Musical Giftedness

Ellen Winner
Boston College and Harvard Project Zero

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Author affiliations:
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Musically gifted children are similar to academically gifted children in three respects (Winner, 1996a). They are typically recognized as gifted because they are precocious, mastering the first steps in their domain early and learning rapidly in that domain. In addition they have what I call a "rage to master" -- a powerful drive to make sense of their domain and to focus sharply in their area of high ability (Winner, 1996b). In music, where giftedness usually emerges in performance rather than composition, this means that children develop a large repertoire of music that they can perform (Winner, 1996a). And finally, they "march to their own drummer:" they do not just learn faster than ordinary children, but also learn differently. A primary way in which they learn differently is that they need far less adult support than does the typical child to learn in their domain.

Musical giftedness reveals itself as young as one or two years of age, earlier than giftedness in any area (Scott & Moffett, 1977; Shuter-Dyson, 1986; Shuter-Dyson & Gabriel, 1981; Stanley & Benbow, 1986). A survey of forty-seven musicians found that their ability had been detected on average at 4;9 (Scheinfeld, 1956, cited in Shuter-Dyson & Gabriel, 1981). And 70% of the great violinists in Leahy's Famous Violinists were prodigies as young children (Drake, 1957, cited in Shuter-Dyson & Gabriel, 1981). Mozart composed a concerto for the harpsichord at age four (Waterhouse, 1988). Mendelssohn was even more of a prodigy, and the violinist Yehudi Menuhin performed with symphony orchestras at age seven. However, it is also possible to be a late bloomer in music: Sloboda (1985) reports that concert pianists are not always recognized as musically gifted in early childhood. How common late bloomers are in music is simply not known, but my guess is that this is a rare phenomenon.

Typically, musically gifted children reveal several atypical characteristics. They show a great deal of sensitivity to the structure of music -- tonality, key, harmony, and
rhythm, and the ability to hear the expressive properties of music. This sensitivity to structure allows the child to remember music, to play it back with ease either vocally or with an instrument, and to transpose, improvise, and even invent.

Another of the early signs that a child is gifted in music is a strong interest and pleasure in musical sounds (Radford, 1990; Scott & Moffett, 1977; Sosniak, 1985). Stravinsky's first memories were of song (Gardner, 1992). And Mozart's ear was said to be so delicate that loud sounds made him physically ill (Schonberg, 1970).

Musical children respond more to music than do average children, showing an intense interest in auditory information, both musical and environmental (Haroutounian, 1998, in preparation; Miller, 1989). Such children often have a strong sense of goodness of tone and timbre. For example, both Artur Rubinstein and Yehudi Menuhin broke toy violins because the tone of these toys was so poor (Radford, 1990).

Another common early sign of musically gifted children is the ability to sing back with accuracy songs that they hear. This ability is made possible by exceptional musical memory, a skill that has been argued to be central to musical ability (Judd, 1988). While typical children begin to sing and talk at about the same age (18 months) (Sloboda, 1985), those with musical gifts begin to sing at a younger age, and often before they can speak (Shuter-Dyson, 1986). E. N., a seven-year-old Hungarian musical prodigy, did not speak until the age of three, but before he was one year old he tried to sing back songs Revesz (1925). Handel sang before he could speak (Revesz, 1925).

Typical children do not try to imitate heard songs until about two or two and a half. Children are able to sing portions of these songs with accuracy at around age three, and can sing whole songs by about age four. However, intervals in these songs are only approximate, and children are not yet able to maintain the same tonality through a single song. At about age five, typical children can accurately reproduce the familiar tunes of their culture (Gardner, Davidson, & McKernon, 1981; Sloboda, 1985). Musically gifted
children stand in striking contrast for they can sing with accuracy, able to match pitches with precision by their second year (Revesz, 1925).

Musically gifted children can imitate a song after only one exposure (Miller, 1989). It is reported that Mozart began to pick out tunes on the piano at age three (Schonberg, 1970). Pepito Areola, a musical prodigy studied by Richet (1900) could play twenty pieces from memory by the age of three and a half. At age three, Arthur Rubinstein shocked his family by faultlessly playing the pieces his older sister had been practicing (Winn, 1979). At the beginning of his fourth year, E.N., a Hungarian prodigy, could reproduce with accuracy on the piano any tune that he overheard (Revesz, 1925); by seven he could play complex Beethoven sonatas from memory. Mozart at 14 was able to write down Alleferi's Miserere, a complex piece of music with nine parts, after hearing it but several times (Henson, 1977).

The seven-year-old E.N. had a short-term musical memory almost equal to that of an adult musician tested (Revesz, 1925). He performed as well as the musician when asked to listen to pieces of music, and then play them back from memory. Moreover, E.N. exceeded the adult musician in long-term memory: both were asked to reproduce music heard 24 hours earlier, but only E.N. succeeded, effortlessly and flawlessly.

E.N.'s memory showed that he had a tacit understanding of musical structure: he could recall familiar structure, harmony, and rhythm better than random harmonies, and had better recall for the music in the diatonic scale than for dissonant music built on the twelve tone chromatic scale. Thus, his memory was thus not eidetic or mindless like that of a tape-recorder, but was instead structure-preserving. When people remember familiar form better than unfamiliar form, we can conclude that they have some representation (conscious or unconscious) of musical structure.

Some prodigies have shown perfect pitch. E.N., for example, at the age of 3 could instantly locate on the piano notes that were sung to him. He could also recognize intervals and the notes in a chord and analyze chords. In fact, his capacity for resolving
multiple chords has hardly ever been equaled (Revesz, 1925). Mozart also had perfect pitch: he could tell when violins were a quarter out of tune by the age of 4 (Schonberg, 1970). Yet there is no consistent association between perfect pitch and musical giftedness (Walters, Krechevsky, & Gardner, 1985). It has been shown that perfect pitch is related to the age at which musical instruction was begun, and is far more likely to be found in individuals who began musical instruction before four than in those who began as late as 12 (Sergent & Roche, 1973). Whether perfect pitch is thus caused by early training, or whether those who seek early training are those who have perfect pitch, is not known.

The ability to sight-read is also not consistently associated with giftedness in music (Walters, Krechevsky, & Gardner, 1985). This ability is possessed by some but not all musical prodigies. Mozart possessed this skill. At seven, he could readily play a piece he had never seen before (Scott & Mofett, 1977). E.N. also had this ability at seven.

There is a clear distinction between the act of performing existing music and the creation of new music. Another distinction exists between composing new music and two more constrained forms of creation: transposing a given piece to a new key, and improvising from a given musical theme. The transposer takes a given piece and shifts it to a new key. The improviser takes a given musical theme and improvises from this theme, without changing the essential style and structure of the already existing piece.

All children begin to produce their own spontaneous songs at around 18 months, and experiment with musical intervals. Their spontaneous songs lengthen and develop in internal organization between two and three. However, by five, spontaneous singing declines in frequency, as the child becomes concerned with making mistakes, and shows an interest in imitating heard songs with accuracy (Sloboda, 1985). Thus, most children in Western culture stop generating music by the end of the preschool years.

Once again, musically gifted children look different. Most musically gifted children learn to play an instrument, and soon after they begin to play they show ‘musical
generativity” in the form of improvising, and in transposing tunes to new keys. E.N. could transpose pieces to new keys at seven, and by ten could transpose complex pieces into any key with ease. He could improvise by four and for the next three years he improvised more than he composed, both on his own themes as well as on those of others. Mozart improvised by four (Scott & Moffett, 1977; Schonberg, 1970). For other examples, see Richet (1900), and Walters, Krechevsky, and Gardner (1985).

The ability to compose in early childhood is far rarer than the ability to perform, and these are clearly two separate kinds of musical talent (Persson, 1997). Revesz (1925) argued that a gift for composition is rarely seen before late childhood. J.S.Bach, Handel, Beethoven, Mendelssohn, Brahms are examples of great musicians reported by Revesz who were performing virtuosi in early childhood but who did not compose until early adolescence or later. E.N. is a rare example of a child who began to compose as early as three and a half. Haydn, Mozart, Chopin, Mahler, Meyerbeer, Saint-Saens, and Strauss also produced their first compositions before ten (Radford, 1990; Revesz, 1925). Mozart began composing at four and by eight had already written six sonatas for piano and violin and three symphonies for small orchestra. However, the biographies of great composers show that the ability to compose at an early age is much rarer than the ability to interpret and perform music at an early age.

Musically gifted children have been found able to represent musical relations in multiple ways (Bamberger, 1986). Bamberger compared musically gifted children to three other groups: musically untrained (presumably nongifted) children, musically untrained adults, and musically trained adults. They were given a randomly ordered array of bells that formed the pitches of the C major scale along with two Cs, two Gs, and two Es, and were asked to construct a familiar tune (Twinkle Twinkle Little Star).

Children and untrained adults added new bells to the bell path in their order of occurrence in the tune and did not reverse direction to hit the same note a second time. This meant they needed two different bells for the two Gs in the tune, because each was
heard as different. These nongifted and nontrained individuals used what Bamberger (1986) calls a "figural" strategy, because they focused on the figure of the tune and heard each note within the context of the tune's shape. Doing this leads to the two Gs being heard as different because of their different functions in the tune.

The nongifted but trained adults used a "formal" strategy (since they had received musical training), building a C major scale and then playing the tune on the scale as if it were a keyboard. They focused on the formal structure of the tune. In contrast, the gifted children switched strategies. At first they began with a figural strategy, lining pitches up from left to right. But when the got to "star," they switched to a formal strategy and moved backwards to hit the G already used for "twinkle." Thus they realized that one bell could be used for both. They felt a conflict between figural and formal strategies as they proceeded and made both figural and formal choices, showing that they represented the notes both in terms of their position on the C major scale and also in terms of their function within the tune. (Two notes can be identical yet serve a different function, and thus feel different.) Thus, Bamberger (1986) argued that musically gifted children have multiple internal representations for the same piece of music, and can move freely from one kind to another. While they are capable of formal strategies, they have also retained the capacity for a more intuitive figural approach. In contrast, nongifted individuals, irrespective of age and musical training, use a single strategy and focus consistently on a limited set of musical dimensions.

A similar point has been made by Scripp and Davidson (1994), who showed that even musically gifted conservatory students face the challenge of developing and coordinating multiple representations of music. Scripp and Davidson found a lack of coordination between conservatory students’ performance knowledge (their ability to play their instrument) and their understanding of musical notation, with the former often way ahead of the latter. For example, they found that conservatory students who have no trouble sightreading tunes on an instrument have considerable difficulty, and make many
errors, if asked to sightsing. We should not, therefore, make the mistake of assessing musical development only by studying performance knowledge. Musical development is multi-dimensional, and musical giftedness does not develop at the same rate along all dimensions.

Sensitivity to non-notational, expressive properties of music -- register, timbre, loudness, articulation, and phrasing -- has been much overlooked. These are the features that carry the emotional and dramatic message of music. An individual with a heightened expressive ear for music might not be able to follow the details of musical structure, but can hear and respond to the emotional message of the music. Persson and his colleagues (Persson, 1996; Persson, Pratt, & Robson, 1996) found that musicians judged pieces in terms of their emotional response, that positive emotional experiences with music were one of the most important factors prompting them to become musicians, and that emotional aspects of music were often ignored in traditional conservatory training. Perhaps sensitivity to the emotional message of music is a better indicator of musical giftedness than is sensitivity to notational aspects.

The Seashore measures (Seashore, 1938), as well as most other musical aptitude tests (e.g., Bentley, 1966; Gordon, 1987; Shuter-Dyson & Gabriel, 1981; Stankov & Horn, 1980), are based on the assumption that individuals with musical talent have an excellent "analytical ear" for music. The Seashore measures assess analytical skills such as the ability to make fine differentiations between tones and musical structures. Individuals are asked to listen to pairs of chords, intervals, rhythms, and brief melodies and to decide if they are the same or different. Cultures in which children are selected for musical training rely on these same kinds of measures: children are given brief tunes and patterns to recall and sing back. The more accurate their performance, the more musical they are considered to be. (This, for instance, has been the practice of music schools in Russia for decades.) The core of musical aptitude is thus assumed to be the ability to detect pitch, duration of pitch, and rhythm.
Some psychologists have argued that musical aptitude tests should assess not analytic ability but rather other qualities that would be more closely predictive of high creative achievement in music. Davies (1978), for example, suggests that aptitude tests should assess musical reasoning. He argues that the possession of a sharp ear for music may be no more predictive of musicality than possession of good eyesight is predictive of good reading ability. Similarly, Teplov (1966) argued that musical aptitude should not be equated with having a good musical memory and an ability to differentiate chords and melodies. Rather, he argued, the ability to respond emotionally to music is the core of musicality. Teplov reflects the traditional Russian musicological interest in expression and affect in music, and in non-notational aspects of music making (Asafiev, 1947; Medushevsky, 1983).

Kirnarskaya and Winner (in press) found that most people, even those with high levels of music training, respond to music analytically rather than expressively. When asked to group passages of music, both trained and untrained individuals grouped according to analytic structure rather than expressive properties. Even music educators with high levels of music training grouped analytically. In contrast, concert performers, who had no more formal training than the music educators, grouped according to expression. Kirnarskaya and Winner concluded that formal musical training does not foster an expressive ear for music. Sensitivity to expressive properties may, they argued, be a marker for inborn musical giftedness. This suggestion, which remains to be directly tested, follows from the fact that concert performers grouped expressively, while equally well trained music educators (who are presumably less gifted since they did not become performers) grouped analytically.

Highly gifted children often face a crisis at adolescence. Bamberger (1982) points out that prodigies in music experience a midlife crises at adolescence, when they become increasingly critical of their playing, and this crisis often results in dropping out of music. Adolescence is the time when prodigies must make the transition from technical
perfection to innovation and big-C, domain creativity. Only those who can reinvent themselves will make the leap between childhood giftedness and adult creativity (Gardner, 1993). It is extremely difficult to predict those gifted children and prodigies who will make this transition, and those who will not (Simonton, 1994). A child who plays Mozart just like her teacher, or even just like a Heifetz recording, amazes us. But by twenty, if this prodigy does not play in a way that is new, with some deep understanding, and a new interpretation, serious musicians and critics will lose interest. Technical perfection will win a child adoration, but it will win the prodigy grown into adulthood little or nothing.

Great artists, especially music performers, were often prodigies as children (Schuter-Dyson, 1986). However, the reverse is not the case: most children who are gifted in art or music do not become adult artists, musicians, or composers. When discussing artistically gifted children, the art historian Hartlaub commented that the promise of these "over-potential years of childhood is almost never fulfilled in adulthood" (Lark Horowitz et al., 1973, p. 190). Even among those who weather this crisis and do not drop out, most do not become known as creative geniuses. This is not surprising, as there is no direct route from precocity to inventiveness. But of course a few prodigies do go on to change their respective domains. These are the ones who earn the epithet "creative" or "creative genius." These are the individuals who, at adolescence or early adulthood, take a new stance. They begin to take risks: they challenge the establishment (Gardner, 1992, 1993).

One reason why only a few musically gifted children and prodigies make the transition to become domain creators as adults is that the funnel is small: there is simply not enough room at the top for all prodigies to become creators. And so there is an inevitable weeding out. Any domain would be in chaos if there were as many creative adult innovators as there are child prodigies.
A second inevitable reason is that the skill of being a prodigy is not the same as the skill of being a big-C creator (Winner, 1997). A prodigy is someone who can easily and rapidly master a domain with expertise. A creator is someone who changes a domain. It is likely that personality factors play a major role in becoming a domain creator. Creators are restless, rebellious, and dissatisfied with the status quo (Simonton, 1994; Sulloway, 1996). And they have something new to "say."

Of course, some individuals, such as Mozart, start out as prodigies and go on to become adults who transform their domains. As a prodigy, Mozart pleased the establishment. But it is only because of his later behavior, when he began to write music that we considered shocking, and which broke with established convention, that we now consider him to be a creative genius. The creative musician takes risks, and breaks with conventions. The gifted child, or child prodigy, does not. As Hurwitz (1983) points out, gifted children have invested a great deal of energy in mastering a set of skills, and are often unwilling, or even unable, to experiment in the way that one must do in order to be creative.

Sheer hard work also plays a role in determining whether a prodigy becomes a creative adult artist or musician or composer. The personality characteristics associated with success in any field are drive, tenacity, and the willingness to overcome obstacles (Gardner, 1993; Simonton, 1994; Roe, 1953). "I believe in nothing but work," said Picasso, who had tremendous energy and drive (Richardson, 1991, p. 48).

Finally, historical and socio-cultural factors determine who becomes classified as an adult creator or genius. No individual or artistic work is inherently creative or not. Instead, creativity is an emergent property formed by an interaction among the individual's gift, the state of the domain at the time when the individual begins to exhibit talent, and the tastes and judgments of the field (e.g., critics, curators, publishers) (Csikszentmihalyi, 1988; Gardner, 1992, 1993; Gardner & Wolf, 1988; Pariser, 1992/93). There is a fair amount of serendipity involved in determining whether giftedness grows
into creative genius. One needs to be born at the right time, at a time when the field is ready to recognize one's talents.
References


