggested that students might be more motivated to learn school music when teachers include some popular music in lessons, as well as incorporating active modes of listening. Music educators could select music that shares similar elements as popular music, such as a fast tempo, or present music that has a familiar style, such as excerpts of *The Planets* by Holst, which are reminiscent of John Williams's film music. When introducing music selections to students initially, they might feel more motivated to listen to and perform music that has a personal appeal, as opposed to music that is strange and foreign to them. Campbell et al. (2007) stated,

popular music has its own aesthetic and social values, that it has considerable potential to connect with the everyday lives of adolescents, and that the informal processes of making popular music, such as improvisation and group composition, could make the educational experience more stimulating and more enjoyable to adolescents. (p. 222)

Allowing students to choose the music they want to learn in the classroom, within appropriate guidelines, can make a great impact on the continuation of their music education. The use of informal music activities and group projects in the classroom are also ways to foster music preference and music identity development, and help further the student's role in music.

When students are allowed to choose the music they want to learn, and then are given the opportunity to learn and perform the music in a small group setting, they are able to take ownership in the learning process. As emotional connections are made to the music, through the limbic system and nucleus accumbens in the brain, as well as social connections through school and home environments, adolescents can broaden their association to music and develop strong music preferences and identities. These informal activities also work to bridge the gap

between what students perceive as *school* music and *their* music. Green (2006) stated,

By allowing learners the personal autonomy to explore authentically that aspect of musical autonomy, we could open their ears to the possibility of imbuing music with a much wider variety of delineations than children and young people usually realize are available. (p. 115)

Conclusion

Adolescence can be a difficult transitional time for some teenagers, as emotions surge and the appeal for reckless activities abound. Coupled with the fact that the prefrontal cortex, in charge of decision making and planning, continues to develop on into adulthood, adolescent behavior often illustrates these developments through risky activities, arrogance, and moody and emotional behaviors. Adolescence is also a time where this passionate behavior can be channeled into things such as music, where preferences can develop and passion for music can extend into lifelong learning. Hallam (2011) stated, "music plays an important role throughout our lives, and that typically the impact is affective rather than intellectual, with the widest range of benefits accruing to those who actively participate in making music" (p. 792). This transitional development period is an important time for teenagers to shape their personal and musical identities, and to prepare for the social and emotional change into adulthood. Music can affect the direction of a teenager's behavior during this time, giving him or her an outlet for emotional expression and access to rewarding activities and social connections, and helping shape identity and develop musical preferences. Music educators can play a large role in the development of music preferences and positive attitudes toward music for their students. By understanding the factors that can influence adolescent music preference, both biologically and environmentally, music educators can better determine the most effective ways to deliver instruction and help their students become lifelong music learners.

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