Chapter 18

Building gifts into musical talents

Gary E. McPherson and Aaron Williamon

Building gifts into musical talents: Introduction

One of the most contentious debates in psychology, education, biology, and other related disciplines centers on the source of exceptional ability. To what extent can the remarkable achievements of eminent musicians, intellectuals, visual artists, writers, and so on be explained through “nature” (genetic endowment) or “nurture” (the environment)? How can these achievements, regardless of their source, be identified and fostered?

In this chapter, we address fundamental issues surrounding the nature/nurture debate in music and, in doing so, scrutinize much of the folklore that typically accompanies remarkable achievement in music. Specifically, we outline a broad structure that distinguishes between “giftedness” and “talent” and discuss, in turn, six core components of this framework:

- ◆ Giftedness
- ◆ Intrapersonal factors
- ◆ Environmental catalysts
- ◆ The developmental process
- ◆ Chance
- ◆ Talent

We then explore the scope and potential for identifying musically gifted children. Throughout, we draw on examples reported by Gagné and McPherson (in press) of highly gifted and talented musicians, including musical prodigies, to elucidate these components.

Defining giftedness and talent

Throughout history there has been an endless fascination with children who display extraordinary abilities in various domains of learning, and this is especially so in music (see de Mink & McPherson, in press; Gagné & McPherson, in press; McPherson & Lehman, 2012). Studying the course of this captivation across the centuries shows that conceptions of giftedness have evolved from a theological view, in which children who display special abilities were regarded as “heavenly” (i.e., a gift from God), through to a metaphysical phase that emphasized individual aptitudes but which also fostered many myths such as the stereotyped “crazed genius,” which we see portrayed in many films. Nowadays empirical approaches attempt to focus on the interaction of genetic and environmental factors, domain-specific training, educational measures and individual differences, and how these differ between cultures (Stoeger, 2009).

One of the most immediate problems one encounters when sifting through literature on giftedness and talent is the range of competing definitions used in various sectors; moreover, as these

definitions are often theoretical in nature, they can be troublesome to implement in practice (Gagné & McPherson, in press; Gallagher, 1993; Gross, 1994). Frequently, terms used in one field are employed differently in another, with the added complication that some researchers use two or three terms interchangeably without any operational definitions to guide their work.

We also see this problem in school education, where it is common to hear teachers use and regard the terms “gifted” and “talented” as if they were synonyms. In other contexts (Ofsted, 2009), the term “gifted” is used to describe learners with high ability or potential in the academic subjects and “talented” for those with high ability or potential in the expressive or creative arts or sports. And yet in others, giftedness is used to indicate higher order excellence than talent (US Department of Education, 1993). In our view, these types of explanations do not adequately explain the difference between human potential and actual achievement, and lead to the confusion and misunderstandings that can undermine efforts to cater for the needs of this group of special-needs learners. This lack of standardization and agreement also makes it difficult to compare findings from different research traditions or across disciplines (see further Gagné, 2004a).

A final problem with the lack of standardization of terms is that conceptions of giftedness and talent are inevitably culture-specific. Shinichi Suzuki’s (1898–1998) Talent Education method for training young violinists and pianists, for instance, is based on the principle that all children can develop requisite musical skills provided they are exposed to the “right” education (Suzuki, 1983). However, this view is very much based on Japanese societal values, in which hard work is often respected above achievement.

For the purposes of this chapter, we choose to differentiate between the terms “giftedness” and “talent” according to the most dominant view internationally, and one that has been adopted by many educational systems around the world. Our explanation is based on the work of the educational psychologist François Gagné (1985, 1993, 2000, 2003, 2004b, 2009a,b, 2010, 2013). This view takes a decidedly “bottom-up” approach to conceptualizing exceptional skills, in that it seeks to explain and identify potential and ability and then to offer direct implications for the education and training of young people. An alternative approach has emerged within the context of psychological research into expert performance and behaviour (for reviews, see Ericsson, 1996; Ericsson & Lehmann, 1996; Howe, Davidson, & Sloboda, 1998; Williamon & Valentine, 2000, 2002). Here, a more “top-down” approach has been adopted, in that much effort has been directed toward studying the performance of established experts, the rationale being that such investigations can shed light on fundamental psychological mechanisms underpinning high-level performance and can eventually be used to inform the training of novices. The former, bottom-up conception fits more organically with the main purpose of this chapter, which is to explain how a child, born with a range of natural abilities that can enhance his or her study of music, may then develop into a talented musician. Nevertheless, we encourage readers to understand both approaches in order to acquire a comprehensive understanding of the topic.

At the heart of Gagné’s (2010, 2013) model, which is adapted here for music to identify specific musical talents (see Figure 18.1), is the distinction between domains of ability (*gifts*) and fields of performance (*talent*). Gagné uses the term “giftedness” to describe individuals who are endowed with natural *potential to achieve* that is distinctly above average for their age group in one or more aptitude domains. In this conception, aptitudes are natural abilities that have a genetic origin and that appear and develop more-or-less spontaneously in every individual. The mix of these aptitudes explains the major proportion of differences between individuals when the surrounding environment and practice are roughly comparable. However, aptitudes do not develop purely by maturation alone; environmental stimulation through practice and learning is also essential.

Fig. 18.1 Differentiated model of musical giftedness and talent

Adapted from Gagné, F., "Building gifts into talents: Detailed overview of the DMGT 2.0," in B. MacFarlane & T. Stambaugh (eds.), *Leading change in gifted education: The festschrift of Dr. Joyce VanTassel-Baska*, p. 64 (Waco, TX), © 2009, Prufrock Press.

Talent can be used to describe someone who demonstrates *superior performance* (or *superior skills*) as a result of some type of systematic training in a specific field. In music, it can refer to a range of competencies that encompass the defined talents shown in Figure 18.1: performing, improvising, composing, arranging, analysis, appraising, conducting, and music teaching.

Giftedness

As depicted in Figure 18.1, Gagné (2010, 2013) identifies six domains of natural abilities (*gifts*), four mental (Intellectual, Creative, Social, Perceptual), and two physical (Muscular, Motor Control). The individual blending of these mental and physical "natural" abilities (or aptitudes) is expected to influence the types of musical talents that will eventually evolve. For example, creativity may not be the key component of some particular talents in music—such as performance within the Western art music tradition—yet it is an essential ingredient of some of the more overtly creative sides of the discipline, including improvising and composing (Winner & Martino, 1993, 2000). Likewise, physical natural abilities—such as the muscular and motor control components of power, speed, strength, endurance, reflexes, ability, coordination, and balance—are in varying ways essential in many forms of musical performance, but may be far less important for those who compose or are engaged in the analysis or appraisal of music. One of the great

challenges in the discipline is for researchers to sort through this maze and to clarify the particular blend of natural abilities which underpin each form of music-related activity (this is discussed further in the section “Identifying the musically gifted”).

Furthermore, as Gagné (2010) explains, these natural abilities “are not innate,” but rather develop “through maturational processes and informal exercise” even though such development and level of expression is “partially controlled by the individual’s genetic endowment” (p. 83). Obviously, gifts are more easily observed in young children before environmental forces and training moderate their influence, but can also be observed at all ages and, most especially, through the facility and how rapidly a music learner acquires new knowledge, skills, and understanding. In this way, ease and speed of learning define any type of giftedness (Gagné, 2010).

What is the difference between “gifted,” “innate,” and “precocious”?

As Gagné (2013) suggests, natural abilities develop progressively, mostly during the early years of one’s life, but spontaneously without the structured learning or formal training associated with the development described in his model. In contrast, the term “innate” is best used in a very restricted way to imply, at a behavioral level, “hard-wired, fixed action patterns of a species that are impervious to experience. Genetic influence on abilities and other complex traits does not denote the hard-wired deterministic effect of a single gene but rather probabilistic propensities of many genes in multiple-gene systems” (Plomin, 1998, p. 421; see further Gagné, 2013).

Given this, it does not make sense to use expressions such as “David is a born musician.” Suggesting that musical talent is “innate” only makes sense metaphorically. Rather, natural mental and physical natural abilities of the type described by Gagné (2013) mean that gifted children can be contrasted with their peers by the rate and speed at which they acquire new skills. The term “precocious,” defined as having developed certain abilities or inclinations at an earlier age than is usual or expected, is often used when referring to “gifted” children’s ability to learn more rapidly than their peers. For example, saying that “David is a precocious pianist” would imply that David was able to play pieces much earlier and faster than peers of his own age who were also learning the piano. Therefore, the higher David’s level of giftedness, the earlier and faster will his mastery of successive stages in his development be achieved (see Gagné & McPherson, in press).

Intellectual natural abilities

Gifted music learners, and most especially musical prodigies, display a number of distinguishing characteristics, but one stands out: their extraordinary ability to memorize music. Mozart, for example, was barely 14 years old when he visited the Sistine Chapel, heard Gregorio Allegri’s famous *Miserere*, and then came back home and reproduced the complete 15-minute score in notation. It is believed that he heard the work more than once, and knew the text beforehand, yet this still stands as a remarkable feat of memorization (Keefe, in press; Kopiez & Lehmann, in press).

The literature is full of impressive feats of memorization by young musicians. Some examples include Erwin Nyiregyházi, who reportedly “learned to play Robert Schumann’s *Piano Concerto in A minor*, Op. 54 by heart in only 10 days, although he played it through only once a day” (Kopiez & Lehmann, in press), and the 4-year-old Lang Lang whose “teacher was astonished by his memory; he could memorize four big pieces every week” (Solomon, 2012, p. 445). Gagné and McPherson (in press) document multiple examples of extraordinary progress based on powerful memory processes. Whilst some of these historical reports might be questioned or even exaggerated, the consistency of instances among their most famous still demonstrates the highly developed memory systems that distinguish young, highly gifted musicians.

Perceptual natural abilities

Because music is an “aural artform,” much of the literature has concentrated on the “perceptual” domain to describe an underlying “trait” of musical potential which might form an integral component of success in all of the eight musical talents listed in Figure 18.1. However, researchers use different frameworks to define this potential. Gardner (1983) refers to a sensitivity to the physical and emotional aspects of sound, while Gordon (2007) talks of the ability to audiate (i.e., comprehend sound inwardly), and Mainwaring (1941, 1947, 1951a,b) places an emphasis on the ability to “think in sound.” These earlier conceptions have been extended by Brodsky (2004), who draws on findings by Papoušek (1996) to posit that the extent to which the processing of complex musical structures might be an innate predisposition in infants tends to “fade away” in situations when the developing child is “not sufficiently engaged in auditory and musical interchanges” (Brodsky, 2004, p. 87).

Although music teachers will be able to gauge a child’s motor abilities and physical coordination within the first weeks of learning an instrument, evidence from studies on high ability (Winner & Martino, 2000) suggests that a possible basic core ability of musically gifted children is their “sensitivity to the structure of music—tonality, key, harmony, and rhythm, and the ability to hear the expressive properties of music” (p. 102). This sensitivity to structure allows musically gifted children to remember, play back, transpose, improvise and create music—ways of enjoying and studying music that were evident during childhood for many of the great composers and performers throughout history. Another aspect is that musical giftedness can reveal itself as early as 1 or 2 years of age, which is earlier than practically any other domain of skill. Mozart, for example, is reported to have had such delicate ears that he would become physically ill when exposed to loud sounds. In similar extreme cases of extraordinarily gifted prodigies, this intense interest in musical and environmental sounds is also accompanied by an even more sophisticated sense of the “goodness” of tone and timbre, as evident in examples of famous musicians such as Rubinstein and Menuhin who as young children broke their toy violins because the tone was so poor (Winner & Martino, 2000).

A more universal perceptual ability that typifies highly gifted musical children, however, is their ability to sing back heard songs earlier than ordinary children, which can occur even before they learn to talk (Winner & Martino, 2000). While ordinary children start imitating songs at around 2 years (or a little after), singing whole songs by age 4 and reproducing songs accurately by 5, the most musically gifted are able to match pitches accurately by their second year and do this often after just one listening. Associated with this sensitivity to sound is the capacity for musically gifted children to represent musical relations in multiple ways (Bamberger, in press) and to respond positively to the emotional aspects of music (Persson, 1996; Persson, Partt, & Robson, 1996). Although a young musician may not have sufficient training to follow every detail of musical structure, he or she “can hear and respond to the emotional message of the music” (Winner & Martino, 2000, p. 105). In these ways, traditional measures of assessing musical aptitude that involve examples of telling whether two successive tonal or rhythmic patterns are the same or different may be missing the point; a sharp ear for distinguishing differences in pitch and rhythm “may be no more predictive of musicality than possessing a good eyesight is predictive of good reading ability” (Winner & Martino, 2000, p. 105; see also Davies, 1978; McPherson & Hallam, in press). The two most important core ingredients of musical giftedness, therefore, seem to involve sensitivity to structural and to expressive (in contrast to technical) properties of music.

Csikszentmihalyi (1998) extends this conception by asserting that “children whose neurological makeup makes them particularly sensitive to sounds will be motivated to pay attention to aural

stimulation, be self-confident in listening and singing, and likely to seek out training in music” (p. 411), while Brodsky (2004) proposes that potential for processing music develops as children become more aware of sound and start to identify and associate with music according to their own “auditory style.” For Brodsky, this predisposition involves a fusion between a *responsiveness* and *preference* for music that links with the child’s *awareness* of music. In our conception, however, *responsiveness* and *preference* would be associated with motivation and interest and therefore fall among intrapersonal catalysts.

Absolute (perfect) pitch

As an extension, the degree to which absolute (or perfect) pitch is related to Gagné’s (2013) natural *perceptual* abilities, hard wired (innate or genetically determined), or impacted by maturation or environmental stimulation, continues to be an area of fascination. Available evidence suggests that no single factor is predictive of absolute pitch in musicians, but rather that a combination of genetic predisposition (especially family history), commencing an instrument during the sensitive period between 3 and 7 years (with an outside limit of between 9 and 12 years), and early exposure to a pedagogy that emphasizes consistent tone–label associations (e.g., fixed-*do* systems, with continuing use of fixed-pitch instruments such as the piano) provides the strongest explanation (Wilson et al., 2012; see also Elmer et al., 2013). Interestingly, a majority of absolute-pitch musicians play piano, a fixed-*do* instrument where the visual layout of the keyboard reinforces rather than destabilizes long-term absolute pitch templates both at the time of starting the instrument and throughout the rest of the musician’s playing career (Wilson et al., 2012). Even though a majority of musical prodigies do seem to possess this ability (Gagné & McPherson, in press), most professional musicians do not, so it is important to keep in mind that absolute-pitch possession (as compared with exceptional relative pitch) is not a prerequisite for achieving musical excellence, or a determining trait that might be used to identify and categorize musically gifted children. Even so, the role of genetic predisposition, commencement age, and appropriate early pedagogy is consistent with Gagné’s explanation in that it shows how the natural *perceptual* (aural) abilities of the most gifted and talented child musicians have developed through maturational processes and appropriate education into an acute sense of pitch (whether absolute- or relative-pitch ability) which then feeds into a more sophisticated sense of musical structure and expression.

Mimicry

In their extensive survey of musical prodigies, Gagné and McPherson (in press) cite Solomon (2012), who suggests that “[t]o be a musician, the person has to have a mimetic capacity to reproduce others’ techniques” (p. 419). Solomon suggests that this ability to produce exceptionally refined interpretations even at a young age seems to involve both auditory and motor aptitudes, as the musician picks up specific aspects of musicianship to craft an interpretation and then reproduces this through performance. In some ways this is akin to languages: “Some people are apparently born with an ear for languages. A small fraction can continue to pick up new languages, and learn to speak them like a native, even when they are well advanced in age. They are natural mimics” (Harris, 1998, p. 388).

Physical natural abilities

In much of the music literature the physical aspects of performing have been underestimated and little studied, even though it is self-evident that they are essential, as they are in other performing arts. This is remarkable, given that a concert pianist can play at speeds of ten or more notes per

second in both hands, in complex changing and spatial patterns, and with multiple patterns of rhythm, dynamics, and articulation (Clarke, 2002, p. 59).

As a very young boy, Michael Jackson reports that he could watch someone do complicated dance steps and know immediately how to do it (Jackson, 2009, p. 136). In this and many other cases of musical prodigies we can observe major individual differences from the earliest phase of music learning which seem to indicate the presence of significant aptitude differences (Gagné & McPherson, in press). Another good example comes from Kenneson (1998), who cites the first cello lesson he gave to 2-year-old Shauna Rolston and how impressed he was by

that toddler's dexterous left hand that was soon acting out musical ideas on the cello with great agility. Shauna was marvelously coordinated. Her right hand, with its deft sense of touch, showed the promise of an unusual talent for bowing. (. . .) Within a year she drew a tone pure as crystal from her little cello (p. 22).

These examples highlight the two distinct dimensions of motor control abilities: a) the motor dexterity itself, and b) the procedural memorization of these motor sequences. A significant gap in the music literature is the dearth of studies focusing on individual differences in motor control abilities among novice performing students. We find this remarkable given that music teachers are able to gauge a child's motor abilities and physical coordination within the first weeks of learning an instrument.

Intrapersonal catalysts

Intrapersonal catalysts comprise at least five types of physical and mental traits, each partially influenced by genetic endowment (Gagné, 2010). First, *physical traits* associated with one's appearance, any disabilities, and general health help identify young individuals who might succeed because of their build. *Mental traits* cluster around temperament and personality, and can be useful in explaining a musician's basic tendencies as opposed to behavioral styles, plus the resilience they draw on when experiencing failure or in situations where learning is frustrating.

Second, *goal management* dimensions help us understand how learners focus on *what* they want to achieve and *how* they intend to go about reaching their goals. It includes three subcomponents: awareness (being attentive and responsive to personal and others' strengths and weaknesses), motivation (in terms of the identification and reassessment of goals), and volition (the intense dedication and personal willpower necessary to achieving goals).

One line of research—achievement motivation—demonstrates how talented children seek moderate challenges and risks, in that they are attracted to tasks that are neither too hard nor too easy. These types of children are “strivers” in that they constantly seek to improve themselves and become better in those tasks that they choose to study (Sternberg, 2000). Another area of research, on so-called self-efficacy, focuses on children's beliefs in their own personal competence about whether or not they can do a task in a particular situation (Bandura, 1997; see further McCormick & McPherson, 2003; McPherson & McCormick, 2006). A key point, however, is that intrapersonal catalysts affect both the quality and quantity of children's engagement with music (McPherson, Davidson, & Faulkner, 2012).

Many gifted children are highly capable in a number of areas and commit themselves to a range of activities, each of which requires vast amounts of time and energy for continuing success. This sometimes produces high levels of stress and emotional instability (Coleman & Cross, 2000). However, multit talented adolescents tend also to be good at *self-managing* their learning by focusing their efforts on a specific task for hours or even days on end, monitoring and controlling their

own learning, sustaining their effort (even when tired), and efficiently planning what they need to do in order to master a new skill (Gagné, 1999, 2000; Gagné et al., 1996).

Some exceptionally gifted children also display *personalities* that are different from other children, such as over-excitabilities in psychomotor, intellectual, sensual, imaginal, and emotional areas of their development. These over-excitabilities, which researchers define as “expanded awareness, intensified emotions, and increased levels of intellectual and/or physical activity” (Coleman & Cross, 2000, p. 204), manifest themselves in many different ways. In music, they explain why some children develop an almost fanatical love of a particular genre or composer, an intense emotional commitment to one or more forms of music, or a deep love for the sound of a particular instrument. Among many examples of the phenomena is the celebrated cellist Jacqueline du Pré, who started her musical education at the age of 4 after hearing the cello performed on the radio and then demanding that her mother arrange lessons (Wilson, 1998). Unfortunately, however, these children’s highly developed capacities in music may not always match other aspects of their development, with the complication that they may experience difficulties physically, socially, or emotionally. In addition, the particular blending of the psychological dimensions results in some highly gifted children placing unreasonably high expectations on themselves, which if not tempered can result in stress, burn-out, and unhealthy self-criticism (Coleman & Cross, 2000).

Each of these characteristics was evident in Mozart, who was so passionate about his learning that it was “of little moment to him what he was given to learn; he simply wanted to learn” (cited in Solomon, 1995, p. 39). He was also single-minded, eager, and capable of intense concentration. “Whatever he was given to learn occupied him so completely that he put all else, even music, on one side; e.g., when he was doing sums, the tables, chairs, walls, even the floor was covered with chalked figures” (Solomon, 1995, p. 39). By the age of 3, when his 7-year-old sister began receiving keyboard lessons from their father, Mozart was drawn to music, “perhaps by a desire to emulate his sister and win his share of their father’s attention,” and spent “endless hours at the keyboard, particularly delighting in ‘picking out thirds and sounding them’” (Solomon, 1995, p. 35). Mozart’s efforts were so focused and concentrated that soon after he began learning he could master simple musical repertoire in a surprisingly short amount of time (Solomon, 1995). These extraordinary behaviors are not seen to the same degree in the vast majority of musically gifted children, and we need to be careful, therefore, that any conception of giftedness and talent values the uniqueness of each individual learner.

Environmental catalysts

It is impossible to survey the full range of environmental forces that come into play in the development of a gifted child musician. However, it is possible to survey some of the most important environmental catalysts, given available research that asserts the importance of parents and siblings, the influence of teachers, and the types of events in children’s lives that can have a profound impact on their subsequent development.

Important environmental influences are the *milieu* in which the child is raised, the *individuals* with whom the learner comes into contact, and the *provisions* which can serve to accelerate progress. According to Gagné (2010), the *milieu* can be studied from a macroscopic level, to understand geographical location and demographic and social issues, and also a microscopic level, to understand issues related to the size of the family, socio-economic status, and neighboring services. For example, living in close proximity to appropriate learning resources supports a young child’s learning and can act as a stimulus for a gifted child’s musical education, as would having

parents who are financially comfortable and prepared to devote large amounts of their time and resources to supporting their child's musical education.

Much of the literature in music and other areas of talent development focuses on the influence of significant *individuals* such as parents, teachers, peers, and siblings within the immediate environment of the young learner. Even though their influence may qualitatively change over time, these significant individuals often provide the emotional and intellectual support necessary for developing skills at the highest level (McPherson, 2009; McPherson, Davidson, & Faulkner, 2012). McPherson and Lehmann (2012) draw on research in sports psychology, for example, to show how the parents' role evolves from direct involvement as an organizer of lessons and encouraging spectator during the *sampling* and *specialist* stages of learning to indirect involvement as a spectator when the child enters the *investment* stage. This can be contrasted to the teacher's role, which for the sampling stage works best if the teacher is a helper and friend, in contrast to the investment stage where the teacher needs to be both an expert musician and a superb role model.

Some researchers such as Sosniak (1985), who studied highly talented pianists, assert that exceptionally talented children typically have at least one parent or relative who cared deeply about their musical development, as confirmed by violinist Isaac Stern:

There *has* to be someone pushing, a parent or a teacher. Every one of the kids I've guided has someone like that in their lives, pushing them, sometimes gently, sometimes horribly, sometimes, unfortunately, to the point of driving the child away from music. It's the quality of parental pushing that helps determine the eventual outcome of the prodigy. (Winn, 1979, p. 40)

Extending this conception is work by Yun Dai and Schader (2001), which stresses the importance of cultural values and beliefs about learning. They report on a study of children who were taking lessons at eminent conservatory music programs as an extension of their normal schooling. Their findings show that parents of these high-level learners tended to emphasize intrinsic rather than extrinsic rewards for their children's learning, by stressing the appreciation and aesthetic qualities, and enrichment of life as the major reasons for wanting their child to learn music. This result was consistent for both children who were beginning their training and also for those who had been studying for more than ten years. The explanation they provide is that the parents who expressed an intrinsic orientation for their children's learning tended to nurture and foster internal motivations for them, in contrast to parents who expressed a strong extrinsic orientation and who pushed their children to a loss of effort and possible conflict. The authors of this study suggest that a social environment that reduces anxiety and external pressure, and encourages personal growth and task commitment, is essential for sustained, long-term involvement (see also Gottfried, Fleming, & Gottfried, 1994; Kemp, 1996; McPherson, Davidson, & Evans, Chapter 22; Sloboda, 1993). Interestingly, many of the parents of the successful learners did not say they wanted their children to learn merely for musical reasons. Nonmusical benefits relating to the child's holistic development (e.g., self-discipline, diligence, academic achievement) were of utmost concern. In sum, a family's lifestyle is important to a child's development, but there is nonetheless no ideal family, in that gifted children can spring from many and varied backgrounds (Freeman, 2000).

Research also shows that musicians who continue playing are able to differentiate between the "personal" and "professional" qualities of their teachers and that personal warmth is a vital characteristic of a teacher during the initial stages of development. Better students remember their first teacher "not so much for their technical adeptness as for the fact that they made lessons fun. They communicated both their love for music and their liking for their pupil" (Sloboda, 1993, p. 110). Leopold Mozart is perhaps one of the best examples of a teacher who could nurture talent. He "was a supreme teacher who understood how to inspire gifted children to great

effort and achievement, instilling a drive for excellence and awaking in them a sense of unlimited devotion to his person and a desire to obtain his approval above all else" (Solomon, 1995, pp. 39–40). At the time, Leopold was one of the finest performers and composers in Europe and, by the time Wolfgang was born, had already published a method for teaching the violin (*Versuch einer gründlichen Violinschule*), which had brought him much acclaim (Turner, 1965). Lehmann, Ericsson and Hetzer (2002), in a biographical study of Wolfgang and 21 lesser-known composers at the time, effectively demonstrate that it was predominantly the quality of young Wolfgang's educational opportunities that distinguished him from the others and that, among the others, it was the quality of their early music instruction that correlated with their status as a prodigy.

Leopold Mozart was also aware of the need to showcase his son's remarkable achievements as an added incentive to fostering his development, and by the age of 7 1/2, Wolfgang had travelled thousands of miles across Europe to perform in almost 90 cities (Solomon, 1995). Such extensive travelling and exposure to influential patrons and contemporary trends in music-making enriched Wolfgang's musical development in profoundly important ways, also leaving indelible impressions on those who were witness to his abilities. At a brief stay at a Franciscan church in Ybbs, the 6-year-old Mozart played the organ "so well that the Franciscans . . . were almost struck dead with amazement" (Anderson, 1985, p. 6). Certainly, one can begin to imagine how the inevitable praise to follow such a performance must have left its mark on the young prodigy.

These are brief examples of how parents and teachers impact on a gifted child's musical development. Although the impact of other significant others such as siblings and peers is not dealt with here, we would predict that in certain situations their impact might be equally influential. Likewise, gaining access to high-quality *provisions* such as music camps, community ensembles, or being chosen to participate in selective schools helps to accelerate the development of a talent or talents. These significant events in a child's life leave a lasting impression on subsequent vocational decisions to engage in a particular activity and are therefore crucial for sustaining involvement.

The developmental process

As can be inferred from the direction of arrows in Figure 18.1, natural abilities (or aptitudes) act as the "raw material" for the emergence of talents (Gagné, 2010), so no amount of giftedness will guarantee success without opportunities for intense, systematic learning and practice. For this reason, Gagné divides his Developmental Processes into three subcategories:

Activities: Access to a musical education, whether by being selected or identified, provides gifted children with opportunities to develop musical talents through exposure to purposeful, structured activities within a specific learning context.

Investment: Exceptionally talented music learners are intellectually curious and emotionally engaged. An intense determination fuels their drive to achieve at a high level such that parents will often make lifestyle changes to accommodate their child's musical interest.

Progress: Precocious learners are defined by the rate at which they learn and acquire new skills, knowledge, and understanding, and thereby possess a "rage to learn" that is not necessarily driven by a desire to achieve fame, money, or a possible career (McPherson & Lehmann, 2012; Winner & Martino, 2000). Such learners often devote large amounts of time, money, and energy into their learning to acquire expertise.

In the music literature, most studies of the developmental process have demonstrated a close connection between *deliberate* forms of practice and overall achievement, for both young and

older musicians (Chaffin & Lemieux, 2004; Ericsson, Krampe, & Tesch-Römer, 1993; Howe et al., 1998). Indeed, the literature discusses the so-called ten-year rule, which suggests that a *minimum* of ten years of dedicated practice are required to become an expert in any field—from music, drama, and dance, to sports and athletics, to business and other cognitive domains (Ericsson et al., 1993; Winner, 1996a,b). In the case of music, the path to eminence can often be much longer, with requisite skills requiring constant development and maintenance (Krampe, 1997; Krampe & Ericsson, 1996). Chaffin and Lemieux (2004) expound on this point further:

While the idea that practice is integral to success is not likely to surprise anyone, the amount of training involved is striking. It is estimated that more than 10,000 hours of practice is required before a performer is ready to begin a professional career. . . . The young pianists in a study by Sosniak (1985) started their careers as concert soloists after an average of 17 years of training. For composers, the period of preparation is even longer: 20 years from first exposure to music to first notable composition for the 76 major composers whose careers were reviewed by Hayes (1981). After a lifetime of practice, the experienced pianists in Krampe's (1997) study had put in 60,000 hours of practice. (pp. 20–1)

High achievement, however, is not determined by quantity of practice alone, just as it is clear that two individuals who practice for the same amount of time will not produce exactly the same performances. Rather, the acquisition of expert-level skill is cultivated through engagement in the highest *quality* of practice (Ericsson et al., 1993; Williamon, Lehmann, & McClure, 2003; Williamon & Valentine, 2000). Reviews by Chaffin and Lemieux (2004), Jørgensen (2004), and Davidson and King (2004) offer a number of suggestions for the content and form that such practice may take.

To this we could also add historical indications that Mozart's musical practice from a very early age was goal-oriented, structured, and effortful, as described in the literature on *deliberate practice* (e.g., Ericsson, 1996). By the age of 6, Mozart was devoting large chunks of his day practicing pieces and receiving a considerable amount of daily input from his father, who was himself an eminent musician and teacher. Not only did the young Mozart practice repertoire, but he also improvised for hours on end and put these thoughts on paper in the form of compositions. His remarkable learning curve meant that he was able to master all the musical clefs very early in his training, as well as sight-read any type of score on the keyboard. His learning was, therefore, not focused merely on performing other composer's music, but also continually varying and building on what had been previously achieved. Very early in his music education, he was gaining practice in transferring what he had learned in one context to another (see Deutsche, 1966).

We feel it judicious to add a note of caution when interpreting the literature cited immediately above, something that the first author of this chapter has discussed in much greater detail in the opening chapter of his recent book on musical prodigies (Gagné & McPherson, in press). Very recent evidence is questioning the power of deliberate practice as the single most important predictor of performance achievement (see further *Intelligence*, volume 45, 2014; Hambrick et al., 2014; Macnamara, Hambrick, & Oswald, 2014; but see also, Platz et al., 2014), and newly emerging evidence in neuroscience is starting to map out the genetic underpinnings of individual differences on diverse musical phenotypes, including perception, melodic memory, absolute pitch, music creativity, and congenital amusia (Mossing & Ullén, in press; Tan et al., 2014, see also Polderman et al., 2015). Harris (1998, 2006) challenges the notion that children's behaviors are primarily the result of how they were raised or taught, because parents and teachers react and adjust their behavior just as much to the child as does the child to his or her parents or teacher. Furthermore, children relate more to their peers than their parents, and are adept at modifying their behavior so that they can fit in with their peer group.

Given this, we can note that development results from the transformation of outstanding natural abilities or gifts into the highly refined and systematically developed competencies displayed in one or more of the musical talents depicted in Figure 18.1 (Gagné, 2010). A major implication of the discussion thus far is that a child may be gifted without displaying any specific “talent” (but not the reverse). This is because the child may possess the potential for success, but may not be able to act on it due to a number of factors such as a lack of interest.

Chance

Chance can act positively on a child’s natural abilities, plus a range of intrapersonal and environmental catalysts in as much as it may bring good fortune, particularly if a child is constantly engaged in exploring the environment or is simply in the “right place at the right time.” The influence of this factor should not be underestimated, and we might wonder whether any of the great composers or performers throughout history would have made it to the top of their fields without at least some breaks during their early, developmental years.

The great jazz trumpeter Louis Armstrong, for example, worked from around 6 years of age for two emigrant brothers collecting cast-offs for their junk wagon. Normally, they would ring a bell or shout to attract customers, but one day, the brothers asked Louis to blow a simple tin-horn that was used at the time during celebrations. It worked wonders, and in the space of a short period of time it became a tremendous asset to the business, helping to draw attention to the junk wagon, with Louis playing a number of popular tunes on what was essentially a crude instrument. In his own words, Armstrong explains:

When I would be on the junk wagon . . . I would blow this long tin-horn without the top on it. Just hold my fingers close together and blow. It was a call for old rags, bones, bottles, or anything that the people and kids had to sell. The kids loved the sound of my tin-horn . . . One day I took the wooden top off the horn, and surprisingly I held up my two fingers close together where the wooden mouthpieces used to be and I could play a tune of some kind. Oh, the kids really enjoyed that. Better than the first time. They used to bring their bottles, Alex would give them a few pennies, and they would stand around the wagon while I would entertain them. (Cited in Bergreen, 1997, pp. 55–6)

According to Bergreen (1997), the chance event of being given a tin-horn to attract attention was “a startling discovery” which made Armstrong realize “that he was capable of pleasing others, white and black, young and old” (p. 56). This event subsequently sowed the seeds “to his revolutionizing jazz, and by extension, American music” (p. 56). Had he been born a decade earlier or later (and had not been exposed to all of the elements of jazz brewing in New Orleans at the time), the entire evolution of jazz may have been different, and we may not have even heard of this remarkable musician.

It would be easy to cite numerous other examples of how chance, such as the luck of being born into a particular family, helps to provide the catalyst for subsequent development. Moreover, it is important to note that Mozart’s unique gifts and exemplary talent as a composer were at least partly influenced by his birth into the cultural milieu of eighteenth-century Europe, at a time when his father could take opportunities to travel and showcase his son’s remarkable achievements. The type of training, experience, and exposure Leopold gave his son would simply not have been possible had Wolfgang been born decades earlier. The same could be said of many other eminent musicians, for as Atkinson (1978) suggests, all human accomplishments can be ascribed to “two crucial rolls of the dice over which no individual exerts any personal control. These are the accidents of birth and background. One roll of the dice determines an individual’s heredity; the other, his formative environment” (p. 221).

Musical talents

Our adaptation of Gagné's (2010) model proposes that there are at least eight distinct types of musical talent: performing, improvising, composing, arranging, analyzing, appraising, conducting, and teaching. All are related to professional occupations and areas of the discipline in which musicians can earn a living. Examples would include professional orchestral musicians, jazz improvisers, composers of original music or arrangers who rework existing pieces for a particular context, professors who teach musical analysis or music critics who write reviews of performances for newspapers, conductors of ensembles, and music teachers.

Part of the reason we define eight distinct talents is our belief that many programs that cater for musically talented children place too much emphasis on performance. A young violinist who can perform a violin concerto is obviously talented, and we must recognize and nurture this type of ability. But there are many other forms of talent that go largely unrecognized, such as the child who can sit at the piano and play "by ear" a variety of popular melodies in any key, or the teenager who can compose a catchy song directly onto a music sequencer without the need to write out the melody using traditional notation. It is here that we are reminded that "the technical skills of Bob Dylan or John Lennon were rudimentary by classical standards, yet few would deny that these two musicians produced work which has had a profound impact on a whole generation, and whose influence is still being felt" (Hargreaves, 1994, p. 358). The point we wish to stress is that all too often children's ability to perform pieces from notation is taken as the defining skill, while the range of abilities needed to develop musically in a broader sense are often neglected (McPherson, 2005).

To add to this, it could be mentioned that while performance skills often develop early, talents in other areas—particularly composition—are rarely seen before late childhood (Winner & Martino, 1993). Simonton (1988, 1991, 2014) shows that the average famous composer begins composing during the late teens and produces unqualified masterpieces before age 30, although Mozart is an obvious exception.

Identifying giftedness and talent

The identification of musical giftedness is essentially a task of trying to predict a child's potential to succeed musically, prior to any formal musical training. However, trying to assess potential prior to formal musical training is no easy matter. Indeed, there are at least three major methodological obstacles that must be overcome in doing so.

First, the measurement of mental and physical gifts is an issue of tremendous debate in and of itself. There are any number of psychometric tests, qualitative methodologies, and experimental procedures that purport to offer insight into these core features of psychological functioning; however, none is completely free of criticism concerning its basic reliability and validity or the operational definitions on which it is based (e.g. see Sternberg & Lubart, 1999 for a critique of psychometric testing in relation to creativity).

Second, beyond perhaps the most obvious examples described here, it is difficult to predict which gifts (or combinations thereof) will lead to which talents. For instance, exactly how creative must one be to excel in composition? To what extent does that level of creativity depend on or interact with other intellectual, social, perceptual, or physical aptitudes? How might an abundance of one gift compensate for a slight deficiency of another? Of course, research has begun to explore the relationships between aptitudes of various types (most notably between creativity and intelligence; see Sternberg & O'Hara, 1999, for a review), but much further grassroots research is

needed to determine precisely how these interrelate before one can then move on to studying how their subsequent interactions predict specific musical talents.

Third, it is typically the case that, by the time an individual is seen to be talented in a given area, the pervasive influences of the developmental process, intrapersonal and environmental catalysts and chance (as detailed earlier), may already have begun to mask initial, subtle differences in natural abilities. No doubt, this may be one explanation for why there has, to date, been little success in matching outstanding musical achievement with a clear-cut set of traits (Simonton, 1999, 2001, 2014; Winner, 1996a). From this viewpoint, it is not surprising that much research on expert performance (with its focus on the skills of acknowledged experts, who are usually adults) has offered so little support for the widely held belief that talent has a biological basis. An intriguing paradox here is that, *if* there is a strong genetic component to musical giftedness, then those who achieve the highest of standards will be those with the most suitable genetic make-up; therefore, for those most talented at the top of the profession, the variance in genetic material will be substantially decreased such that the remaining individual differences in heredity would be no longer easy to observe (Gagné, 2003).

These three obstacles are not necessarily insurmountable, and we believe that progress in this area is inevitable, but most likely through programs of longitudinal research that employ a range of quantitative and qualitative methods and that concurrently examine giftedness in children *and* expert performance.

As explained earlier, some researchers have argued for a general trait of musical giftedness involving sensitivity to the structural and expressive dimensions of sound, rather than the physical parameters of sound as suggested by the music psychologists Carl Seashore, Arnold Bentley, and Edwin Gordon (see further, Hallam, Chapter 4; McPherson & Hallam, *in press*). Research reviewed by Boyle (1992), however, shows that nonmusical factors such as academic achievement, academic intelligence, and socio-economic background will increase the accuracy of prediction (see also Hedden, 1982; Rainbow, 1965). Based on Gagné's model, high aptitudes in music, though observable in older children and adults, are more easily and directly observable in young children, as environmental influences and systematic learning have exerted their moderating influence only to a limited extent. Nevertheless, a salient and robust battery of tests as such has thus far eluded researchers.

There are probably a multitude of indicators, given the nature and scope of the aptitude domains described here, in addition to the fact that some students (including those from minority or disadvantaged groups) often display their potential in ways that are unique or individual (Richardson, 1990) and that success in music may not be totally dependent on only those aptitudes identified by Gordon (1987). Moreover, Gordon (1987) himself states that "[t]here is no one infallible score on any music aptitude test which indicates superior potential for learning music" (p. 56) because it is up to the teacher to make a subjective evaluation of the results from each of the components of the measure. This is yet another reason why "giftedness" should be viewed more broadly in terms of a profile of aptitudes which, as a result of intrapersonal and environmental catalysts in addition to learning and training, may lead to the development of specific fields of talent.

Prevalence, identification, and labeling

Many authorities in the gifted and talented education literature suggest, for school system classifications purposes, that children in the top 10 to 15% of a given population can be labeled as "gifted." Gross (2000), for example, advocates a system whereby the top 15% of any population would fit this category, while Gagné (2010) takes a more conservative view by defining the top 10%. In Gagné's conception children can be described as mildly (1:10), moderately (1:100),

highly (1:1,000), exceptionally (1:10,000), or extremely (1:100,000) gifted. As mentioned earlier, measures of musical aptitude focus exclusively on perceptual (aural) discrimination, with the result that other natural abilities required for understanding the full range of musical potential included in our figure are not measured or defined in many conceptions of musical giftedness. This is one of the reasons why no measure of musical aptitude currently exists that can demonstrate the reliability and validity of assessment seen in IQ measures of general cognitive functioning (McPherson & Hallam, in press).

In contrast to difficulties in assessing giftedness, talent measurement is relatively straightforward (Gagné, 2003) because soon after beginning music a child can be compared with peers of similar age and approximate training who are engaged in the same activity (Gagné, 1993; Sisk, 1990). Normative assessment in the form of teacher ratings, achievement tests, competitions, and scholarships (though occasionally criticized as subjective) is one way in which talented young musicians have traditionally been identified. According to Gagné (2003), however, the use of the term *talented* should be reserved for the top 10% of children, with the emerging talent being the major criterion for further selection into advanced programs.

Perhaps more so than any other area of human pursuit, the label *prodigy* is used repeatedly in music to describe the most extreme cases of exceptionally talented childhood musicians. Definitions of prodigies stipulate that they must have developed their skills to an extraordinary high level before the onset of puberty, which normally occurs around 10–11 for girls and 11–12 for boys (McPherson & Lehmann, 2012; Morelock & Feldman, 2000; but see further Gagné & McPherson, in press). Without any doubt the most famous musical prodigy is Wolfgang Amadeus Mozart, who performed at a very young age throughout Europe and went on to compose some of the greatest music ever written. In current times, any Internet search for the “next Mozart” and “musical prodigy” will return thousands of hits, some of the videos of which have received over a million views (de Mink & McPherson, in press). The vast majority of these children are not true prodigies according to research definitions, and as has often been the case throughout history, acquiring skills and expertise in any area of music does not always equate to commercial success or acclaim in later adult life. Most important for our discussion here, however, is that exceptional talent in particular fields, such as performing or creating music, emerge when a child’s natural abilities are mediated, not only through the support of intrapersonal and environmental catalysts, but also through systematic learning and extensive practice (Gagné, 1993, 2010). Taking into account Gagné’s classification, however, examples such as Mozart and many other recognized child prodigies would occur on the extreme far end of the classification scale, which reinforces the importance of acknowledging and celebrating less distinct and remarkable forms of giftedness that are much more common within any given age group.

Conclusions

In this chapter, we have distinguished between *gifts* and *talents*. Giftedness corresponds to potential that is distinctly above average in at least one aptitude domain, while talent refers to superior performance in a specific field of human activity (Gagné, 2010, 2013).

In conclusion, we believe the most productive means for understanding how naturally occurring human *gifts* blossom into at least eight forms of musical *talent* is by understanding the complex series of interactions through which natural abilities interact with intrapersonal and environmental catalysts, developmental processes, and chance events to produce certain types of musical talent. The most distinctive aspect of this choreography of interactions is that it is unique for each child. For this reason we should therefore celebrate the unique musical profile of each and every child.

Reflective questions

- 1 Reflect on your own musical development. Using Figure 18.1, how would you explain each aspect of your own musical development?
- 2 What do you believe has had the most impact on your own musical development? Why?
- 3 If you were to provide a percentage (e.g., 60–40, 50–50) to explain the impact of nature versus other factors in your own development, what would it be? Is this an appropriate way of thinking about these influences?
- 4 Have you observed any examples of children who display natural abilities of the type shown in Figure 18.1? If so, how would you describe them? How can you be certain they are natural abilities rather than acquired abilities that result from some sort of environmental exposure?
- 5 How has the content of this chapter shaped your thinking on musical development?
- 6 As a result of reading this chapter, what will you do in the future to more adequately cater for the gifted and talented children with whom you come into contact?

Key source

Gagné, F., & McPherson, G. E. (in press). Musical prodigiousness: Analysing its complex origins from a CMTD perspective. In G. E. McPherson (Ed.), *Musical prodigies: Interpretations from psychology, education, musicology and ethnomusicology*. Oxford: Oxford University Press.

Reference list

- Anderson, E. (1985). *The letters of Mozart and his family*. New York: Macmillan.
- Atkinson, J. W. (1978). Motivational determinants of intellectual performance and cumulative achievement. In J. W. Atkinson & J. O. Raynor (Eds.), *Personality, motivation, and achievement* (pp. 221–42). New York: John Wiley.
- Bamberger, J. (in press). Growing-up prodigies: The midlife crisis. In G. E. McPherson (Ed.), *Musical prodigies: Interpretations from psychology, education, musicology and ethnomusicology*. Oxford: Oxford University Press.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.
- Bergreen, L. (1997). *Louis Armstrong: An extravagant life*. New York: Broadway Books.
- Boyle, J. D. (1992). Evaluation of musical ability. In R. Colwell (Ed.), *Handbook of research on music teaching and learning* (pp. 247–65). New York: Schirmer.
- Brodsky, W. (2004). Developing the Keele Assessment of Auditory Style (KAAS): A factor-analytic study of cognitive trait predisposition for audition. *Musicae Scientiae*, **VIII**(1), 83–108.
- Chaffin, R., & Lemieux, A. (2004). General perspectives on achieving musical excellence. In A. Williamon (Ed.), *Musical excellence: Strategies and techniques to enhance performance* (pp. 19–39). Oxford: Oxford University Press.
- Clarke, E. (2002). Understanding the psychology of performance. In J. Rink (Ed.), *Musical performance: A guide to understanding* (pp. 59–72). Cambridge: Cambridge University Press.
- Coleman, L. J., & Cross, R. L. (2000). Social-emotional development and the personal experience of giftedness. In K. A. Heller, F. J. Mönks, R. J. Sternberg, & R. F. Subotnik (Eds.), *International handbook of giftedness and talent* (2nd ed., pp. 203–12). New York: Elsevier.
- Csikszentmihalyi, M. (1998). Fruitless polarities. *Behavioral and Brain Sciences*, **21**(3), 411.
- Davidson, J. W., & King, E. C. (2004). Strategies for ensemble practice. In A. Williamon (Ed.), *Musical excellence: Strategies and techniques to enhance performance* (pp. 105–22). Oxford: Oxford University Press.
- Davies, J. (1978). *The psychology of music*. London: Hutchinson.
- de Mink, F., & McPherson, G. E. (in press). Musical prodigies within the virtual world of YouTube. In G. E. McPherson (Ed.), *Musical prodigies: Interpretations from psychology, education, musicology and ethnomusicology*. Oxford: Oxford University Press.

- Deutsch, O. E. (1966). *Mozart: A documentary biography*. London: Adam & Charles Black.
- Elmer, S., Sollberger, S., Meyer, M., & Jäncke, L. (2013). An empirical reevaluation of absolute pitch: Behavioral and electrophysiological measurements. *Journal of Cognitive Neuroscience*, *25*(10), 1736–53.
- Ericsson, K. A. (Ed.) (1996). *The road to excellence: The acquisition of expert performance in the arts and sciences, sports, and games*. Mahwah, NJ: Erlbaum.
- Ericsson, K. A., Krampe, R. T., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review*, *100*(3), 363–406.
- Ericsson, K. A., & Lehmann, A. C. (1996). Expert and exceptional performance: Evidence of maximal adaptation to task constraints. *Annual Review of Psychology*, *47*, 273–305. doi: 10.1146/annurev.psych.47.1.273.
- Freeman, J. (2000). Families: The essential context for gifts and talents. In K. A. Heller, F. J. Mönks, R. J. Sternberg, & R. F. Subotnik (Eds.), *International handbook of giftedness and talent* (2nd ed., pp. 573–85). New York: Elsevier.
- Gagné, F. (1985). Giftedness and talent: Reexamining a reexamination of the definitions. *Gifted Child Quarterly*, *29*(3), 103–12.
- Gagné, F. (1993). Constructs and models pertaining to exceptional human abilities. In K. A. Heller, F. J. Mönks, & A. H. Passow (Eds.), *International handbook of research and development of giftedness and talent* (pp. 69–87). New York: Pergamon.
- Gagné, F. (1999). The multigifts of multitalented individuals. In S. Cline & K. T. Hegeman (Eds.), *Gifted education in the twenty-first century: Issues and concerns* (pp. 17–45). Delray Beach, FL: Winslow Press.
- Gagné, F. (2000). Understanding the complex choreography of talent development through DMGT-based analysis. In K. A. Heller, F. J. Mönks, R. J. Sternberg, & R. F. Subotnik (Eds.), *International handbook of giftedness and talent* (2nd ed., pp. 67–79). New York: Elsevier.
- Gagné, F. (2003). Transforming gifts into talents: The DMGT as a developmental theory. In N. Colangelo & G. A. Davis (Eds.), *Handbook of gifted education* (3rd ed., pp. 60–74). Boston: Allyn and Bacon.
- Gagné, F. (2004a). An imperative, but, alas, improbable consensus! *Roeper Review*, *27*(1), 12–14.
- Gagné, F. (2004b). Transforming gifts into talents: The DMGT as a developmental theory. *High Ability Studies*, *15*(2), 119–41.
- Gagné, F. (2009a). Building gifts into talents: Detailed overview of the DMGT 2.0. In B. MacFarlane & T. Stambaugh (Eds.), *Leading change in gifted education: The festschrift of Dr. Joyce VanTassel-Baska* (pp. 61–80). Waco, TX: Prufrock Press.
- Gagné, F. (2009b). Debating giftedness: Pronat vs. Antinat. In L. V. Shavinina (Ed.), *International handbook of giftedness* (pp. 155–204). New York: Springer.
- Gagné, F. (2010). Motivation within the DMGT 2.0 framework. *High Ability Studies*, *21*(2), 81–99.
- Gagné, F. (2013). The DMGT: Changes within, beneath, and beyond. *Talent Development & Excellence*, *5*(2), 5–19.
- Gagné, F., & McPherson, G. E. (in press). Musical prodigiousness: Analysing its complex origins from a CMTD perspective. In G. E. McPherson (Ed.), *Musical prodigies: Interpretations from psychology, education, musicology and ethnomusicology*. Oxford: Oxford University Press.
- Gagné, F., Neveu, F., Simard, L., & St Père, F. (1996). How a search for multitalented individuals challenged the concept itself. *Gifted and Talented International*, *11*(1), 4–10.
- Gallagher, J. J. (1993). Current status of gifted education in the United States. In K. A. Heller, F. J. Mönks, & A. H. Passow (Eds.), *International handbook of research and development of giftedness and talent* (pp. 755–70). New York: Pergamon.
- Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences*. New York: Basic Books.
- Gordon, E. E. (1987). *The nature, description, measurement and evaluation of music aptitudes*. Chicago: GIA Publications.

- Gordon, E. E. (2007). *Learning sequences in music: A contemporary music learning theory*. Chicago: GIA Publications.
- Gottfried, A. E., Fleming, J. S., & Gottfried, A. W. (1994). Role of parental motivational practices in children's academic intrinsic motivation and achievement. *Journal of Educational Psychology*, **86**(1), 104–13.
- Gross, M. (1994). Radical acceleration. *The Journal of Secondary Gifted Education*, **5**(4), 27–34.
- Gross, M. (2000). Issues in the cognitive development of exceptionally and profoundly gifted individuals. In K. A. Heller, F. J. Mönks, R. J. Sternberg, & R. F. Subotnik (Eds.), *International handbook of giftedness and talent* (2nd ed., pp. 179–92). New York: Elsevier.
- Hambrick, D. Z., Altmann, E. M., Oswald, F. L., Meinz, E. J., & Gobet, F. (2014). Facing facts about deliberate practice. *Frontiers in Psychology*, **5**, 751. doi: 10.3389/fpsyg.2014.00751.
- Hargreaves, D. J. (1994). Musical education for all. Is everyone musical?—Peer commentaries. *The Psychologist*, August, 357–8.
- Harris, J. R. (1998). *The nature assumption: Why children turn out the way they do*. New York: The Free Press.
- Harris, J. R. (2006). *No two alike: Human nature and human individuality*. New York: E. E. Norton.
- Hayes, J. R. (1981). *The complete problem solver*. Philadelphia: Franklin Institute Press.
- Hedden, S. K. (1982). Prediction of music achievement in the elementary school. *Journal of Research in Music Education*, **30**(1), 61–8.
- Howe, M. J. A., Davidson, J. W., & Sloboda, J. A. (1998). Innate talents: Reality or myth? *Behavioral and Brain Sciences*, **21**(3), 399–442.
- Jackson, M. (2009). *Moonwalk*. New York: Harmony Books.
- Jørgensen, H. (2004). Strategies for individual practice. In A. Williamon (Ed.), *Musical excellence: Strategies and techniques to enhance performance* (pp. 85–103). Oxford: Oxford University Press.
- Keefe, S. P. (in press). Mozart the child performer—composer: New musical—biographical perspectives on the early years to 1766. In G. E. McPherson (Ed.), *Musical prodigies: Interpretations from psychology, education, musicology and ethnomusicology*. Oxford: Oxford University Press.
- Kemp, A. E. (1996). *The musical temperament*. Oxford: Oxford University Press.
- Kenneson, C. (1998). *Musical prodigies: Perilous journeys, remarkable lives*. Portland, OR: Amadeus Press.
- Kopiez, R., & Lehman, A. C. (in press). Musicological reports on early 20th century prodigies: The beginnings of an objective assessment. In G. E. McPherson (Ed.), *Musical prodigies: Interpretations from psychology, education, musicology and ethnomusicology*. Oxford: Oxford University Press.
- Krampe, R. T. (1997). Age-related changes in practice activities and their relation to musical performance skills. In H. Jørgensen & A. C. Lehmann (Eds.), *Does practice make perfect? Current theory and research on instrumental music practice* (pp. 165–78). Oslo: Norwegian Academy of Music.
- Krampe, R. T., & Ericsson, K. A. (1996). Maintaining excellence: Deliberate practice and elite performance in young and older pianists. *Journal of Experimental Psychology: General*, **125**(4), 331–59.
- Lehmann, A. C., Ericsson, K. A., & Hetzer, J. (2002). How different was Mozart's music education and training? A historical analysis comparing the music development of Mozart to that of his contemporaries. In C. Stevens, D. Burnham, G. E. McPherson, E. Schubert, & J. Renwick (Eds.), *Proceedings of the seventh international conference on music perception and cognition* (pp. 426–9). Adelaide, Australia: Causal Productions.
- Macnamara, B. N., Hambrick, D. Z., & Oswald, F. L. (2014). Deliberate practice and performance in music, games, sports, education, and professions: A meta-analysis. *Psychological Science*, **25**(8), 1608–18. doi: 10.1177/0956797614535810.
- Mainwaring, J. (1941). The meaning of musicianship: A problem in the teaching of music. *British Journal of Educational Psychology*, **XI**(3), 205–14.
- Mainwaring, J. (1947). The assessment of musical ability. *British Journal of Educational Psychology*, **17**(1), 83–96.

- Mainwaring, J. (1951a). Psychological factors in the teaching of music: Part I: Conceptual musicianship. *British Journal of Educational Psychology*, **21**(2), 105–21.
- Mainwaring, J. (1951b). Psychological factors in the teaching of music: Part II: Applied musicianship. *British Journal of Educational Psychology*, **21**(3), 199–213.
- McCormick, J., & McPherson, G. E. (2003). The role of self-efficacy in a musical performance examination: An exploratory structural equation analysis. *Psychology of Music*, **31**(1), 37–51.
- McPherson, G. E. (2005). From child to musician: Skill development during the beginning stages of learning an instrument. *Psychology of Music*, **33**(1), 5–35.
- McPherson, G. E. (2009). The role of parents in children's musical development. *Psychology of Music*, **37**(1), 91–110.
- McPherson, G. E., Davidson, J. W., & Faulkner, R. (2012). *Music in our lives: Rethinking musical ability, development and identity*. Oxford: Oxford University Press.
- McPherson, G. E., & Hallam, S. (in press). Musical potential. In S. Hallam, I. Cross, & M. Thaut (Eds.), *The Oxford handbook of music psychology*. Oxford: Oxford University Press.
- McPherson, G. E., & Lehmann, A. (2012). Exceptional musical abilities—child prodigies. In G. E. McPherson & G. Welch (Eds.), *Oxford handbook of music education* (pp. 31–50). New York: Oxford University Press.
- McPherson, G. E., & McCormick, J. (2006). Self-efficacy and performing music. *Psychology of Music*, **34**(3), 325–39.
- Morelock, M. J., & Feldman, D. H. (2000). Prodigies, savants and Williams syndrome: Windows into talent and cognition. In K. A. Heller, F. J. Mönks, R. J. Sternberg, & R. F. Subotnik (Eds.), *International handbook of giftedness and talent* (2nd ed., pp. 227–41). Oxford: Elsevier Science Ltd.
- Mossing, M. A., & Ullén, F. (in press). Genetic influences on musical giftedness, talent and practice. In G. E. McPherson (Ed.), *Musical prodigies: Interpretations from psychology, education, musicology and ethnomusicology*. Oxford: Oxford University Press.
- Office of Standards in Education, Children's Services and Skills (Ofsted, 2009). *Gifted and talented pupils in schools*. Manchester: Ofsted (available as download at <<http://www.ofsted.gov.uk>>).
- Papoušek, H. (1996). Musicality in infancy research: Biological and cultural origins of early musicality. In I. Deliège & J. A. Sloboda (Eds.), *Musical beginnings: Origins and development of musical competence* (pp. 37–55). Oxford: Oxford University Press.
- Persson, R. S. (1996). Musical reality: Exploring the subjective world of performers. In R. Monelle & C. T. Gray (Eds.), *Song and signification: Studies in music semiotics* (pp. 58–63). Edinburgh: University of Edinburgh Faculty of Music.
- Persson, R. S., Partt, G., & Robson, C. (1996). Motivational and influential components of musical performance: A qualitative analysis. In A. J. Cropley & D. Dehn (Eds.), *Fostering the growth of high ability: European perspectives* (pp. 287–302). Norwood, NJ: Ablex.
- Platz, F., Kopiez, R., Lehmann, A. C., & Wolf, A. (2014). The influence of deliberate practice on musical achievement: A meta-analysis. *Frontiers in Psychology*, **5**, 746. doi: 10.3389/fpsyg.2014.00646.
- Plomin, R. (1998). Genetic influence and cognitive abilities. *Behavioral and Brain Sciences*, **21**(3), 420–1.
- Polderman, T. J. C., Benyamin, B., de Leeuw, C. A., Sullivan, P. F., van Bochoven, A., Visscher, P. M., & Posthuman, D. (2015). Meta-analysis of the heritability of human traits based on fifty years of twin studies. *Nature Genetics*, **47**(7), 702–709. doi: 10.1038/ng.3285.
- Rainbow, E. L. (1965). A pilot study to investigate the constructs of musical aptitude. *Journal of Research in Music Education*, **13**(1), 3–14.
- Richardson, C. P. (1990). Measuring musical giftedness. *Music Educators Journal*, **76**(7), 40–5.
- Simonton, D. K. (1988). Age and outstanding achievement: What do we know after a century of research? *Psychological Bulletin*, **104**(2), 251–67.

- Simonton, D. K. (1991). Emergence and realization of genius: The lives and works of 120 classical composers. *Journal of Personality and Social Psychology*, **61**(5), 829–40.
- Simonton, D. K. (1999). Talent and its development: An emergenic and epigenetic model. *Psychological Review*, **106**(3), 435–57.
- Simonton, D. K. (2001). Talent development as a multidimensional, multiplicative, and dynamic process. *Current Directions in Psychological Science*, **10**(2), 39–43.
- Simonton, D. K. (2014). *The Wiley handbook of genius*. Malden, MA: John Wiley & Sons.
- Sisk, D. A. (1990). The state of gifted education: Toward a bright future. *Music Educators Journal*, **76**(7), 35–9.
- Sloboda, J. A. (1993). Musical ability. In D. Goldstein & J. J. Godfrey (Eds.), *The origins and development of high ability* (pp. 106–18). Wiley, Chichester: Ciba Foundation Symposium 178.
- Solomon, M. (1995). *Mozart*. London: Hutchinson.
- Solomon, A. (2012). *Far from the tree: Parents, children, and the search for identity*. New York: Scribner.
- Sosniak, L. A. (1985). Learning to be a concert pianist. In B. S. Bloom (Ed.), *Developing talent in young people* (pp. 19–67). New York: Ballantine.
- Sternberg, R. J. (2000). Giftedness as developing expertise. In K. A. Heller, F. J. Mönks, R. J. Sternberg, & R. F. Subotnik (Eds.), *International handbook of giftedness and talent* (2nd ed., pp. 55–66). New York: Elsevier.
- Sternberg, R. J., & Lubart, T. I. (1999). The concept of creativity: Prospects and paradigms. In R. J. Sternberg (Ed.), *Handbook of creativity* (pp. 3–15). Cambridge: Cambridge University Press.
- Sternberg, R. J., & O'Hara, L. A. (1999). Creativity and intelligence. In R. J. Sternberg (Ed.), *Handbook of creativity* (pp. 251–72). Cambridge: Cambridge University Press.
- Stoeger, H. (2009). The history of giftedness research. In L. V. Shavinina (Ed.), *International handbook of giftedness* (pp. 17–38). New York: Springer.
- Suzuki, S. (1983). *Nurtured by love*. New York: Smithtown.
- Tan, Y. T., McPherson, G. E., Peretz, I., Berkovic, S. F., & Wilson, S. J. (2014). The genetic basis of music ability. *Frontiers in Psychology*, **5**, 658.
- Turner, W. J. (1965). *Mozart: The man and his works*. London: Methuen & Co Ltd.
- U.S. Department of Education, Office of Educational Research and Improvement. (1993). *National excellence. A case for developing America's talent*. Washington, DC: U.S. Government Printing Office.
- Williamson, A., Lehmann, A. C., & McClure, K. (2003). Studying practice quantitatively. In R. Kopiez, A. C. Lehmann, I. Wolther, & C. Wolf (Eds.), *Proceedings of the fifth triennial ESCOM conference* (pp. 182–5). Hanover, Germany: Hanover University of Music and Drama.
- Williamson, A., & Valentine, E. (2000). Quantity and quality of musical practice as predictors of performance quality. *British Journal of Psychology*, **91**(3), 353–76.
- Williamson, A., & Valentine, E. (2002). The role of retrieval structures in memorizing music. *Cognitive Psychology*, **44**(1), 1–32.
- Wilson, E. (1998). *Jacqueline du Pré*. London: Weidenfeld & Nicolson.
- Wilson, S. J., Lusher, D., Martin, C. L., Rayner, G., & McLachlan, N. (2012). Intersecting factors lead to absolute pitch acquisition that is maintained in a “fixed-do” environment. *Music Perception*, **29**(3), 285–96.
- Winn, M. (1979). The pleasures and perils of being a child prodigy. *New York Times Magazine*, 12–19 (December 23), 38–45.
- Winner, E. (1996a). *Gifted children: Myths and realities*. New York: Basic Books.
- Winner, E. (1996b). The rage to master: The decisive role of talent in the visual arts. In K. A. Ericsson (Ed.), *The road to excellence: The acquisition of expert performance in the arts and sciences, sports, and games* (pp. 271–301). Mahwah, NJ: Erlbaum.

- Winner, E., & Martino, G.** (1993). Giftedness in the visual arts and music. In K. A. Heller, F. J. Monks, & A. H. Passow (Eds.), *International handbook of research and development of giftedness and talent* (pp. 253–81). New York: Pergamon.
- Winner, E., & Martino, G.** (2000). Giftedness in non-academic domains: The case of the visual arts and music. In K. A. Heller, F. J. Monks, R. J. Sternberg, & R. F. Subotnik (Eds.), *International handbook of giftedness and talent* (2nd ed., pp. 95–110). New York: Elsevier.
- Yun Dai, D., & Schader, R.** (2001). Parent's reasons and motivations for supporting their child's music training. *Roeper Review*, 24(1), 23–6.

Minerva Access is the Institutional Repository of The University of Melbourne

Author/s:

MCPHERSON, G;Williamon, A

Title:

Building gifts into musical talents

Date:

2016

Citation:

MCPHERSON, G. & Williamon, A. (2016). Building gifts into musical talents. McPherson, GE (Ed.). The child as musician: A handbook of musical development, The child as musician: A handbook of musical development, (2), pp.340-360. Oxford University Press.

Persistent Link:

<http://hdl.handle.net/11343/56540>