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Chapter 2

General perspectives on achieving musical excellence

Roger Chaffin and Anthony F. Lemieux

Are exceptional musicians born or made? The everyday explanation for outstanding accomplishment—whether it be a virtuoso performance by a concert soloist, the triple axel jump of an ice skater, or a kayaker shooting a class six rapid—is to attribute it to an innate gift or talent. The idea of "talent" reflects the feeling of awe that such displays of virtuosity induce in us: the sense that these abilities lie outside the range of normal mortals. It has been one of the goals of psychology, since its earliest days, to understand the nature of outstanding talent. Galton framed the issues in his book *Hereditary Genius* (1869/1979), in which he attributed outstanding achievement to natural, inherited gifts, combined with a capacity for hard work and the ability to focus one's skills on a particular goal. In support of this analysis, he offered the genealogies of eminent men to show that eminence runs in families.

While there are clear limitations in his evidence—which overlooks the roles of inherited wealth, social position, and gender—Galton's views are still widely espoused today (Ericsson & Charness, 1994). Talent is regularly invoked whenever outstanding achievement needs to be explained, and often seems to be the only plausible explanation for the dramatic differences commonly observed in the musical accomplishment. The idea that extraordinary abilities are an inborn gift of nature flatters the talented, while relieving the rest of us of the expectation that our own efforts should be measured on the same scale. A great deal of scientific effort has been directed at pinning down the genetically based traits and abilities of which talent is composed. Many likely candidates have been identified (see Coon & Carey, 1989). Success in predicting outstanding achievement from such components has, however,

been relatively meager (Simonton, 1999, 2001; Winner, 1996a). Good evidence of a genetic basis for intellectual ability is still lacking. This may be the result of overly simplistic assumptions about how traits combine to produce extraordinary talent (Simonton, 1999), and more sophisticated approaches may eventually succeed in demonstrating the biological basis for talent so widely taken for granted. Meanwhile, the jury is still out.

More progress has been made in understanding the other two components of Galton's analysis: a capacity for hard work and the ability to concentrate on a particular goal. These provide the main focus of the discussion here. In every field that has been examined, those who attain eminence do so only after prolonged hard work over a period of years. This is as true of music as of any other field and suggests that, whatever the role of heredity, the aspiring performer must be willing to work for success. This chapter, therefore, begins by examining the amount of work involved in achieving musical excellence. As in the joke about the visitor to New York who asked, "How do I get to Carnegie Hall?", the answer is "Practice, practice, practice."

Accumulating hours of practice, however, is not enough. High levels of accomplishment also require that practice time be well spent. Given the vast amounts of practice required to reach the highest levels in any field, even small improvements in effectiveness may yield very large differences in achievement. The second section of this chapter describes the evidence for this claim, setting the stage for the more specific, practical suggestions about how to achieve specific musical goals that are described in Chapters 5-8 of this book. The third section of the chapter identifies five general characteristics of effective practice—concentration, goal setting, self-evaluation, strategy selection, and "the big picture"—that constitute, in Galton's terms, the ability to focus and hone one's skills. These are the characteristics that allow the kinds of strategies described in Chapters 5-8 to be implemented effectively.

But where does the drive to excel come from? Is the temperament needed to devote oneself intensively to music born or made? The evidence for genetically based traits of temperament is stronger than for talent, but as with talent, there is clear evidence that environment also plays an important role. This chapter concludes, therefore, by considering the social psychological antecedents of the motive to succeed. It is intended that, by laying out the general precursors to musical excellence, performers and teachers will be better able to recognize and assess their own skills (as well as those of their students and colleagues) and make the most effective use of strategies for enhancing performance.

2.1 Quantity of practice: The ten-year rule

There is now a compelling body of evidence for the "ten-year rule": a minimum of ten years of dedicated work and practice are required to become an expert in any field. The ten-year minimum has been documented in every field of human endeavor that has been examined—from those that are largely physical in nature (like running), to those that are predominantly mental (like chess), to those requiring a combination of both (like musical performance). Indeed, this rule holds for musicians, novelists, poets, mathematicians, chess players, tennis players, swimmers, long distance runners, livestock judges, radiologists, and doctors, with the only possible exceptions being in the visual arts (Ericsson *et al.*, 1993; Winner, 1996b). And ten years is a minimum, not the norm; for most, the path to eminence is much longer. And this is just the beginning. At least in music, the skills acquired during the long years of training must be continuously maintained and developed through practice (Krampe & Ericsson, 1996; Krampe, 1997).

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 (Ericsson *et al.*, 1993).

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. Such prolonged training has profound effects on physical and mental characteristics of the sort that have been generally thought of as determined by heredity, such as the proportion of fast and slow twitch muscle fibers and the area of cortex devoted to particular motor and sensory functions (Altenmüller & Gruhn, 2002; Ericsson *et al.*, 1993; Chapter 3 of this volume reviews the effects of prolonged training on health and offers suggestions for how they may be managed over the course of one's career).

To those familiar with the field of music, apparent counterexamples to the ten-year rule spring readily to mind. Music has provided its share of the geniuses and prodigies whose histories appear to make the case for inborn talent. Closer examination, however, suggests that these cases support rather than demolish the ten-year rule. Even with the best of intentions, early achievements tend to be exaggerated, and given the market value of child prodigies, deliberate misrepresentation is not uncommon. For these reasons, the early achievements of prodigies tend to be obscured by myth and distortion (Ericsson & Charness, 1994; Hayes, 1981; Howe, 1990, 1996; Howe *et al.*, 1998; Sloboda, 1996). Among composers, the most striking cases of early achievement (e.g. Alban Berg, Liszt, Mozart, and Shostakovich) all turn out to have put in the requisite ten years before producing their first masterwork, shaving off just a year in the case of Berg and Shostakovich. These extraordinary cases "prove" the ten-year rule by demonstrating how well it marks the outer limit for even the most extreme examples of early accomplishment. In this company, the paragon of childhood genius, Mozart,

was a late developer, not producing his first masterwork until he had been composing for 13 years, at the tender age of 17 (Schonberg, 1970, cited in Hayes, 1981, p. 211).

Close examination of that other class of apparent exceptions to the ten-year rule, musical savants, points to the same conclusion. Savants are people with a special ability that contrasts with their generally low level of functioning in other areas. Often their abilities appear to emerge very suddenly and without the opportunity for practice. The cases that have been studied, however, suggest that savants learn their skills in the same way as other people and that it is the recognition of their skills that occurs suddenly (Ericsson & Faivre, 1988; Howe, 1996; Sloboda *et al.*, 1985). Studies of musical savants and geniuses, thus, both point to the same conclusion: there are no clear exceptions to the ten-year rule in the field of music. Even the most exceptional talents put in nine or ten years of prolonged, dedicated work to develop the skills that allowed them to make their mark. For most people, a great deal more time and work is needed.

In summary, the development and maintenance of musical skills require a tremendous amount of practice. To reach the finals of international piano competitions, for instance, young pianists must practice regularly from childhood, increasingly dedicating their lives to music. Estimates of the amount of practice required for high achievement are remarkably uniform: about 2,500 hours by age 13, 6,500 by age 17, and approaching 10,000 by age 21 (Ericsson *et al.*, 1993; Sloboda *et al.*, 1996). Those who practice less generally achieve less. This is true for students, and it is true for professionals, even after a lifetime of performing. Once a person has put in the 10,000 or more hours of practice needed to acquire the skills of a concert soloist, additional practice is needed to maintain those skills. The relationship between amount of practice and level of skill continues to hold, even among professional pianists (Krampe & Ericsson, 1996; Krampe, 1997).

This is not to say that achievement is solely determined by the amount of practice. It is almost certainly not the case that anyone who puts in the required number of hours would achieve the same high level of skill. More accomplished musicians may simply be more motivated to engage in musical activities and, as a result, practice more; in turn, their abilities may make practice itself more rewarding. Regardless, the relationship between practice and achievement suggests that practice is an important, indeed essential, part of the road to high achievement.

2.2 Quality of practice

Simply putting in hours of practice, however, is not enough. Practice time must be managed effectively. The same amount of practice can produce very different levels of achievement in different people. In a study by Sloboda *et al.* (1996), there were considerable differences in the amount of reported practice *within* each of four groups of music students, with the groups representing different levels of musical achievement. Among the "elite" group (i.e. students enrolled in a selective, specialist high school for music), there was "a small handful of outliers who [did] vastly greater amounts of practice than anyone else" (p. 301), and there was a handful students in all groups who managed on very little practice, less than 20% of the group average. In preparing for Associated Board examinations (a system of standardized music exams), there were students in each group who passed with one fifth as much practice as the other students, and there were others who did four times more practice. Similarly, there were large differences in the amount of practice reported by the pianists in Sosniak's (1985) study. In their early years, some spent "every free minute" at the piano, while others practiced as little as possible—although with practice enforced by parents, this was still a substantial amount (p. 34). These differences narrowed as the pianists became more serious about their practice in their middle years, but still ranged from two to four hours per day.

Williamon and Valentine (2000, 2002) also found a wide range in the amount of practice student pianists required to learn a new piece, with some students taking two or three times as much time as others. Moreover, these differences in quantity of practice were not related to the quality of the final performance; rather, quality of performance was predicted by how practice was organized. As learning progressed, practice was increasingly organized in terms of the structure of the music (as identified by each pianist), and those who started doing this earlier gave the best performances at the end of the learning process. Musical achievement in this case was predicted by the ability to discern the musical shape of the piece and thus to form an "artistic image" of how it should be performed (Neuhaus, 1973), rather than by the amount of practice.

Similar differences in the effectiveness of practice also occur in beginning students. O'Neill (1997) found that, during their first year of music lessons, children who exhibited a "helpless" orientation to practice put in twice as much time to reach the same level of achievement as those exhibiting a "mastery" orientation. McPherson and Zimmerman (2002) found that achievement during the first nine months of music lessons was determined less by the amount of practice than by commitment to the instrument. Regardless of how much practice they did, students who felt they would be playing their instrument throughout their schooling made more progress than those who felt they would play for only a few years.

What is the source of these enormous differences in the amount of time needed to reach similar levels of accomplishment? One possibility is that the differences are due to raw, native talent. It may be that those who practice less are simply more talented and need to put in less work to achieve the same end. As noted above, however, psychologists have so far been unsuccessful in providing the evidence needed to substantiate this explanation. The contribution to achievement made by native talent has yet to be determined. Native talent is, in any case, not something that anyone can do anything about. Meanwhile, it is clear that

enormous amounts of practice are needed, even for the most talented, and it seems very likely that at least some of the large differences in musical achievement that can be observed at every level of training are due to differences in how effectively practice time is spent.

Preparing a musical performance is a complex task and the necessary skills develop over many years. Musicians learn to practice more effectively as their skills develop. The pianist Misha Dichter noted, "I hate to think of the time I wasted as a student. Now it's just so easy to see certain shortcuts that would have saved thousands of hours" (Noyle, 1987, p. 57). Psychological studies of practice in fields other than music indicate that Dichter was probably right. Effective practice depends on finding strategies that work (Chase & Ericsson, 1982; Ericsson & Faivre, 1988; Seashore, 1939; Ericsson *et al.*, 1993). Without an effective strategy, practice does not lead to improvement (Chase & Ericsson, 1981). Within the field of music, there is ample evidence that use of more effective practice strategies results in faster and better learning. Details of this evidence with regard to individual and ensemble practice and in terms of achieving specific musical goals—such as memorizing, sight-reading, and improvising—are provided in Chapters 5-8 of this volume.

The characteristics of effective practice have been the subject of investigation in variety of domains for over a century (e.g. Bryan & Harter, 1899; see reviews by Ericsson, 1996, 1997; Ericsson *et al.*, 1993; Ericsson & Lehmann, 1996). Effective practice is not simply a matter of going through the motions. The repeated exercise of a skill, even for professional purposes, does not necessarily lead to improvement. In most fields, skill development stops at a stable plateau when performance reaches the level required to get the job done, and further improvement only occurs when there is some new incentive, like a pay raise or opportunity for promotion, to motivate the hard work required (Bryan & Harter, 1899). Ericsson and colleagues have characterized the work needed to produce improvement as "deliberate" practice. Whether the skill involved is cognitive (like solving algebra problems), physical (like

typing), or perceptual (like wine-tasting), improvement requires setting goals that are attainable from the current skill level and which lead to the development of effective strategies (Chase & Ericsson, 1981). Progress must be constantly monitored and new routes to improvement continually explored. For those with the necessary skills, self-evaluation and self-directed exploration may be sufficient, but for students and for the less skilled, the help of a teacher or coach is essential to provide the necessary feedback and to suggest productive strategies for overcoming problems. Although it is the everyday grind of practice that often seems most salient, effective practice is anything but routine. Rather, it is a matter of continuous, creative problem solving, self-evaluation, and striving.

2.3 Fundamental characteristics of musical excellence

In this section, five fundamental characteristics of effective practice are outlined. They are based on the literature on expertise and skill learning reviewed in the previous section and are general characteristics of effective practice, not limited to music. Evidence that these characteristics of effective practice also apply to the field of music can be found in the writings of noted piano pedagogues (e.g. Gieseking & Leimer, 1932/1972; Neuhaus, 1973; Sandor, 1981), in published interviews with eminent pianists (see Chaffin *et al.*, 2002, for a summary), and in interview studies that have investigated how accomplished musicians practice and perform (Aiello, 2001; Hallam, 1995a, 1995b, 1997a, 1997b; Wicinski, 1950, cited in Miklaszewski, 1989). In order to provide performers and teachers with useful examples, the discussion here has been restricted to characteristics that can be illustrated from the limited number of empirical studies of the practice of expert musicians.

2.3.1 Concentration

The ability to concentrate fully on the task at hand is probably the most important characteristic of effective practice for musicians (Auer, 1921; Hallam, 1998). Heinrich Neuhaus, the eminent Russian pianist and teacher notes "The greater the...concentration, the better the result" (1973, p. 4). The eminent pianists whose comments about practice were collected by Chaffin *et al.* (2002) appear to agree. Misha Dichter warns,

> In practicing, never daydream. Never use the piano as a vehicle for simply moving the fingers and passing time. If you have only one moment when you're not aware of what you're doing musically or technically (and usually both), you're wasting your time… (Noyle, 1987, p. 59).

Once a piece is learned, it is easy to fall into mindless practice because the piece can be played automatically, without attention. As David Bar-Illan notes, "One can all too easily play music without actually listening to it" (Dubal, 1997, pp. 40-41). Playing without full attention is dangerous, Leon Fleischer warns, because "under the stress of public performance, [motor memory is] the first thing that goes, if you are nervous" (Noyle, 1987, p. 95). Emile Sauer sums up the situation as follows:

> One hour of concentrated practice with the mind fresh and the body rested is better than four hours of dissipated practice with the mind stale and the body tired. With a fatigued intellect the fingers simply dawdle over the keys and nothing is accomplished (Cooke, 1913/1999, p. 238).

What does this kind of concentration look like? To answer this question, Chaffin *et al.* (2002) observed the practice of a concert pianist as she learned the "Presto" of J.S. Bach's *Italian Concerto*. The practice sessions, which were videotaped, give a predominant impression of continuous, urgent activity as the pianist played without pause, stopping and starting continuously at top speed. When asked about the frantic pace of her work the pianist reported,

"When I start on a new piece, I have such an appetite to take hold of it and make it mine" (p. 255).

In an attempt to quantify this "appetite to take hold", Chaffin *et al.* compared the *practice rate* (the number of beats actually played per minute) with the *mean target tempo* (number of beats per minute dictated by the tempo at which the pianist was trying to play). The expectation was that the two values would be nearly identical, showing that the pianist played almost continuously throughout each practice session. The reality proved very different, and much more interesting. The practice rate was less than a fourth of the target tempo; the pianist played only a quarter the number of notes expected, based on the tempo at which she was nominally playing. This might suggest that the pianist had spent three-quarters of her practice time daydreaming, except that the videotapes showed otherwise. Rather, the discrepancy between the two measures reflected time spent in micro-pauses and momentary decreases in tempo, each no more than a few seconds, which occurred continually throughout every practice session. During these pauses and hesitations the pianist was thinking: evaluating what she had just done, planning what to do next, mentally previewing the upcoming passage, allowing time for what Matthay (1926, p. 5) calls "pre-listening."

The pianist was indeed engaged in non-stop practice; the impression from the videotape of continuous, unrelenting effort was not mistaken. But non-stop practice does not mean non-stop playing. Effective practice must be guided by thought; and thinking takes time. The measurements showed that only a quarter of the time was spent actually playing (moving the fingers over the keys) and that the remaining three-quarters of the time was spent in thinking. These measurements suggest that a central characteristic of effective practice is the mental effort and concentration that is involved and that, at least for accomplished musicians, the level of effort may be reflected in the ratio of rate of practice to target tempo (pp. 130-135).

The need to maintain full attention is the reason that practice is most effective if done in short sessions of an hour or less, separated by breaks for recuperation (Auer, 1921; Seashore, 1938/1967; Rubin-Rabson, 1940a). As the pianist Rudolf Firkusny noted, "Concentration is very tiring.... Sometimes one or two hours of concentrated practicing is much more tiring than playing seven or eight hours" (Noyle, 1987, p. 81). Bella Davidovich reports,

> I find that a one-hour period is where I achieve the utmost in terms of concentration. I work very intensively for one hour and then take a ten, fifteen, or twenty minute break during which I will occupy myself with something completely different, whether it's to eat or something else. This method works out well so that I can continue for eight hours, in one-hour periods (Noyle, 1987, p. 43).

The same is true for the practice of all kinds of skills, not just music (see Ericsson *et al.*, 1993, for a review) and the ability to practice effectively for even this much time develops only with experience and training (Sosniak, 1985). For maximum effectiveness, the length of practice sessions must be tailored both to the task at hand and to the energy required. In Chaffin *et al.*'s (2002) account of a concert pianist learning the "Presto" of the *Italian Concerto*, the length of practice sessions decreased steadily from one hour at the beginning to half an hour towards the end of the learning process nearly a year later. Throughout, the pianist monitored her energy level, making comments like, "I definitely feel like I am running out of steam" (p. 163) and stopped when she became too tired, even when this conflicted with her goals for the practice session (e.g. "I'll stop now and take a break and come back to it later," p. 163). Ericsson *et al.* (1993) noted that, in a study of student violinists, the most accomplished student performers took more naps than less accomplished performers and students preparing for careers as music teachers. The implication is that musicians should take more care to be well rested when they practice in order to practice effectively.

The need to practice attentively is also responsible for the common preference among experienced musicians to practice in the morning and to use the morning hours for their most demanding tasks. For many people, mental capacities are at their peak during the morning (May *et al.*, 1993; Hasher *et al.*, 2002; Yoon *et al.*, 2000) and this appears to be the case for many of the pianists surveyed by Chaffin *et al.* (2002). Bella Davidovich reports that, "The best hours for practice are in the morning when a person's mind is fresh and the ears are fresh" (Noyle, 1987, p. 43). Emil Sauer said, "I find in my own daily practice that it is best for me to practice two hours in the morning and then two hours later in the day" (Cooke, 1913/1999, p. 238). Janina Fialkowska confirms May *et al.*'s (1993) finding that morning practice becomes more important later in life:

> For me, the best time to learn something new is in the morning. I, absolutely, at my advanced age cannot learn a new piece, I cannot memorize, in the afternoon after lunch. I don't know why, I cannot… (Noyle, 1987, pp. 67-68).

More systematic evidence comes from Sloboda *et al.*'s (1996) study of student musicians, in which the most accomplished students reported doing a higher proportion of their scales in the morning while less accomplished students practiced scales more in the evening. The more accomplished students were apparently devoting their most effective practice time to the type of practice that, for most people, is least rewarding and therefore harder to concentrate on (see Chapters 11 and 12 of this volume for suggestions of specific techniques for enhancing concentration).

2.3.2 Goal setting

A second general characteristic of effective practice is that it involves setting and meeting specific goals. Neuhaus (1973) describes an incident in which Sviatislav Richter

reported that he had repeated one difficult passage of ten bars over a hundred times and recommends,

> You have to put the kettle on the stove and not take it off until it boils…. Mastering the art of working, of learning compositions is characterized by an unwavering determination and an ability not to waste time. The greater the part...played by willpower (going straight for the goal)...the better the result… (p. 3-4).

This is why students are generally urged to work on a piece initially in small segments (Barry & Hallam, 2002). Limiting the number of problems to be dealt with makes it possible to focus attention on a small number of problems and solve them, mastering the passage at once instead of returning to it time and time again. By not playing through passages before they have been mastered, the musician also avoids developing bad motor habits that will later have to be laboriously unlearned.

Expert musicians appear to follow Neuhaus's advice, organizing practice into periods of *work* in which one passage of a few bars is repeated many times, separated by *runs* in which progress is evaluated and new problems are identified for work (Chaffin *et al.*, 2002; Gruson, 1988; Miklaszewski, 1989; Williamon *et al.*, 2002). Chaffin *et al.* (2002) describe an example of the effectiveness of the strategy in which the pianist they were studying worked through one eight-bar section for the first time, repeating different short segments for a total of more than 150 repetitions. In a second practice session, the same passage received another 50 repetitions and, from then on, needed no further work; it had been mastered in two focused encounters. This pattern of work interspersed by runs continued throughout the 10 months of preparation. Even when the pianist was able to perform fluently and was polishing the piece for performance, intensive work on short passages continued to account for about 5% of the music played in each session. As playing became more fluent, runs increased in length, but work did

not. Instead, work segments became slightly shorter as the pianist was able to focus more narrowly on individual problems. This pattern of activity is indicative of practice that is goal-directed with problems being identified and eliminated in every session, as Neuhaus recommends (strategies for setting goals and action planning are discussed in Chapters 5 and 12 of this volume).

2.3.3 Self-evaluation

To know when a goal has been accomplished the performer needs feedback about success and failure. Ultimately, this must come from within. While teachers play an essential role in setting standards and developing discrimination in their pupils, they cannot be present during every practice session and cannot provide the continuous, moment-to-moment feedback that determines the microstructure of practice with its constant starts, stops, and repetitions. It has already been noted that the opportunity for feedback is a necessary condition for the improvement of any kind of skill (Ericsson *et al.*, 1993). Here, the suggestion is more specific—that effective practice in the field of music requires the feedback provided by self-evaluation and that without it, progress is slower. For example, McPherson and McCormick (1999) found that students who practiced more also made more evaluative judgments about the success and failure of their efforts. Similarly, the majority of the comments made by the pianist observed by Chaffin *et al.* (2002) during practice were evaluative in nature. General evaluative remarks were the most frequent topic, accounting for nearly 40% of all remarks, and most of the comments classified under other headings also contained an evaluative component, suggesting that self-evaluation was part of every decision and action. It may also be important that most of these evaluative remarks, whether positive or negative, were delivered with an air of dispassionate detachment—for example, “That needs work too. It’s coming along” (p. 159).

Chapter 4 of this volume offers specific suggestions for how self-evaluation can be used to enhance performance.

2.3.4 Strategies

The ability to meet goals depends on being able to come up with an effective practice strategy to meet the needs of the moment. Effective practice depends on a wide range of strategies that can be flexibly deployed. Hallam (1995a, 1995b) interviewed 22 professional musicians selected for their reputation for technical and musical excellence, asking about their practice habits and how they would go about learning a new piece. The musicians reported a wide range of strategies that they used flexibly to address every aspect of their task: learning new repertoire, maintaining skills, preparing for performance, and managing the physical and emotional demands of their challenging careers. Direct observations of the practice of experienced musicians confirms these reports. Chaffin *et al.* (2002) describe strategies dealing with everything from choice of fingering, what bars to use as starting places, and the spacing of practice sessions, to the management of frustration, memorization techniques, and deployment of attention during performance (see also Chaffin & Imreh, 1997, 2001, 2002; Ginsborg, 2001; Hallam, 1994; Lehmann & Ericsson, 1998; Miklaszewski, 1989, 1995; Nielsen, 1999, 2001; and Chapters 5-8 of this book for recommended strategies for individual and ensemble rehearsal).

2.3.5 The big picture

A fifth characteristic of effective practice is the ability to keep in mind the larger musical picture, the "artistic image" of a piece (Neuhaus, 1973), at the same time as attending to details of technique and interpretation. The performer needs to have an idea of the overall expressive shape of the piece while making initial decisions about technique. If these decisions

are made without the big picture in mind, many of them may have to be changed later, which greatly increases the learning time. The ability to switch attention from detail to big picture and back increases with experience (Chaffin *et al.*, 2002, p. 90; Williamon *et al.*, 2002). Most of the experienced performers interviewed by Hallam (1995a, 1995b) and the eminent Russian pianists interviewed by Wicinski (1950, cited in Miklaszewski, 1989) reported beginning work on a new piece by first looking at the big picture and thinking about how it should be performed. Similarly, the pianist studied by Chaffin *et al.* (2002) began by identifying the overall shape of a new piece and locating the main difficulties for performance, anticipating from the outset decisions that would not be made until later in the learning process (see Chaffin *et al.*, 2003, for details). The ability to anticipate in this way is characteristic of expert problem solving in many fields. For example, chess experts are able to play "lightning chess," intuitively making snap decisions that anticipate later developments in the game (Chase, 1983; Glaser & Chi, 1988; Gobet & Simon, 1996). Similarly, when accomplished performers acquaint themselves with a new work there is an "instantaneous and subconscious process of "work at the artistic image" (Neuhaus, 1973, p. 17).

One effect of paying attention to the larger musical picture is the use of the formal structure of a piece to organize practice, something recommended by many pedagogues (e.g. Matthay, 1926; Sandor, 1981; Shockley, 1986). Experienced musicians spontaneously do this from the outset, starting practice segments at the beginnings of sections when first learning a new piece (Chaffin & Imreh, 2002; Chaffin *et al.*, 2002; Miklaszewski, 1989, 1995; Nielsen, 1999, 2001). Later in the learning process, the use of section boundaries as starting places is abandoned, at least for a time, in order to ensure fluent transitions between sections (see Chaffin *et al.*, 2002). For less experienced musicians, in contrast, use of the structure to organize practice begins later in the learning process and increases across sessions. In Williamon and Valentine's (2002) study, the students did not initially have a good grasp of the

structure and only began using it to organize practice later in the learning process as they began to appreciate its musical significance. Earlier use of the structure was associated with more musical final performance. Students who were quicker to grasp the musical shape of the piece gave better performances.

2.3.6 Caveat

The five characteristics identified above have been noted as important by distinguished teachers, reported of their own practice by eminent musicians, and identified in empirical observations of the practice of expert or experienced musicians. The list is necessarily tentative since it remains to be shown, for any of these characteristics, that they are more common among professionals than among students. For this, further studies comparing the practice of musicians at different levels of training are needed. Eventually, experimental studies will be needed to determine which characteristics can be usefully induced in student practice by instruction (Hallam, 1997a, 1997b), and for this, the pioneering studies of Rubin-Rabson (1937, 1939, 1940a, 1940b, 1941a, 1941b, 1941c) still provide the model.

2.4 The social psychological antecedents of musical excellence

Concentration, setting clear goals, evaluating progress, using strategies flexibly, and looking for the big picture are complex skills. Developing them requires unusual motivation. Where does that motivation come from? It is likely that motivation is one of several necessary components of musical talent, and it seems to be the one most strongly constrained by biology (Ericsson *et al.*, 1993). Heredity plays a large role in determining other aspects of temperament (Kagan *et al.*, 1992; Kagan *et al.*, 1994), and it may be that the same is true of the motivation to master musical skills. As with the case for abilities, it is still uncertain as to the extent to which genetics contribute to the motivation to play music. Meanwhile, there is ample evidence of the

powerful contribution of the social environment to both the motivation to succeed and the development of musical excellence.

Social factors involved in the development of musical excellence are summarized in Figure 2.1, which provides a conceptual model integrating the motivational and social cognitive principles discussed in the remainder of the chapter. Those who develop the deep commitment needed to master a musical instrument (1) play for their own satisfaction, rather than to please someone else or for other external reasons, (2) attribute their achievements (and failures) to their own efforts, and (3) feel that they have the capacity to improve.

Insert Figure 2.1 about here

2.4.1 Sources of motivation

Motivation determines what people like and what they do. Motivation to engage in an activity such as instrumental practice can come either from inside a person (intrinsic, e.g. am I doing this because I want to?) or from someone or something else (extrinsic, e.g. am I doing this because someone else—parents, teachers, or peers—wants me to?), or some combination of the two (Deci & Ryan, 1985; Ryan & Deci, 2000; see also Hallam, 1997a). Intrinsic motivation appears to be essential for the development of effective practice strategies (see Maehr *et al.*, 2002, and O'Neill & McPherson, 2002, for reviews). Studies of parental involvement in the practice of young instrumental students show that children's initial motivation to practice comes largely from their parents (Pitts *et al.*, 2000a, 2000b; McPherson & Zimmerman, 2002). Internalization of the motivation to practice represents the development of intrinsic motivation as students begin to undertake practice of their own volition. As intrinsic motivation develops, students need fewer parental reminders and are more likely to engage in goal-directed and self-regulated practice. Parents who continue to supervise or

compel practice can ultimately hinder the development of the sustainable, intrinsic motivation that is essential if students are to engage in the kinds of effective practice described in the previous section (O'Neill, 1997; Pitts *et al.*, 2000a, 2000b; McPherson & Zimmerman, 2002; McPherson & Renwick, 2001).

The motivation to undertake the intense effort required to practice effectively has been identified in gifted children as the "rage to master." Winner (1996a, 1996b) describes it as a powerful motive to excel in a given behavioral or intellectual arena that emerges when children work on appropriately challenging, self-assigned tasks that they are highly motivated to accomplish. The rage to master is an unusually intense form of intrinsic motivation, and Winner's descriptions of its development provide good examples of the transition from external to internal motivation. Children need to have at least some modicum of success at a task before they develop their own internal motivation to perform it. Some initial positive experience is needed for the child to decide that he or she is "good" at a task. Children come to recognize their own talents, as well as their likes and dislikes, from observation of their own successes and failures (e.g. Bem, 1972).

Although Winner introduced the construct of rage to master to describe the motivation of gifted children, it can be usefully extended to adults. In fact, the term provides an excellent description of the kind of concentrated, goal-oriented absorption identified in the previous section as a hallmark of effective practice (Chaffin *et al.*, 2002). In adults, this state of intense creative engagement with a task has been characterized as "flow" (Csikszentmihalyi & Csikszentmihalyi, 1988; Csikszentmihalyi, 1990; Csikszentmihalyi *et al.*, 1993; O'Neill & McPherson, 2002). The trance-like state often described by musicians as occurring during their best performances is another manifestation of flow. The groundwork for these transcendent experiences during performance is laid during practice when many hours must be spent in a similar state of absorption in the task of mastering the music. When the same intense, focused

attention is finally transferred from the details of practice to the expressive effects of a fluent performance, the result is the very special, transcendent experience so often reported by performers (Chaffin & Imreh, 2002).

2.4.2 Attribution

People constantly try to understand themselves and other people by identifying the causes of their behavior, a process that social psychologists refer to as "attribution" (Heider, 1958; Jones & Davis, 1965; Kelley, 1971; Dweck & Goetz, 1978). The attributions people make in explaining their own achievements have important effects on their subsequent motivation (Weiner, 1974, 1985, 1986; Weiner *et al.*, 1972, 1976).

Weiner *et al.* (1972) identified three elements in the attribution process that affect expectations for future performance and, thus, motivation. The first element is whether the causal factor has an internal or external locus (e.g. is my success due to my own efforts or abilities?). The second element is intentionality (e.g. did I try?). The third element is whether the causal factor is stable or unstable over time and across situations (e.g. can I expect to succeed again next time?). To the extent that a student feels herself to be in control of her successes or failures, engages intentionally in practice activities, and perceives the causal factors associated with her successes and failures as having stability across time and situation, she assumes a greater level of responsibility for her performance. She also assumes responsibility for her own improvement and for problem solving. On the other hand, if a student feels that her success or failure is due to someone or something else (external attributions), feels that her efforts were not important to the overall outcome (lack of intentionality), and that the results could just as well be otherwise next time (lack of stability over time or situation), she is unlikely to assume personal responsibility for addressing and remedying problems with her practice and their effects on her performances.

2.4.3 Self-efficacy

Thus far, the importance of motivation and the role of attribution have been addressed. However, a person's intense desire to excel and sense of personal responsibility must also be accompanied by feelings of competence, capability, and personal agency (e.g. Bandura, 1977, 1982, 1986, 1997). Studies by McPherson and McCormick (1999) and Pitts *et al.* (2000a) provide evidence of the importance of feelings of self-efficacy in music students. So, while students must have both the motivation to engage in effective practice and a sense of personal agency, these factors alone may not be sufficient to sustain effective practice. It is also necessary that students feel that they either have or are capable of developing the requisite skills.

As the student makes more internal attributions for his successes and failures, self-efficacy becomes increasingly important. For example, if a student makes internal attributions and feels a sense of personal responsibility for his achievement (or lack thereof), but does not have a sense of self-efficacy, he could become discouraged and ultimately stop practicing. However, if internal attributions for successes and failures are accompanied by a sense of self-efficacy, the student not only feels personally responsible for his progress, but also feels confident that he will indeed have the skills and ability necessary for further improvement.

2.5 Conclusions

Some of the variability in musical achievement can be attributed to the amount of time spent in practice. Tens of thousands of hours of practice are needed to reach and sustain a professional level of playing in the Western classical music tradition. The idea that very gifted individuals can achieve the highest levels of accomplishment in this field with minimal effort is a myth. In music, as in most fields of human endeavor, even the most exceptional prodigies

and savants put in at least ten years of dedicated effort and practice in order to develop their skills to the point that they are capable of attaining eminence.

Another important factor determining the level of musical accomplishment is the effectiveness of those thousands of hours of practice time. Because preparation time is so long, and because so many hours must be spent in practice, even small differences in efficiency may accumulate over years, resulting in very large differences in accomplishment. To be effective, practice must be guided by efficient strategies and continuous monitoring of their effectiveness. It seems indisputable that some of the differences between individuals in musical accomplishment are due to the effectiveness of their practice. Five characteristics of effective practice are:

- Concentration
- Setting and meeting specific goals
- Constant self-evaluation
- Flexible use of strategies
- Seeing the big picture

This list of characteristics is offered in the hope that it will stimulate research on the characteristics of effective music practice. In addition, identifying the characteristics of effective practice is worthwhile because it can help to understand the basic psychological processes involved in skill acquisition and because of its pedagogical value. Knowing that practicing in a particular way systematically produces better results should be helpful to both students and teachers in their efforts toward excellence. Concentration, goal setting, self-evaluation, use of strategies, and attention to the big picture can all be seen as manifestations of an intense desire to produce music, of the “rage to master.” Such motivation must be nurtured; it cannot be produced strictly by instruction. There are, however, important situational and

social factors involved in the development of the motivation toward mastery, and some of the most important have been enumerated here. There is still much to learn about the long and complex process of developing musical skill. The process is, however, well worth understanding, since it is both a universal of human culture and a microcosm of cognitive development.

Suggestions for further information and reading

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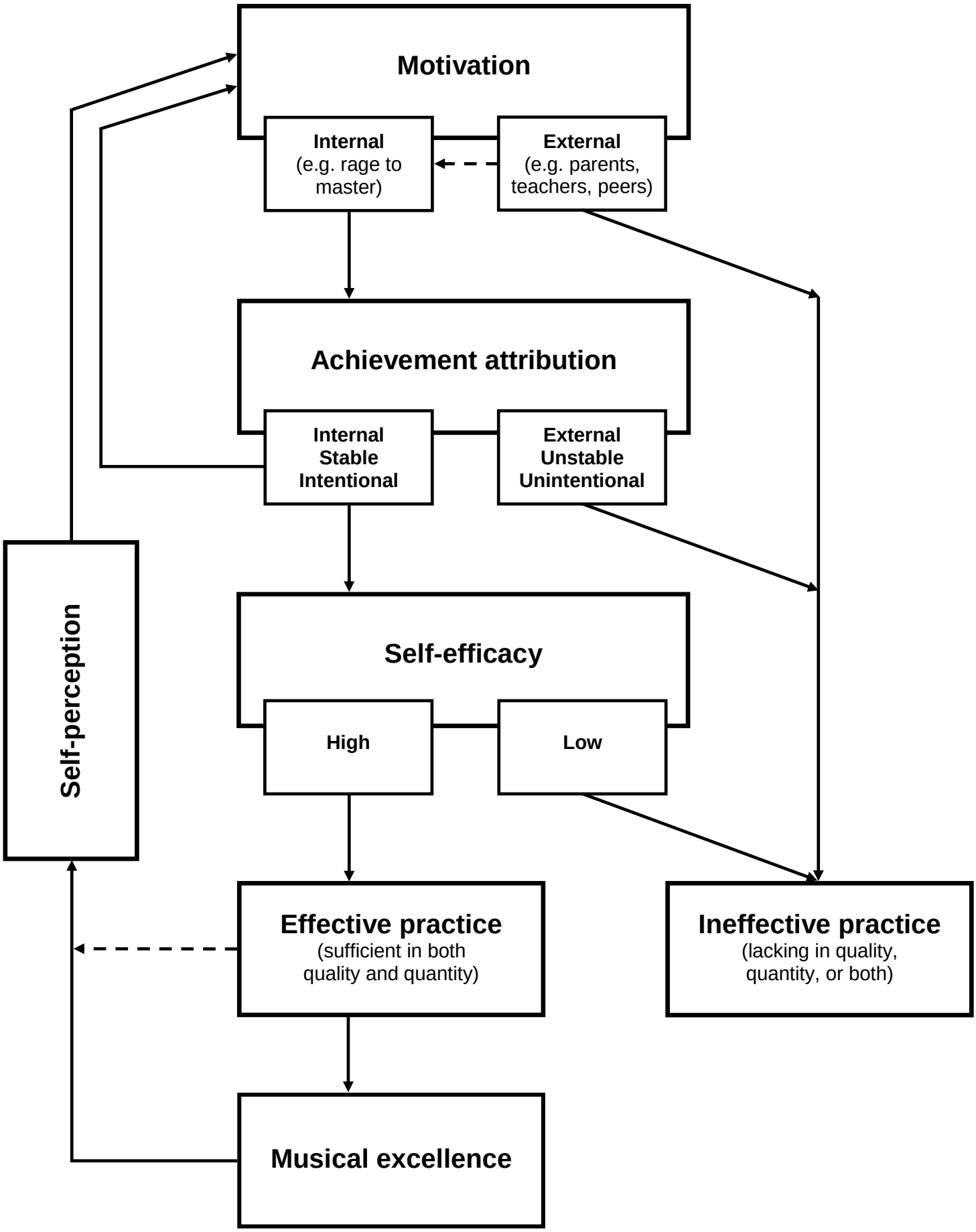
Figure captions

Figure 2.1

A conceptual model of the social antecedents of musical excellence.

Figure 2.1


Motivation
Internal
(e.g. rage to master)
External
(e.g. parents, teachers, peers)
Achievement attribution
Internal
Stable
Intentional
External
Unstable
Unintentional
Self-perception
Self-efficacy
High
Low
Effective practice
(sufficient in both quality and quantity)
Ineffective practice
(lacking in quality, quantity, or both)
Musical excellence