CHAPTER 26

MUSIC TRAINING AND NONMUSICAL ABILITIES

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Introduction

The present chapter summarizes what is known about associations between music training and nonmusical abilities. (Reviews of music *listening* and cognitive abilities are provided by Schellenberg, 2012, and Schellenberg and Weiss, 2013.) Because the available literature has grown exponentially in recent years, the focus is limited to behavioral studies published since 2000 that examined music lessons taken outside of school, with a particular focus on studies published since 2005. The central issues are: (1) whether musically trained individuals differ from their untrained counterparts in areas other than those that involve musical skills, and (2) whether such associations are the consequence of taking music lessons. One interpretive problem with quasi-experimental and correlational (hereafter correlational) studies is that pre-existing individual differences could influence whether someone takes music lessons *and* how well they perform on measures of nonmusical abilities. Such differences include music aptitude, cognitive abilities, personality, and demographic variables such as family income and other markers of socio-economic status (SES).

The first part of the review discusses associations between music and cognitive abilities in specific domains, including speech perception, other language abilities, spatial abilities, and mathematical abilities. The second part focuses on associations between music training and domain-general abilities, including IQ, academic abilities, memory, and executive functions. The final section asks whether music training is associated with social/emotional abilities and personality.

Music Training and Specific Cognitive Abilities

Speech Perception

Musically trained individuals tend to perform better than their untrained counterparts on many tasks that examine listeners' perception of speech (for reviews, see Strait and Kraus 2011, 2014). For example, professional musicians are better than individuals without formal music training at identifying syllables presented with degraded spectral information (Elmer, Meyer and Jäncke, 2012). Similarly, musicians are better than musically untrained adults at determining whether two sentences uttered in a foreign tone language are the same or different (Marie, Delogu, Lampis, Belardinelli and Besson, 2011). Such advantages extend to tasks with greater ecological validity, such as perceiving speech in noise (Parbery-Clark, Skoe, Lam and Kraus, 2009; Parbery-Clark, Strait, Anderson, Hittner and Kraus, 2011). Even 9-year-olds with only 4 years of music lessons are faster and more accurate than children without lessons at discriminating syllables that vary in fundamental frequency or duration (Chobert, Marie, François, Schön and Besson, 2011). When 5-year-olds take weekly music lessons for 16 weeks, improvements in *phonological awareness* are greater than they are for same-age children in control groups who take swimming lesson or no lessons (Rauscher and Hinton, 2011). Phonological awareness is the ability to perceive and segment the sounds of speech (i.e., phonemes).

What role does music aptitude play in associations between music training and speech perception? Tests of aptitude measure the degree to which a listener can naturally perceive and remember sequences of tones that vary in pitch or duration (e.g., Wallentin, Nielsen, Friis-Olivarius, Vuust and Vuust, 2010), and recent evidence confirms that music aptitude has a substantial genetic component (Oikkonen and Järvelä, 2014). Aptitude tests are designed to determine who would benefit most from music lessons, assuming that children with high aptitude would benefit more than those with low aptitude. If one also assumes that children with high levels of music aptitude would be more likely than other children to take music lessons, the situation is complicated by the fact that aptitude also predicts performance on tests of speech perception (Milovanov and Tervaniemi, 2011). For example, music aptitude is associated positively with phonological awareness among pre-schoolers and kindergarteners (Anvari, Trainor, Woodside and Levy, 2002; Peynircioğlu, Durgunoğlu and Öney-Küsefoğlu, 2002). In adulthood (Slevc and Miyake, 2006) and childhood (Milovanov, Huotilainen, Välimäki, Esquef and Tervaniemi, 2008), aptitude is correlated positively with the ability to perceive and/or produce sounds from a non-native language. When adults' music aptitude is measured with a test designed to identify particularly poor abilities (Drayna, Manichaikul, de Lange, Snieder and Spector, 2001), performance is associated positively with scores on several different measures of speech perception (Jones, Lucker, Zalewski, Brewer and Drayna, 2009).

Evidence that music training *causes* enhancements in speech perception comes from one study that pseudo-randomly assigned 8-year-olds to music or painting lessons for a period of 2 years (François, Chobert, Besson and Schön, 2013). The "pseudo" part ensured that the music and painting groups were matched initially in terms of cognitive abilities, sex, age,

grade at school, and SES. The task required children to identify whether three-syllable nonsense words were presented previously in a 5-minute string of syllables. The music and painting groups performed equivalently before the study began, but the music group outperformed the painting group after 1 year of training, with an even larger difference between groups after two years. The task likely favored the trained children, however, because the syllables at exposure were sung. In another study, kindergarteners who were assigned randomly to intensive training in music (10 minutes per day, 5 days per week, 20 weeks) showed improvements in phonological awareness that were identical to those of other kindergarteners who received lessons in perceiving and segmenting the sounds of speech (Degé and Schwarzer, 2011). A third group of kindergarteners, who received training in sports, did not show similar improvement, which ruled out the possibility that maturity accounted for pre- to post-test improvements in the other two groups. Experimental designs allowed François et al. (2013) and Degé and Schwarzer (2011) to infer that music training caused improvements in performance on their particular outcome measure, but it is unknown whether the results would generalize to other tests of speech perception.

In sum, although it is reasonable to speculate that music lessons improve listening abilities in general and speech-perception abilities in particular, there is little direct evidence in this regard. In correlational studies, moreover, music aptitude would almost certainly play a role. One possibility is that music lessons *exaggerate* pre-existing differences, representing a gene–environment interaction that is emblematic of development and learning across domains (Berk, 2012). Ideally, future research would document the relative contributions of nature (music aptitude) and nurture (music training) in their influence on speech perception, and how these factors interact. Although researchers have suggested that positive associations between *duration* of training and speech perception provide evidence that music lessons are causing such associations (e.g., Strait and Kraus, 2011), individuals with high levels of music aptitude would be more likely than other individuals to take music lessons for many years on end *and* to perform well on tests of speech perception.

Other Language Abilities

Musically trained individuals also perform better than untrained individuals on measures of language abilities other than speech perception. For example, among adults, music training is associated positively with remembering lists of words that are read (Brandler and Rammsayer, 2003) or heard (e.g., Jakobson, Lewycky, Kilgour and Stoesz, 2008). Musically trained adults also exhibit advantages at making grammaticality judgments (Patston and Tippett, 2011), pronouncing irregularly spelled words (e.g., *bouquet, subtle*; Jakobson et al., 2008; Stoesz, Jakobson, Kilgour and Lewycky, 2007), and remembering lyrics (Kilgour, Jakobson and Cuddy, 2000) or short excerpts of speech (Cohen, Evans, Horowitz and Wolfe, 2011). In one instance, music training in childhood predicted a larger vocabulary (Forgeard, Winner, Norton and Schlaug, 2008). In another instance, musically trained adults showed enhanced comprehension of complicated passages of text (Thompson, Schellenberg and Letnic, 2012), a finding consistent with an earlier meta-analysis, which concluded that music training in high school is associated positively with reading ability (Butzlaff, 2000).

One might be tempted to attribute all of these observed associations to general cognitive abilities. In other words, is music training simply a marker of intelligence? This point

is particularly pertinent because music aptitude is also associated with general intelligence (for review, see Schellenberg and Weiss, 2013). Nevertheless, even when IQ is held constant, musically trained children exhibit enhanced performance on tests of reading comprehension (Corrigall and Trainor, 2011) or spelling (Hille, Gust, Bitz and Kammer, 2011). Although these results confirm that such associations are not simply a byproduct of high IQs, they do not inform the issue of causation.

Recent experimental studies suggest, however, that music training may actually cause improvements in language abilities, including those that are necessary for reading. In a study of 8-year-olds who were assigned pseudo-randomly to 6 months of music or painting lessons, children in the music group showed larger pre- to post-test improvement in reading irregularly spelled words (Moreno et al., 2009). In a follow-up study with pseudo-random assignment of 4- to 6-year-olds to 4 weeks of daily, computer-controlled lessons in music listening or visual arts, children in the music group had larger pre- to post-test increases in vocabulary (Moreno et al., 2011a). The music group also had larger improvements on a task that required them to match arbitrary symbols with words (Moreno, Friesen and Bialystok, 2011b), a skill that is a prerequisite for learning to read.

Thus, there are many associations between music training and language abilities, although many of these could be due to individual differences in music aptitude or general cognitive ability. There is also some evidence that music training causes improvements in vocabulary and in the skills required for reading. Because the interventions have been intensive (daily) and designed specifically for the study (Moreno et al., 2011a, 2011b), or the outcome measure has been very specific (Moreno et al., 2009), it is unclear whether the findings would generalize to typical weekly vocal or instrumental lessons, or to other measures of language ability.

Spatial Abilities

Spatial (or visuospatial) abilities represent other relatively specific abilities that have been examined in relation to music training. Rauscher (2008; Rauscher and Hinton, 2011) proposed that *spatial-temporal* abilities—those that require mentally manipulating a visual image in the absence of a physical model—are distinct from spatial abilities in general. This notion ignores the many factor-analytic studies of the intellect that have been conducted in the context of basic research (Carroll, 1993) or IQ testing (e.g., Wechsler, 2008). Spatial abilities are correlated across the various types of tests used to measure them. The correlations are never perfect due to test-specific variance, but there is no evidence that spatial-temporal tests are more highly correlated with each other than with other tests of spatial abilities.

In fact, musically trained individuals have better spatial abilities than untrained individuals whether or not the test meets Rauscher's definition of spatial-temporal. For example, advantages for adult musicians are evident on tests of mental rotation (Sluming, Brooks, Howard, Downes and Roberts, 2007), visual search (Patston and Tippett, 2011; Rodrigues, Loureirof and Caramelli, 2013; Stoesz et al., 2007), selective and divided visual attention (Rodrigues et al., 2013), judgments of line orientation (Patston, Hogg and Tippett, 2007), memory for line drawings (Jakobson et al., 2008), and the ability to arrange a set of colored blocks to match a visual image (Stoesz et al., 2007). Even in kindergarten and elementary school, music training is associated with performance on tests of spatial abilities (Rauscher and Hinton, 2011).

Evidence for causation comes from an Israeli study, in which a 2-year music-training intervention (2–3 hours/week) was introduced in some after-school centers for at-risk children (Portowitz, Lichtenstein, Egorova and Brand, 2009). Compared to control children at similar centers with no intervention, the musically trained children showed larger improvements in remembering and reproducing a complex line drawing. An earlier meta-analysis also found evidence that music training causes enhancements in spatial skills (Hetland, 2000). To summarize, music training is associated positively with spatial abilities, and there is some evidence that music training causes enhanced levels of performance. Such evidence does not rule out the possibility that children with good spatial abilities are also more likely than other children to take music lessons.

Mathematical Abilities

The question of associations between music training and mathematical abilities is particularly interesting because several properties of music are based on mathematical relations (i.e., tone durations, frequency ratios, etc.), which raises the possibility that learning music could be accompanied by improvements in mathematical abilities. Several books on "music and mathematics" have appeared in recent years (e.g., Loy, 2006, 2007), but none discusses the possibility of associations between music training and mathematics, or overlap between the skills that are necessary for mathematics and playing music. A detailed search for research published since 2000 revealed only one empirical study in a peer-reviewed journal. Haimson, Swain and Winner (2011) asked whether mathematicians have particularly good musical skills. They required large samples of university professors in mathematics or languages to complete an online survey about their music background. The two groups did not differ on measures of music perception, music memory, music performance, or music creation. In other words, individuals who are experts in mathematics are no more musical than similarly qualified scholars in the humanities. Vaughn's (2000) meta-analysis from several years ago found a small association between music training and mathematical abilities but no evidence for causation.

Rauscher and Hinton (2011) summarized the results from several unpublished studies, some of which assigned preschoolers from low-SES families randomly to 2 years of music lessons and compared them to control groups of same-age children assigned to computer lessons or no lessons. Each child was administered a set of 26 tests at the beginning and end of the intervention. Although the groups were equivalent on all tests at time 1, the music group had higher scores on tests of arithmetic and spatial abilities at time 2. Several aspects of these results make them less than compelling. First of all, individual differences in scores at time 1 were not held constant when analyzing scores at time 2, and there was no evidence of significantly larger group differences on some tests compared to others (i.e., no interaction). Secondly, there was no attempt to correct for multiple tests and the actual number of tests that showed group differences was not specified. More crucially, the original research never underwent the peer-review process. Thus, when considered in the context of the literature as a whole, the anomalous findings (i.e., a direct causal influence of music training on mathematical abilities) call for skepticism.

In sum, evidence of associations between music training and mathematical abilities is inconsistent, with no convincing reports of a causal association. When such associations are

evident in correlational research, they could be due to the fact that high-functioning individuals are likely to take music lessons and to perform well on mathematics tests. There is also no obvious reason why associations with mathematical abilities tend to be weaker than those that are evident with language or spatial abilities.

Music Training and General Cognitive Abilities

I now examine the possibility that general abilities could be the source of many observed associations between music training and more specific cognitive abilities.

IQ and Academic Achievement

In general, children who take music lessons have higher IQs than their counterparts without lessons (Gibson, Folley and Park, 2009; Hille et al., 2011; Schellenberg, 2011a; Schellenberg and Mankarious, 2012). There is also a dose–response association: as *duration* of training increases, so do IQ scores (Degé, Kubicek and Schwarzer, 2011a; Degé, Wehrum, Stark and Schwarzer, 2015; Corrigall and Schellenberg, 2015; Corrigall, Schellenberg and Misura, 2013; Schellenberg, 2006). These associations remain evident when confounding variables such as SES (e.g., family income, parents' education) and/or involvement in nonmusical out-of-school activities are held constant (Corrigall et al., 2013; Degé et al., 2011a; Schellenberg, 2006, 2011a, 2011b; Schellenberg and Mankarious, 2012). Even among undergraduates who are no longer taking lessons, IQs are higher among those who took music lessons in the past (Schellenberg, 2006, 2011b).

Associations between music training and general ability extend beyond one-on-one IQ testing to performance in school, with a similar dose–response association and similar partial associations (i.e., with SES held constant; Corrigall et al., 2013; Degé et al., 2014; Schellenberg, 2006). Advantages for children with music training extend across the various subjects taught in school except for sports (Wetter, Koerner and Schwaninger, 2009). In fact, musically trained children get better grades in school than one would expect based on their IQs (Corrigall et al., 2013; Schellenberg, 2006), which implicates the involvement of other individual-difference variables, such as personality, which might help to explain why musically trained children are particularly good students.

When sample sizes are small, associations between music training and IQ often fail to reach statistical significance (Corrigall and Trainor, 2011; Parbery-Clark et al., 2011; Strait, Parbery-Clark, Hittner and Kraus, 2012). In other instances, particularly when children with a minimum amount of training (e.g., at least 3 years) are compared to children with no lessons, effect sizes are too large to be attributable to any environmental factor (Gibson et al., 2009; Hille et al., 2011; Schellenberg, 2011a; Schellenberg and Mankarious, 2012), implicating pre-existing cognitive differences. Nevertheless, associations with IQ often disappear when professional musicians are compared to control groups of professionals with no music training (for a review, see Schellenberg, 2015). In other words, children who take music lessons

tend to have above average cognitive abilities, but professional musicians are not systematically more intelligent than musically untrained adults.

Is there any evidence that music lessons cause increases in general cognitive abilities? In one study, Iranian kindergarteners were assigned randomly to 12 75-minute music lessons taught weekly and compared to same-age children matched in gender and SES who took no lessons (Kaviani, Mirbaha, Pournaseh and Sagan, 2014). The music group had larger increases in IQ over the 12-week period. Although we can infer that music training caused the observed differences between groups, it is impossible to determine whether "music" played a central role. Any additional, structured activity with an adult instructor may have had a similar effect. Similar evidence for a causal effect of music training on intelligence—with similar interpretive problems—was evident in a study of Israeli 6- to 12-year-old children (Portowitz et al., 2009). Children who were assigned to a 2-year music-training program had larger increases in general intelligence compared to a control group with no intervention.

One study with clearer results assigned 6-year-old Canadian children randomly to a year of keyboard lessons, voice (Kodály) lessons, drama lessons, or no lessons (Schellenberg, 2004). Increases in IQ over the year did not differ for the two music or for the two control groups, but they were larger for the combined music groups compared to the combined control groups. Notably, the music groups had larger increases on the four indexes that measure more specific abilities (verbal ability, spatial ability, processing speed, and attention), and there was no hint of larger differences between the music and control groups in some domains than in others (i.e., no interaction).

When samples are small, however, causal effects of music training on general intelligence are unlikely to be evident (e.g., François et al., 2013; Moreno et al., 2009). In one study of 4-year-olds in the US, null findings may have stemmed from the young age of the children, the short duration of the music intervention (6 weeks, 4.5 hours in total), the free-form pedagogy, or because pre-existing individual differences in general abilities were not held constant (Mehr, Schachner, Katz and Spelke, 2013). In general, though, the available evidence indicates that high-functioning individuals are likely to take music lessons, and that music lessons may exaggerate slightly their pre-existing advantages.

Memory and Executive Functioning

Associations between music training and general cognitive abilities may be a consequence of better memory or superior executive functioning, which, in turn, lead to better performance on a wide variety of tests (including those that measure IQ) and better grades in school. In line with this view, there is much evidence that the enhanced listening skills of musically trained individuals extend to tests that involve memory for non-linguistic auditory stimuli. For example, adult musicians' superior memory for music and speech extends to environmental sounds, but not to pictures of objects or to abstract works of art (Cohen et al., 2011). Music training in adulthood and childhood is also associated positively with memory for strings of digits or lists of words (or non-words), but not with memory for spatial locations (Hansen, Wallentin and Vuust, 2013; Roden, Grube, Bongard and Kreutz, 2014a). When tasks measure working memory by requiring participants to recall items in an order different from that in which they were presented (e.g., backward), advantages for adult musicians are evident with oral presentation of words or numbers, but not with visual presentation of

colors (Parbery-Clark et al., 2011; Strait et al., 2012). In one test of older adults, a history of music training was predictive of enhanced auditory working memory but there was no association with visual memory (Hanna-Pladdy and Gajewski, 2012).

Although these findings are consistent with the idea that musically trained individuals are particularly good listeners, there are many contradictory findings showing that musicians demonstrate enhanced visual short-term (Bidelman, Hutka and Moreno, 2013) and working (Oechslin, Van De Ville, Laseyras, Hauert and James, 2013) memory, enhanced short- and long-term memory for geometric shapes as well as for words (Jakobson et al., 2008), and enhanced auditory *and* visual working memory (George and Coch, 2011; Lee, Lu and Ko, 2007). In one study of older adults, a history of music training was predictive of performance on a test of visual memory but *not* on a test of auditory memory (Hanna-Pladdy and MacKay, 2011).

Even children who have taken music lessons for only 18 months show better visual working memory at the end of the intervention compared to control children who receive additional training in the natural sciences (Roden et al., 2014a). When a 2-year "extended" music program is offered in schools, 10-year-olds who register in the program have larger improvements in visual and auditory memory over the course of the program compared to other children (Degé, Wehrum, Stark and Schwarzer, 2011b). In short, music training is often accompanied by memory advantages for auditory *and* visual stimuli. Although longitudinal studies without random assignment provide evidence that is consistent with a causal interpretation (Roden et al., 2014a; Degé et al., 2011b), it is also possible that pre-existing differences determine (1) improvements in memory later in development, and (2) who takes music lessons.

Executive functions are related to working memory but broader because they involve "conscious control of thought, emotion, and action" (Zelazo, 2004, p. 12). They also represent domain-general abilities, such as cognitive flexibility, planning, and the ability to ignore irrelevant information or to inhibit automatic but incorrect responses. Adult musicians are better than musically untrained individuals at identifying (1) the pitch of a tone presented with conflicting but irrelevant verbal information (e.g., *low* sung at a high pitch), and (2) the direction of an arrow presented with conflicting but irrelevant spatial information (e.g., an arrow pointing right but presented on the left side of a display; Bialystok and DePape, 2009). When 4- to 6-year-olds are assigned to 4 weeks of intensive training in music listening or visual arts, children in the music group have larger improvements in the ability to identify geometric figures on the basis of color while ignoring irrelevant variation in shape (Moreno et al., 2011a). In one investigation, executive functions—particularly selective attention and response inhibition—mediated the association between music training and IQ in a sample of 9- to 12-year-old children (Degé et al., 2011a). In another study, however, musically trained and untrained 9- to 12-year-olds differed substantially in IQ, slightly in working memory, but not on any measure of executive functioning (Schellenberg, 2011a).

A study of older adults that included random assignment to 6 months of individual piano lessons or a non-lessons control group reported that the intervention improved executive functioning (Bugos, Perlstein, McCrae, Brophy and Bedenbaugh, 2007). Closer inspection of the methods and results reveals otherwise. On one speeded test (*Trail-making*) that required participants to connect dots on a page—alternating between those labeled numerically or alphabetically (1-A-2-B-3-C…), the groups did not differ at pre-test, post-test- or follow-up, and the effect disappeared when baseline performance (connecting dots labeled

numerically) was taken into consideration. The strongest finding was on a speeded test that required participants to match symbols with digits. This test (*Digit Symbol—Coding*) was actually designed to be a measure of processing speed (Wechsler, 2008), which is not typically considered to be an executive function. Although tests of processing speed obviously require conscious control of thought, so does any test. In any event, processing speed is another domain-general ability that has a small positive association with music training in children (Roden et al., 2014b) and adults (Helmbold, Rammsayer and Altenmüller, 2005).

In short, music training is often associated positively with memory and executive functioning. In some instances, memory advantages are more likely to be evident on auditory tasks than on visual tasks because musically trained individuals are good listeners. Nevertheless, there is much evidence that music training is associated positively with visual memory. Music training also predicts performance on some tests of executive functions, particularly those that require selective attention and response inhibition, but there is little evidence that music training actually causes improvements in memory or executive functioning.

Music Training: Social-Emotional Skills, and Personality

The final section examines whether music training is associated with non-cognitive abilities or traits, including social-emotional skills and personality. Evolutionary theorists consider social cohesion to be an adaptive consequence of performing music (Huron, 2003). Specifically, music making in groups (i.e., whole communities or tribes) is thought to promote interpersonal bonding and survival of the group. Nevertheless, correlational (Schellenberg, 2006) and experimental (Schellenberg, 2004) research has failed to find an association in childhood between music training and adaptive social skills (e.g., cooperating with adults). In a study that included random assignment of 9-year-olds to 3 years of individual piano lessons or a no-lessons control group, the two groups did not differ in self-esteem at any point in time and changes in self-esteem over time were similar for both groups (Costa-Giomi, 2004). In another study of children who received a two-year music intervention, the treatment and control groups did not differ in self-esteem at the beginning or end of the study (Portowitz et al., 2009). Because the majority of children in these studies received one-on-one music instruction, it remains possible that making music in *groups* has social benefits, which would be consistent with evolutionary accounts.

Might music training be associated with emotional intelligence or emotional development? The question is reasonable because of links between music listening and emotional responding, and because music performance involves the expression of emotions (Corrigall and Schellenberg, 2013; Juslin, Chapter 13, Gabrielsson, Chapter 14, and Juslin and Lindstrom, Chapter 37, this volume). Nevertheless, in early adulthood, performance on tests of emotional intelligence has no association with duration of music training even when (1) music training predicts general intelligence (Schellenberg, 2011b; Trimmer and Cuddy, 2008), or (2) emotional intelligence predicts the ability to recognize emotions in music (Resnicow, Salovey and Repp, 2004) or speech (Trimmer and Cuddy, 2008). In childhood, 7- and 8-year-olds with music training perform better than their untrained counterparts on a

non-auditory test of comprehending emotions *and* on a test of IQ, but their advantage on the emotion test disappears when individual differences in IQ are held constant (Schellenberg and Mankarious, 2012).

Is music training associated with one or more of the five main dimensions of personality? Two likely possibilities include *conscientiousness*, which is associated with performance in school, and *openness-to-experience*, which is associated with IQ and years of education (John, Naumann and Soto, 2008). In adulthood, duration of music training in childhood is associated positively with openness-to-experience, and this association remains evident when cognitive ability is held constant (Corrigall et al., 2013). Among 10- to 12-year-old children (Corrigall et al., 2013) and 17-year-olds (Hille and Schupp, 2014), duration of training is associated with both conscientiousness and openness-to-experience. For the 10- to 12-year-olds, associations with personality (i.e., openness-to-experience) remain evident when general cognitive ability is held constant, but the association between music training and general cognitive ability disappears when personality is held constant. Moreover, the "special" association between music training and school performance (i.e., with IQ held constant) disappears when individual differences in conscientiousness are controlled. When children begin to take formal music lessons at around 7 or 8 years of age, the best predictors of music training are the parent's (i.e, the parent who accompanies the child to the laboratory) openness-to-experience and the child's agreeableness (Corrigall and Schellenberg, 2015). These results are important because previous findings of associations between music training and cognitive abilities may not have been evident if individual differences in personality had been measured and held constant.

In sum, despite much anecdotal evidence, empirical findings suggest that music training is not linked with social or emotional abilities in any meaningful way, although music training in large groups may represent an exception. Links with personality are more convincing, and provide additional evidence that individual differences determine who takes music lessons and for how long.

Conclusion

Associations between music training and cognitive abilities are well established and they are *not* limited to specific domains of cognitive functioning. Music training may play a causal role in some of these associations, particularly those related to speech perception, language use, and spatial abilities. Music training may also cause small improvements in domain-general abilities such as IQ. Unless taking music lessons has transformative powers, however, the number and magnitude of the associations make it implausible that music training is causing all of them. Rather, pre-existing differences in music aptitude, cognitive abilities, and personality influence the decision to take music lessons and test-taking abilities. Indeed, many of the associations reviewed in this chapter may not have emerged if such pre-existing individual differences had been measured and held constant. More generally, associations between music training and nonmusical abilities are bound to be a consequence of nature *and* nurture, and of interactions between nature and nurture.

Future studies could attempt to provide a richer account of associations between music training and nonmusical abilities by measuring aptitude and cognitive abilities before the

training begins. One possibility is that music training would have the strongest effects for children who score relatively high on tests of aptitude and/or IQ, because they are naturally suited for music training. It is also possible that music training would be particularly effective for children who score relatively low on aptitude and/or IQ because they have the most room for improvement.

Author Note

Preparation of this chapter was supported by the Natural Sciences and Engineering Research Council of Canada and the Social Sciences and Humanities Research Council of Canada. Correspondence should be sent to Glenn Schellenberg, Department of Psychology, University of Toronto Mississauga, Mississauga, ON, Canada L5L 1C6 (email: g.schellenberg@utoronto.ca).

References

Anvari, S.H., Trainor, B.J., Woodside, J. and Levy, B.A. (2002). Relations among musical skills, phonological processing and early reading abilities in pre-school children. *Journal of Experimental Child Psychology*, *83*, 111–130.

Berk, L.A. (2012). *Child development* (9th ed.). Boston, MA: Pearson.

Bialystok, E. and DePape, A.M. (2009). Musical expertise, bilingualism, and executive functioning. *Journal of Experimental Psychology: Human Perception and Performance*, *35*, 565–574.

Bidelman, G.M., Hutka, S. and Moreno, S. (2013). Tone language speakers and musicians share enhanced perceptual and cognitive abilities for musical pitch: evidence for bidirectionality between the domains of language and music. *PLoS ONE*, *8*(4), e60676. doi:10.1371/journal.pone.0060676

Brandler, S. and Rammsayer, T.H. (2003). Differences in mental abilities between musicians and non-musicians. *Psychology of Music*, *31*, 123–138.

Bugos, J.A., Perlstein, W.M., McCrae, C.S., Brophy, T.S. and Bedenbaugh, P.H. (2007). Individualized piano instruction enhances executive functioning and working memory in older adults. *Aging and Mental Health*, *11*, 464–471.

Butzlaff, R. (2000). Can music be used to teach reading? *Journal of Aesthetic Education*, *34*(3/4), 167–178.

Carroll, J.B. (1993). *Human cognitive abilities: A survey of factor-analytical studies*. New York: Cambridge University Press.

Chobert, J., Marie, C., François, C., Schön, D., and Besson, M. (2011). Enhanced passive and active processing of syllables in musician children. *Journal of Cognitive Neuroscience*, 23, 3874-3887.

Cohen, M.A., Evans, K.K., Horowitz, T.S. and Wolfe, J.M. (2011). Auditory and visual memory in musicians and nonmusicians. *Psychonomic Bulletin & Review*, *18*, 586–591.

Corrigall, K.A. and Schellenberg, E.G. (2013). Music: the language of emotion. In C. Mohiyeddini, M. Eysenck and S. Bauer (Eds.), *Handbook of psychology of emotions: Recent theoretical perspectives and novel empirical findings* (Vol. 2; pp. 299–325). Hauppauge, NY: Nova.

Corrigall, K.A. and Schellenberg, E.G. (2015). Predicting who takes music lessons: parent and child characteristics. *Frontiers in Psychology*, *6*, 282. doi: 10.3389/fpsyg.2015.00282

Corrigall, K.A. and Trainor, L.J. (2011). Associations between length of music training and reading skills in children. *Music Perception*, *29*, 147–155.

Corrigall, K.A., Schellenberg, E.G. and Misura, N.M. (2013). Music training, cognition, and personality. *Frontiers in Psychology*, *4*, 222. doi:10.3389/fpsyg.2013.00222

Costa-Giomi, E. (2004). Effects of three years of piano instruction on children's academic achievement, school performance and self-esteem. *Psychology of Music*, *32*, 139–152.

Degé, F., Kubicek, C. and Schwarzer, G. (2011a). Music lessons and intelligence: a relation mediated by executive functions. *Music Perception*, *29*, 195–201.

Degé, F. and Schwarzer, G. (2011). The effect of a music program on phonological awareness in preschoolers. *Frontiers in Psychology*, *2*, 124. doi:10.3389/fpsyg.2011.00124

Degé, F., Wehrum, S., Stark, R. and Schwarzer, G. (2011b). The influence of two years of school music training in secondary school on visual and auditory memory. *European Journal of Developmental Psychology*, *8*, 608–623.

Degé, F., Wehrum, S., Stark, R. and Schwarzer, G. (2014). Music lessons and academic self-concept in 12- to 14-year-olds. *Musicae Scientiae*, *18*, 203–215.

Drayna, D., Manichaikul, A., de Lange, M., Sneider, H. and Spector, T. (2001). Genetic correlates of musical pitch recognition in humans. *Science*, *291*, 1969–1972.

Elmer, S., Meyer, M. and Jäncke, L. (2012). Neurofunctional and behavioral correlates of phonetic and temporal categorization in musically trained and untrained subjects. *Cerebral Cortex*, *22*, 650–658.

Forgeard, M., Winner, E., Norton, A. and Schlaug, G. (2008). Practicing a musical instrument in childhood is associated with enhanced verbal ability and nonverbal reasoning. *PLoS One*, *3*(10), e3566. doi:10.1371/journal.pone.0003566

François, C., Chobert, J., Besson, M. and Schön, D. (2013). Music training and the development of speech segmentation. *Cerebral Cortex*, *23*, 2038–2043.

George, E.M. and Coch, D. (2011). Music training and working memory: an ERP study. *Neuropsychologia*, *49*, 1083–1094.

Gibson, C., Folley, B.S. and Park, S. (2009). Enhanced divergent thinking and creativity in musicians: a behavioral and near-infrared spectroscopy study. *Brain and Cognition*, *69*, 162–169.

Haimson, J., Swain, D. and Winner, E. (2011). Are mathematicians more musical than the rest of us? *Music Perception*, *29*, 203–213.

Hanna-Pladdy, B. and Gajewski, B. (2012). Recent and past musical activity predicts cognitive aging variability: direct comparison with general lifestyle activities. *Frontiers in Human Neuroscience*, *6*, 198. doi: 10.3389/fnhum.2012.00198

Hanna-Pladdy, B. and MacKay, A. (2011). The relation between instrumental musical activity and cognitive aging. *Neuropsychology*, *25*, 378–386.

Hansen, M., Wallentin, M. and Vuust, P. (2013). Working memory and musical competence of musicians and non-musicians. *Psychology of Music*, *41*, 779–793.

Helmbold, N., Rammsayer, T. and Altenmüller, E. (2005). Differences in primary mental abilities between musicians and nonmusicians. *Journal of Individual Differences*, *26*, 74–85.

Hetland, L. (2000). Learning to make music enhances spatial reasoning. *Journal of Aesthetic Education*, *34*(3/4), 179–238.

Hille, K., Gust, K., Bitz, U. and Kammer, T. (2011). Associations between music education, intelligence, and spelling ability in elementary school. *Advances in Cognitive Psychology*, *7*, 1–6.

Hille, A. and Schupp, J. (2014). How learning a musical instrument affects the development of skills. *Economics of Education Review*, *44*, 56–82.

Huron, D. (2003). Is music an evolutionary adaptation? In I. Peretz and R.J. Zatorre (Eds.), *The cognitive neuroscience of music* (pp. 57–75). Oxford: Oxford University Press.

Jakobson, L., Lewycky, S., Kilgour, A. and Stoesz, B. (2008). Memory for verbal and visual material in highly trained musicians. *Music Perception*, *26*, 41–55.

John, O.P., Naumann, L.P. and Soto, C.J. (2008). Paradigm shift to the integrative big-five trait taxonomy: history, measurement, and conceptual issues. In O.P. John, R.W. Robins and L.A. Pervin (Eds.), *Handbook of personality: Theory and research* (pp. 114–158). New York: Guilford.

Jones, J.L., Lucker, J., Zalewski, C., Brewer, C. and Drayna, D. (2009). Phonological processing in adults with deficits in musical pitch recognition. *Journal of Communication Disorders*, *42*, 226–234.

Kaviani, H., Mirbaha, H., Pournaseh, M. and Sagan, O. (2014). Can music lessons increase the performance of preschool children in IQ tests? *Cognitive Processing*, *15*, 77–84.

Kilgour, A.R., Jakobson, L.S. and Cuddy, L.L. (2000). Music training and rate of presentation as mediators of text and song recall. *Memory & Cognition*, *28*, 700–710.

Lee, Y.-S., Lu, M.-J. and Ko, H.-P. (2007). Effects of skill training on working memory capacity. *Learning and Instruction*, *17*, 336–344.

Loy, G. (2006). *Musimathics, Volume 1: The mathematical foundations of music*. Cambridge, MA: MIT Press.

Loy, G. (2007). *Musimathics, Volume 2: The mathematical foundations of music*. Cambridge, MA: MIT Press.

Marie, C., Delogu, F., Lampis, G., Belardinelli, M.O. and Besson, M. (2011). Influence of musical expertise on segmental and tonal processing in Mandarin Chinese. *Journal of Cognitive Neuroscience*, *23*, 2401–2415.

Mehr, S.A., Schachner, A., Katz, R.C. and Spelke, E.S. (2013). Two randomized trials provide no consistent evidence for nonmusical cognitive benefits of brief preschool music enrichment. *PLoS ONE*, *8*(12), e82007. doi:10.1371/journal.pone.0082007

Milovanov, R., Huotilainen, M., Välimäki, V., Esquef, P.A.A. and Tervaniemi, M. (2008). Musical aptitude and second language pronunciation skills in school-aged children: Neural and behavioral evidence. *Brain Research*, *1194*, 81–89.

Milovanov, R. and Tervaniemi, M. (2011). The interplay between musical and linguistic aptitudes: A review. *Frontiers in Psychology*, *2*, 321. doi:10.3389/fpsyg.2011.00321

Moreno, S., Bialystok, E., Barac, R., Schellenberg, E.G., Cepeda, N.J. and Chau, T. (2011a). Short-term music training enhances verbal intelligence and executive function. *Psychological Science*, *22*, 1425–1433.

Moreno, S., Friesen, D. and Bialystok, E. (2011b). Effect of music training on promoting preliteracy skills: Preliminary causal evidence. *Music Perception*, *29*, 165–172.

Moreno, S., Marques, C., Santos, A., Santos, M., Castro, S.L. and Besson, M. (2009). Musical training influences linguistic abilities in 8-year-old children: More evidence for brain plasticity. *Cerebral Cortex*, *19*, 712–723.

Oechslin, M.S., Van De Ville, D., Laseyras, F., Hauert, C.-A. and James, C.E. (2013). Degree of musical expertise modulates higher order brain functioning. *Cerebral Cortex*, *23*, 2213–2224.

Oikkonen, J. and Järvelä, I. (2014). Genomics approaches to study musical aptitude. *Bioessays*, *36*, 1102–1108. doi:10.1002/bies.201400081

Parbery-Clark, A., Skoe, E., Lam, C. and Kraus, N. (2009). Musician enhancement for speech-in-noise. *Ear and Hearing*, *30*, 653–661.

Parbery-Clark, A., Strait, D.L., Anderson, S., Hittner, E. and Kraus, N. (2011). Musical experience and the aging auditory system: Implications for cognitive abilities and hearing speech in noise. *PLoS ONE*, *6*(5), e18082. doi:10.1371/journal.pone.0018082

Patston, L.L., Hogg, S.L. and Tippett, L.J. (2007). Attention in musicians is more bilateral than in non-musicians. *Laterality*, *12*, 262–272.

Patston, L.M. and Tippett, L.J. (2011). The effect of background music on cognitive performance in musicians and nonmusicians. *Music Perception*, *29*, 173–183.

Peynircioğlu, Z., Durgunoğlu, A. and Öney-Küsefoğlu, B. (2002). Phonological awareness and musical aptitude. *Journal of Research in Reading*, *25*, 68–80.

Portowitz, A., Lichtenstein, O., Egorova, L. and Brand, E. (2009). Underlying mechanisms linking music education and cognitive modifiability. *Research Studies in Music Education*, *31*, 107–128.

Rauscher, F.H. (2008). The impact of music instruction on other skills. In S. Hallam, I. Cross and M. Thaut (Eds.), *The Oxford handbook of music psychology* (pp. 244–252). Oxford: Oxford University Press.

Rauscher, F.H. and Hinton, S.C. (2011). Music instruction and its diverse extra-musical benefits. *Music Perception*, *29*, 215–226.

Resnicow, J.E., Salovey, P. and Repp, B.H. (2004). Is recognition of emotion in music performance an aspect of emotional intelligence? *Music Perception*, *22*, 145–158.

Roden, I., Grube, D., Bongard, S. and Kreutz, G. (2014a). Does music training enhance working memory performance? Findings from a quasi-experimental longitudinal study. *Psychology of Music*, *42*, 284–298.

Roden, I., Könen, T., Bongard, S., Frankenberg, E., Friedrich, E.K. and Kreutz, G. (2014b). Effects of music training on attention, processing speed and cognitive music abilities—findings from a longitudinal study. *Applied Cognitive Psychology*, *28*, 545–557.

Rodrigues, A.C., Loureiro, M.A. and Caramelli, P. (2013). Long-term musical training may improve different forms of visual attention ability. *Brain and Cognition*, *82*, 229–235.

Schellenberg, E.G. (2004). Music lessons enhance IQ. *Psychological Science*, *15*, 511–514.

Schellenberg, E.G. (2006). Long-term positive associations between music lessons and IQ. *Journal of Educational Psychology*, *98*, 457–468.

Schellenberg, E.G. (2011a). Examining the association between music lessons and intelligence. *British Journal of Psychology*, *102*, 283–302.

Schellenberg, E.G. (2011b). Music lessons, emotional intelligence, and IQ. *Music Perception*, *29*, 185–194.

Schellenberg, E.G. (2012). Cognitive performance after music listening: a review of the Mozart effect. In R.A.R. MacDonald, G. Kreutz, and L. Mitchell (Eds.), *Music, health, and wellbeing* (pp. 324–338). Oxford: Oxford University Press.

Schellenberg, E.G. (2015). Music and nonmusical abilities. In G.E. McPherson (Ed.), *The child as musician: A handbook of musical development* (2nd ed., pp. 149–176). Oxford, UK: Oxford University Press.

Schellenberg, E.G. and Mankarious, M. (2012). Music training and emotion comprehension in childhood. *Emotion*, *12*, 887–891.

Schellenberg, E.G. and Weiss, M.W. (2013). Music and cognitive abilities. In D. Deutsch (Ed.), *The psychology of music* (3rd ed., pp. 499–550). Amsterdam: Elsevier.

Slevc, L.R. and Miyake, A. (2006). Individual differences in second language proficiency: does musical ability matter? *Psychological Science*, *17*, 675–681.

Sluming, V., Brooks, J., Howard, M., Downes, J.J. and Roberts, N. (2007). Broca's area supports enhanced visuospatial cognition in orchestral musicians. *Journal of Neuroscience*, *27*, 3799–3806.

Stoesz, B., Jakobson, L., Kilgour, A. and Lewycky, S. (2007). Local processing advantage in musicians: evidence from disembedding and constructional tasks. *Music Perception*, *25*, 153–165.

Strait, D.L. and Kraus, N. (2011). Playing music for a smarter ear: cognitive, perceptual, and neurobiological evidence. *Music Perception*, *29*, 133–146.

Strait, D.L. and Kraus, N. (2014). Biological impact of auditory expertise across the life span: musicians as a model of auditory learning. *Hearing Research*, *308*, 109–121.

Strait, D.L., Parbery-Clark, A., Hittner, E. and Kraus, N. (2012). Musical training during early childhood enhances the neural encoding of speech in noise. *Brain & Language*, *123*, 191–201.

Thompson, W.F., Schellenberg, E.G. and Letnic, A.K. (2012). Fast and loud background music hinders reading comprehension. *Psychology of Music*, *40*, 700–708.

Trimmer, C.G. and Cuddy, L.L. (2008). Emotional intelligence, not music training, predicts recognition of emotional speech prosody. *Emotion*, *8*, 838–849.

Vaughn, K. (2000). Music and mathematics: modest support for the oft-claimed relationship. *Journal of Aesthetic Education*, *34*(3/4), 149–166.

Wallentin, M., Nielsen, A.H., Friis-Olivarius, M., Vuust, C. and Vuust, P. (2010). The Musical Ear Test, a new reliable test for measuring musical competence. *Learning and Individual Differences*, *20*, 188–196.

Wechsler, D. (2008). *Wechsler Adult Intelligence Scale* (4th ed.). San Antonio, TX: Psychological Corporation.

Wetter, O.E., Koerner, F. and Schwaninger, A. (2009). Does musical training improve school performance? *Instructional Science*, *37*, 365–374.

Zelazo, P.D. (2004). The development of conscious control in childhood. *Trends in Cognitive Sciences*, *8*, 12–17.

PART 6

LEARNING MUSICAL SKILLS

EDITED BY SUSAN HALLAM

CHAPTER 27

MUSICAL POTENTIAL

GARY E. McPHERSON AND SUSAN HALLAM

Introduction

There is general agreement that music is a universal trait of humankind, that *Homo sapiens* as a species has the propensity for musical development and that musical potential is as universal as linguistic ability (Blacking, 1995; Wallin, Merker and Brown, 2000; Morley, 2013). An ongoing controversy persists, however, concerning the extent of individual variability in musical potential and the degree to which observable differences in acquiring musical skills result from social contexts that facilitate learning, genetic factors, or interactions between the two. This chapter outlines key elements of these debates and also considers how "musical potential" has been assessed.

The Nature–Nurture Debate

Francis Galton (1876) pioneered the study of genetic influences on learning and development using evidence from twin studies to argue that traits leading to eminence were largely inherited. Recent research suggests, however, that there are complex interactions between the environment and genetic factors which influence observable behavior, with genetic factors having a closer association with physical attributes than psychological factors, and that many dimensions of an individual's development, such as memory, language development and intelligence, can be enhanced through systematic practice and learning (Gross, 2010). Research attempting to establish the extent of the heritability of musical potential has reached similar conclusions with no decisive evidence showing that it is directly dependent on aural acuity, intelligence or other types of artistic ability (for reviews see Hodges, 1996; Shuter-Dyson, 1999), even though very recent work with a sample of Finnish family members has identified several candidate genes that are expressed in brain regions where music is perceived (i.e., hippocampus, thalamus and prefrontal cortex) (Ukkola-Vuoti et al., 2013). The most plausible explanation is that musical development is the result of a range of gene combinations interacting with environmental stimulation in an interactive rather than additive manner. Evidence that the cerebral cortex has an amazing ability to self-organize in response to stimuli such as music supports this view (Rauschecker, 2003).

Cortical activation during music processing reflects personal musical experiences accumulated over time, including listening to music, learning to play an instrument, formal instruction and professional training resulting in multiple mental representations of music that are, in part, interchangeable and rapidly adaptive (Altenmüller, 2001, 2003). While self-selection for musicianship by individuals with innate capacity leading to functional and structural differences through musical engagement cannot be completely ruled out, current evidence suggests that musical training, when undertaken over extended periods of time, can potentially change brain functioning as well as brain structure (Schlaug, 2003). Much research is now focused on identifying the genetic and environmental factors that facilitate or impede musical development.

Musical Savants and Williams Syndrome

The most difficult phenomena to explain without resorting to some notion of inherited differences in musical potential are children at the extremes of neurodevelopment, for instance, musical savants, children with Williams syndrome, and child prodigies.

Savants have generally low cognitive functioning but are able to achieve at normal levels in some activities, especially those related to nonsymbolic, artistic, visual and motor abilities, for instance, music, art and math (Gross, 2010). Many musical savants exhibit absolute pitch (Miller, 1989) enabling them to make confident, rapid judgments about individual pitches and complex chords. They are also sensitive to rules reflecting harmonic relationships and the structure of musical compositions (e.g., Young and Nettelback, 1995). Explaining these skills without resorting to genetic explanations is difficult. However, environmental influences should not be underestimated. Many savants have limited sight and language disorders, which may lead to increased development of auditory processing skills and the use of music as a means of communication. They also spend considerable time practicing their skills.

Although not typically displaying savant-like musical skill, individuals with Williams syndrome have low measured intelligence and difficulties with mathematical and spatial reasoning but are more adept than might be expected in language and music, the development of the latter depending on access to appropriate musical opportunities. Several studies (Levitin and Bellugi, 1998; Levitin et al., 2003; Levitin et al., 2007; Ng, Lai, Levitin and Bellugi, 2013) have shown that these children are typically as musically accomplished, engaged and interested as ordinary children but display greater emotional responses to music, become interested at a younger age, spend more time listening to music and possess a highly sensitive emotional attachment to music. The impact of these on their experience of music gives them more incentive to engage with music (Morley, 2013).

Musical Prodigies

Prodigies are children who display exceptional talent early in life. McPherson and Lehmann (2012) suggest that approximately one in 47,000 children in a chosen area can be defined

as prodigious. Ruthsatz and Detterman (2003) identified a recent example, a 6-year-old who despite having had no formal tuition acquired considerable musical skill by imitating other performers and improvising his own musical pieces. He could sing in two languages, had taught himself to play numerous instruments, had an intelligence quotient (IQ) of 132, an extraordinary memory, and attained a high score on Gordon's (1982) music aptitude measure. His exceptional musical behaviors were self-motivated and spontaneous and he particularly liked entertaining people. His musical abilities were closely aligned with his extraordinary memory and high IQ, more so than with the time or type of practice he undertook.

The overt musical behaviors of savants and Williams syndrome individuals share some similarities with the behavior of prodigies, even though their neurodevelopmental trajectories differ. Neuroconstructivists suggest that typical and atypical development can be viewed as different trajectories in a continuum of possibilities. An atypically developing trajectory affects the interactions of others with the child and the kind of experiences that the child seeks out which further impact on the trajectory (Mareschal et al., 2007). For example, when parents believe that their child has musical ability, they are more inclined to provide musical resources and reward musical activity, which in turn supports increasing levels of expertise as the child engages more fully with music (McPherson, 2009). This results in the child developing particular neural structures that make further musical development much easier (Altenmüller and Gruhn, 2002; Hodges, 2006).

Other research suggests that the typical "rage to master" which characterizes prodigies can be explained as a result of domain-specific high attentional control that begins in infancy to produce a spontaneous version of deliberate practice (Vandervert, 2009). The high attentional control of prodigies originates and then accelerates connections between the cerebral cortex (where mental modeling construction and repetition occur) and the cerebellum (where model formation occurs), such that cerebellar control models feedback to the working memory areas of the cortex. In this way the child prodigy's working memory becomes faster, more concentrated and more efficient (Vandervert, 2007). This explains the behavior of these individuals in terms of the reciprocal learning relationships between the anticipatory, adaptive cognitive-affective and attentional modeling functions of the cerebellum and those of the cerebral cortex (Vandervert, 2009).

Shavinina (2009) proposes that extreme levels of giftedness occur as a result of stimulation and activation early in life when the developing child selectively responds in ways that heighten his or her cognitive, emotional and social sensitivities. Shavinina argues that cognitive experience of this type provides the psychological basis from which highly gifted children are able to develop their creative, metacognitive and extracognitive (i.e., feelings, beliefs, intellectual values, intuition) abilities. In appropriate circumstances, heightened sensitivity during the early years of children's musical training, interacts "with preexisting individual differences in brain organization and ongoing maturational process to produce differential changes in white matter structure" to promote plasticity in motor and auditory connectivity in ways that serve as a type of scaffold upon which further training can produce outstanding musicians (Steele, Bailey, Zatorre and Penhune, 2013, p. 1288).

These explanations support an interactive, dynamic model of how exceptional achievement in music develops as a result of environmental forces acting together with innate potentials to influence a child's development.

The Role of Learning in the Development of Musical Expertise

Research undertaken within the expertise paradigm has also challenged previously accepted notions that high-level achievement depends exclusively on inherited ability. The basic premise of this theory is that time spent on "deliberate practice" underpins the development of high-quality expert performance. For instance, it has been established that classical Western musicians need to have accrued up to 16 years of practice to achieve levels that will lead to international standing in playing an instrument. Such individuals usually begin playing at a very early age and over succeeding years increase the amount of practice undertaken, sometimes up to as much as 50 hours a week by adolescence (Sosniak, 1985).

Ericsson and colleagues (Ericsson, Krampe and Tesch-Romer, 1993) have suggested a monotonic relationship between "deliberate practice" (which they define as goal-oriented, structured and effortful practice that is influenced by motivation, resources and attention) and an individual's acquired performance (for review see Jørgensen and Hallam, Chapter 28, this volume; Lehmann and Gruber, 2006). This is supported by evidence that musicians at the highest levels of expertise have accumulated considerably more hours of practice than their less successful peers, although there are substantial individual (Jørgensen, 2002; Sloboda, Davidson, Howe and Moore, 1996) and instrumental and genre differences (Gruber, Degner and Lehmann, 2004; Jørgensen, 2002). Recent research suggests that deliberate practice may account for as little as 30% of the variance in expertise (Hambrick et al., 2014).

In addition, reported correlations between achievement and time spent practicing vary between 0.25 (Doan, 1973) and 0.67 (Hallam, 1998). In Hallam's study the correlation rose to 0.84 when years of time learning was correlated with achievement, as opposed to time spent practicing. Overall length of time over which learning has taken place may be as important as the actual amount of practice in determining level of expertise. This was evident in a causal model developed by McPherson, Bailey and Sinclair (1997) which shows a strong association between the length of time learning and taking lessons and high school musicians' ability to sight-read and perform music that they had rehearsed over the previous weeks and months (see also, McPherson, 2005; McPherson, Davidson and Faulkner 2012).

Accumulated practice from the time of beginning learning to the present does not seem to predict the quality of performance at any point in time (Hallam, 1998, 2013; Hallam et al., 2012; Williamon and Valentine, 2000), although self-efficacy can predict achievement (McPherson and McCormick, 2006). A longitudinal study with beginning instrumentalists also showed that accumulated practice only partly explains children's ability to perform rehearsed music and sight-read and none of their ability to memorize music, play by ear or improvise. McPherson (2005) showed that accumulated practice explained between 9% and 32% of the variance in the learner's ability to perform rehearsed repertoire over their first 3 years of learning, and even less for their sight-reading ability. Other skills, such as the sophistication of the mental strategies which the young players adopted to guide their playing, were more important (see McPherson et al., 2012; and Jørgensen and Hallam, Chapter 28, this volume).

To date, much of the research has failed to take account of the amount of time spent acquiring musical skills through listening to music, engaging in playful musical activity and participating in group activities where learning and consolidation of skills occurs

in an informal learning context (e.g., Kokotsaki and Hallam, 2007). In addition, much research has neglected those who may have undertaken considerable amounts of practice but have dropped out of music instruction. There are complex relationships between prior knowledge, motivation, effort and perceived efficacy which influence decisions to continue or discontinue learning (Hallam, 1998; Sloboda et al., 1996). When a child begins to learn an instrument, prior musical knowledge affects facility of learning and the time needed to achieve mastery. While undertaking additional practice may compensate for a lack of prior knowledge, this has a time cost and requires perseverance. If a task proves too challenging, then a child may perceive that the effort required to succeed is too great and may give up learning altogether (Hurley, 1995). Difficulties may also be evident when a child perceives that he or she does not have sufficient ability. Such perceptions often lead to a loss of self-esteem, loss of motivation, less practice and a downward spiral leading to the termination of lessons (Austin, Renwick and McPherson 2006; Chandler, Chiarella and Auria, 1987).

The personal beliefs held by learners and their parents may also impact on attainment. Parental and child ability conceptions are recognized as having a major impact on motivation and the desire of children to continue learning, especially when faced with obstacles (Austin et al., 2006). McPherson (2009) showed that parental ability conceptions can be self-fulfilling. McPherson and Davidson (2002) interviewed mothers before and after their child commenced learning an instrument. Those who held fixed views that their child may not have sufficient ability to succeed musically tended to provide less support for practice than mothers whose view was more malleable. They were also more likely to encourage their child to pursue other activities if they believed their child was not succeeding. Some mothers actually gave up on their child as a potential musician much sooner than the child.

The Development of General Musical Skills

The impact of the home environment is of profound importance in the development of children's musical potential as is the general milieu of the environment to which a child is exposed. The opportunities parents and significant others provide are among the most critical factors for realizing children's musical potential (McPherson et al., 2012; see also Creech, Chapter 31, this volume).

The seeds of musical potential are sown early because the human auditory system is functional 3–4 months before birth. After 28–30 weeks of gestation, fetuses can reliably react to external sounds (Parncutt, 2006; see also Parncutt, Chapter 23, this volume). The process of musical enculturation begins from the point at which brain development starts to become influenced by auditory stimulation. These processes gain momentum after birth when a mother and infant imitate each other's vocalizations in ways that show a shared emotional experience that some believe is the very basis of musicality (Trevarthen and Malloch, 2002). In the immediate months after an infant is born, the complex skills required for understanding and analyzing music within any particular culture start to develop as a result of ongoing exposure to music. Even though exposure to music is different for each child, all children typically develop a surprising array of internal schemata for music long before they reach school or begin formal music instruction.

Measuring Musical Potential

Historically, the developers of musical aptitude tests have held varying views regarding the heritability of musical ability. Seashore (1938/1960; Seashore, Lewis and Saetveit, 1938) believed that musical ability was a set of loosely related basic aural discrimination skills, which had a genetic basis and did not change over time. Wing (1981), Drake (1957) and Bentley (1966) shared Seashore's view of musical ability as being inherited, although they differed in their conceptions of the nature of that ability and how it might be assessed. More recent tests, based on measurements involving tonal (melody, harmony), rhythm (tempo, meter) and preference (phrasing, balance, style) aptitudes, have been devised by Gordon (1965, 1979, 1982). Gordon (2007) suggests that students rarely display high (or low) aptitudes in all seven aptitudes and that all are based on the ability to "audiate"; a term he has coined to describe how individuals give meaning to music that is heard or imagined.

The rationale underlying all of these approaches is that "musicality" has its basis in aural perception. However, the predictive reliability of all of these measures is generally low (Hodges and Haack, 1996; Winner and Marino, 2000). Using ability to sing as a means of assessing musical ability is also problematic as the relationship between developmental tonal aptitude and use of the singing voice can be very small (Rutkowski, 1996). Generally, it is now recognized that aural skills alone are insufficient to predict future success across the full range of musical activities, especially those involving motor skills (Gilbert, 1981) and creativity (Vaughan, 1977; Webster, 1988).

A Recent Conception of Musical Potential

McPherson and Williamon (2006, 2015) adapted Gagné's (2009, 2013) "differentiated model of giftedness and talent" to music as a means of defining the natural abilities, intrapersonal factors and environmental catalysts that might impact on the development of musical skills. This conception defines gifts (e.g., intellectual, creative, socioaffective, sensorimotor) as natural innate potentials to achieve and talent as observable skills and proposes that at least eight distinct types of musical talents (performing, improvising, composing, arranging, analyzing, appraising, conducting, music teaching) can be developed through systematic practice and training (see Figure 27.1).

Six domains of natural abilities (gifts) are identified: four mental (intellectual, creative, social, perceptual), and two physical (muscular, motor control). The individual blending of these mental and physical "natural" abilities (or aptitudes) influence each of the eight 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 and Martino, 1993, 2000). Likewise, motor aptitudes—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 will be far less important for those who compose or are engaged in the analysis or appraisal of music.

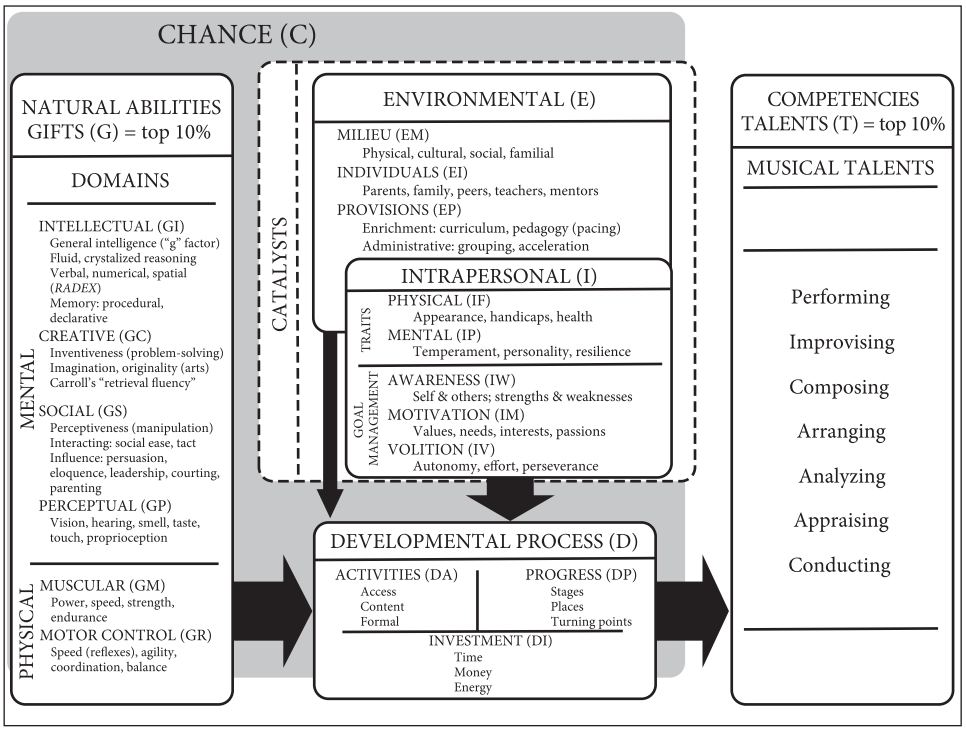

FIGURE 27.1 Differentiated model of musical giftedness and talent.

(Reproduced from Gagné, Françoys, 'Building gifts into talents: Detailed overview of the DMGT 2.0', in Bronwyn MacFarlane and Tamra Stambaugh, ed., *Leading Change in Gifted Education: The Festschrift of Dr. Joyce Van Tassel-Baska*, p. 64 © Prufrock Press, 2009.)

Gagné (2010) argues that natural abilities are partly controlled by genetic endowment and may appear spontaneously without structured learning or formal training as a result of maturation and informal exercise. They are more easily observed in young children when environmental forces and training have had limited impact but can be observed at all ages, and most especially through the facility and speed a young music learner acquires new knowledge, skills and understandings. Innate used in this way simply implies at a behavioral level, "hard-wired, fixed action patterns of a species that are impervious to experience" and that are not the "effect of a single gene but rather probabilistic propensities of many genes in multiple-gene systems" (Plomin, 1998, p. 421). The natural mental and physical 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 rapidly and faster.

Natural Musical Abilities (Gifts)

Because music is an "aural art form," 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 forms of musical talent. 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) 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 speculate about the extent to which the processing of complex musical structures might be an innate predisposition in infants that tends to "fade away" in situations when the developing child is "not sufficiently engaged in auditory and musical interchanges" (Brodsky, 2004, p. 87).

Winner and Martino (2000) suggest 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. Musical giftedness can reveal itself as early as 1 or 2 years of age, which is earlier than practically any other skill domain. In 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 (Winner and Martino, 2000).

Very musical children can sing back heard songs earlier than ordinary children, sometimes before they learn to talk (Winner and Martino, 2000). While ordinary children start imitating songs at around 2 years, singing whole songs by age 4 and reproducing songs accurately by 5 years, the most musical 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, 2006) and to respond positively to the emotional aspects of music (Persson, 1996; Persson, Pratt and 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 and Martino, 2000, p. 105).

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. These concepts of responsiveness and preference are associated with motivation and interest and fall among intrapersonal catalysts.

Absolute (Perfect) Pitch

The degree to which absolute (or perfect) pitch is related to natural perceptual abilities, hard wired (innate or genetically determined) or impacted by maturation or environmental stimulation, continues to be an area of interest. The evidence suggests that no single factor is predictive of absolute pitch in musicians but that a combination of genetic predisposition, commencing an instrument between 3 and 7 years with an outside limit of between 9

and 12 years and early exposure to pedagogy that emphasizes consistent tone-label associations (fixed-do systems, continuing use of fixed-pitch instruments such as piano) provides the strongest explanation (see Elmer, Sollberger, Meyer and Jäncke, 2013; Wilson, Lusher, Martin and McLachlan, 2012; and Loui, Chapter 6, this volume).

Aspects of Music Performance and the Professional and Personal Qualities that Underpin Competence Acquisition

McPherson (1996, 2005) distinguishes between visual (sight-reading, performing rehearsed music from notation), aural (playing from memory and by ear) and creative (improvising) aspects of music performance. When considering these in relation to groups of children of differing ages and abilities, he found that different musical skills were involved in developing each. There was not an automatic transfer between the three orientations. Each needed to be developed separately and in combination to maximize potential. This is rare in most formal learning situations where visual forms of performance often dominate (see McPherson et al., 2012).

Hallam and Bautista (2012) suggest that attaining high levels of expertise depend on the development of a wide range of different professional and personal skills. Some of these may be required for all musical activities, and others are applied more selectively to particular tasks (see Box 27.1). In order to become a successful musician, individuals also need to develop social skills (being able to work with other musicians, promoters, the public), planning and organizational skills (planning practice schedules, programs, travel arrangements) and time management skills (being punctual, meeting deadlines). These are clearly required for developing expertise in a range of professions and while necessary are not exclusively "musical."

Actualization of Musical Potential

In the modern world, children have great access to music through the media and are able to learn music in a multitude of different ways. Technological developments have resulted in changes to the way music is perceived and valued within society, such that mere aural perception is no longer regarded as the defining aspect of musical ability.

Haroutounian (2000), in analyzing the level of importance attached to particular criteria in identifying musically able children, suggested that the general behaviors of "sustained interest" and "self-discipline" were more important than music-specific characteristics. Similarly, Hallam and Prince (2003) asked a sample of musicians, student musicians, educators and the general public to define musical ability. Seventy-one percent of the respondents viewed musical ability as being able to play a musical instrument or sing suggesting that musical ability is often identified on the basis of developing practical skills. Overall, 28% of the sample mentioned aural skills as indicative of musical ability, 32% included listening and

Box 27.1 Skills which can be acquired in learning to play an instrument

Aural skills supporting the development of:
- rhythmic accuracy and a sense of pulse
- good intonation
- the facility to know how music will sound without having to play it
- playing by ear
- improvisational skills.

Cognitive skills supporting the development of:
- reading music
- transposition
- understanding keys
- understanding harmony
- understanding the structure of the music
- the memorization of music
- composing
- understanding different musical styles and their cultural and historic contexts.

Technical skills supporting the development of:
- instrument specific skills
- technical agility
- articulation
- expressive tone quality.

Musicianship skills supporting the development of:
- expressive playing
- sound projection
- control
- conveying musical meaning.

Performance skills supporting the development of:
- communication with an audience
- communication with other performers
- being able to coordinate a group
- presentation to an audience.

Creative skills supporting the development of:
- interpretation
- improvisation
- composition.

Evaluative skills supporting the development of:
- listening with understanding
- being able to describe and discuss music
- being able to make comparisons between different types of music and performances
- critically assessing personal performance, improvisation and compositions
- monitoring progress.

Self-regulatory skills supporting the development of:
- managing the process of learning
- managing practice
- enhancing concentration
- enhancing motivation.

understanding, 24% having an appreciation of music and 15% being responsive to music. Personal qualities including motivation, personal expression, immersion in music, total commitment and metacognition (being able to learn how to learn) were cited most often by musicians. Unsurprisingly, the musicians gave more complex responses, with many more elements in their explanations.

Further research (Hallam, 2010) using rating scales to illicit responses to a set of statements about musical ability showed that it was conceptualized in relation to rhythmic ability, organization of sound, communication, motivation, personal characteristics, the integration of a range of complex skills and performing in a group. Having a musical ear ranked lower than might have been expected given its prominent position with regard to musical ability historically. The high ratings given to motivation and personal commitment demonstrated their importance in developing high-level skills. Overall, the conceptions of musical ability generated by the research were complex and multifaceted, and they reflected the wide range of expert achievement that occurs in the music professions of the developed world.

Conclusion

The extent to which genetic endowment underpins or limits all subsequent musical development has and continues to be fiercely debated (see Hallam, 2006, 2015; *High Ability Studies* Volume 18; *Behavioral and Brain Sciences* Volume 21; McPherson and Williamon 2006, 2015), although there is general consensus that human beings as a species are preprogrammed to acquire a wide range of musical skills. We argue that what children are born with enables rather than constrains what they will eventually be able to achieve. While a range of generalized abilities may come into play when learning music, a host of environmental and personal catalysts work in combination with teaching and learning processes to develop particular types of talent. These talents form the basis of the many varied ongoing professional, amateur and informal forms of meaningful engagement that individuals can have with music.

While tests of musical aptitude may assess current aural skills, musical potential is a complex phenomenon that involves many factors. While aural abilities are important, they do not provide the basis from which to accurately assess a child's current or future musical potential. Instead, musical potential is best thought of as malleable and ever changing, and a dimension of human experience that takes many forms and occurs at many different levels. All children are inherently musical and deserve access to the types of informal and formal experiences that will maximize their own, individual musical potential.

References

Altenmüller, E.O. (2001). How many music centers are in the brain? *Annals of the New York Academy of Sciences*, *930*, 273–280.

Altenmüller E.O. (2003). How many music centres are in the brain? In I. Peretz and R. Zatorre (Eds.), *The cognitive neuroscience of music* (pp. 346–356). Oxford: Oxford University Press.

Altenmüller, E. and Gruhn, W. (2002). Brain mechanisms. In R. Parncutt and G.E. McPherson (Eds.), *The science and psychology of music performance: Creative strategies for teaching and learning* (pp. 63–81). New York: Oxford University Press.

Austin, J., Renwick, J. and McPherson, G.E. (2006). Developing motivation. In G.E. McPherson (Ed.), *The child as musician: a handbook of musical development* (pp. 213–238). Oxford: Oxford University Press.

Bamberger, J. (2006). What develops in musical development? In G.E. McPherson (Ed.), *The child as musician: A handbook of musical development* (pp. 69–91). Oxford: Oxford University Press.

Bentley, A. (1966). *Measures of musical abilities.* Windsor: NFER-NELSON.

Blacking, J. (1995). *Music, culture, and experience.* Chicago, IL: University of Chicago Press.

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.

Chandler, T.A., Chiarella, D. and Auria, C. (1987). Performance expectancy, success, satisfaction and attributions as variables in band challenges. *Journal of Research in Music Education*, *35*, 249–258.

Csikszentmihalyi, M. (1998). Fruitless polarities. *Behavioral and Brain Sciences*, *21*, 411.

Doan, G.R. (1973). *An investigation of the relationships between parental involvement and the performance ability of violin students*. (Unpublished doctoral dissertation.) Ohio State University, Columbus, OH.

Drake, R.M. (1957). *Manual for the Drake musical aptitude tests* (2nd ed.). Chicago, IL: Science Research Associates.

Elmer, S., Sollberger, S., Meyer, M. and Jäncke, L. (2013). An empirical reevaluation of absolute pitch: behavioral and electrophysiological measurements. *Journal of Cognitive Neuroscience*, *25*(10), 1736–1753.

Ericsson. K.A., Krampe, R.T. and Tesch-Romer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review*, *100*, 363–406.

Gagné, F. (2009). Building gifts into talents: detailed overview of the DMGT 2.0. In B. MacFarlane and T. Stambaugh (Eds.), *Leading change in gifted education: The festschrift of Dr. Joyce VanTassel-Baska* (pp. 61–80). Waco, TX: Prufrock Press.

Gagné, F. (2010). Motivation within the DMGT 2.0 framework. *High Ability Studies*, *21*, 81–99.

Gagné, F. (2013). The DMGT: changes within, beneath, and beyond. *Talent Development & Excellence*, *5*, 5–19.

Galton, F. (1876). The history of twins as a criterion of the relative powers of nature and nurture. *Royal Anthropological Institute of Great Britain and Ireland Journal*, *6*, 391–406.

Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences*. New York: Basic Books.

Gilbert, J.P. (1981). Motoric music skill development in young children: a longitudinal investigation. *Psychology of Music*, *9*(1), 21–25.

Gordon, E.E. (1965). *Musical aptitude profile.* Chicago, IL: GIA.

Gordon, E.E. (1979). *Primary measures of music audiation*. Chicago, IL: GIA.

Gordon, E.E. (1982). *Intermediate measures of music audiation*. Chicago, IL: GIA.

Gordon, E.E. (2007). *Learning sequences in music: A contemporary music learning theory*. Chicago, IL: GIA.

Gross, R. (2010). *Psychology: The science of mind and behaviour* (6th ed). Abingdon: Hodder Education Publishers.

Gruber, H., Degner, S. and Lehmann, A.C. (2004). Why do some commit themselves in deliberate practice for many years—and so many do not? Understanding the development of professionalism in music. In M. Radovan and N. Dordevic (Eds.), *Current issues in adult learning and motivation* (pp. 222–235). Ljubljana: Slovenian Institute for Adult Education.

Hallam, S. (1998). The predictors of achievement and drop out in instrumental music tuition. *Psychology of Music*, *26*, 116–132.

Hallam, S. (2006). Musicality. In G. McPherson (Ed.), *The child as musician: A handbook of musical development* (pp. 93–110). Oxford: Oxford: University Press.

Hallam, S. (2010). 21st century conceptions of musical ability. *Psychology of Music*, *38*(3), 308–330.

Hallam, S. (2013). What predicts level of expertise attained, quality of performance, and future musical aspirations in young instrumental players? *Psychology of Music*, *41*(3), 265–289.

Hallam, S. (2015). Musicality. In G.E. McPherson (Ed.), *The child as musician: A handbook of musical development* (2nd ed., pp. 67–80). Oxford: Oxford: University Press.

Hallam, S. and Bautista, A. (2012). Processes of instrumental learning: the development of musical expertise. In G.E. McPherson and G. Welch (Eds.), *The Oxford handbook of music education* (Vol. 1) (pp. 658–676). Oxford: Oxford University Press.

Hallam, S. and Prince, V. (2003). Conceptions of musical ability. *Research Studies in Music Education*, *20*, 2–22.

Hallam, S., Rinta, T., Varvarigou, M., Creech, A., Papageorgi, I. and Lani, J. (2012). The development of practising strategies in young people. *Psychology of Music*, *40*(5), 652–680.

Hambrick, D.Z., Oswald, F.L., Altmann, E.M., Meinz, E.J., Gobet, F. and Campitelli, G. (2014). Deliberate practice: is that all it takes to become an expert? *Intelligence*, *45*, 34–45.

Haroutounian, J. (2000). Perspectives of musical talent: a study of identification criteria and procedures. *High Ability Studies*, *11*, 137–160.

Hodges, D.A. (1996). Human musicality. In D.A. Hodges (Ed.), *Handbook of music psychology* (pp. 29–68). San Antonio, TX: IMR Press.

Hodges, D.A. (2006). The musical brain. In G.E. McPherson (Ed.), *The child as musician: A handbook of musical development* (pp. 51–68). Oxford: Oxford University Press.

Hodges, D.A. and Haack, P.A. (1996). The influence of music on human behavior. In D.A. Hodges (Ed.), *Handbook of music psychology* (pp. 469–555). San Antonio, TX: IMR Press.

Hurley, C.G. (1995). Student motivations for beginning and continuing/discontinuing string music tuition. *The Quarterly Journal of Music Teaching and Learning*, *6*, 44–55.

Jørgensen, H. (2002). Instrumental performance expertise and amount of practice among instrumental students in a conservatoire. *Music Education Research*, *4*, 105–119.

Kokotsaki, D. and Hallam, S. (2007). Higher education music students' perceptions of the benefits of participative music making. *Music Education Research*, *9*, 93–109.

Lehmann, A.C. and Gruber, H. (2006). Music. In K.A. Ericsson, N. Charness, P.J. Feltovich and R.R. Hoffman (Eds.), *The Cambridge handbook of expertise and expert performance* (pp. 457–470). Cambridge: Cambridge University Press.

Levitin, D.J. and Bellugi, U. (1998). Musical abilities in individuals with Williams syndrome. *Music Perception*, *15*, 357–389.

Levitin, D.J., Cole, K., Chiles, M., Lai, Z., Lincoln, A. and Bellugi, U. (2007). Characterizing the musical phenotype in individuals with Williams syndrome. *Child Neuropsychology*, *10*, 223–247.

Levitin, D.J., Menon, V., Schmitt, J.E., Eliez, S., White, C.D., Glover, G.H., Kadis, J., Korenberg, J.R., Bellugi, U. and Reiss, A.L. (2003). Neural correlates of auditory perception in Williams syndrome: an fMRI study. *NeuroImage*, *18*, 74–82.

Mainwaring, J. (1941). The meaning of musicianship: a problem in the teaching of music. *British Journal of Educational Psychology*, *XI*(3), 205–214.

Mainwaring, J. (1947). The assessment of musical ability. *British Journal of Educational Psychology*, 17(1), 83–96.

Mareschal, D., Johnson, M.H., Sirois, S., Spratling, M.W., Thomas, M.S.C. and Westerman, G. (2007). *Neuroconstructivism: How the brain constructs cognition* (Vol. 1). Oxford: Oxford University Press.

McPherson, G.E. (1996). Five aspects of musical performance and their correlates. *Bulletin of the Council for Research in Music Education*, *127*, 115–121.

McPherson, G.E. (2005). From child to musician: skill development during the beginning stages of learning an instrument. *Psychology of Music*, *33*, 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., Bailey, M. and Sinclair, K. (1997). Path analysis of a model to describe the relationship among five types of musical performance. *Journal of Research in Music Education*, *45*, 103–129.

McPherson, G.E. and Davidson, J.W. (2002). Musical practice: mother and child interactions during the first year of learning an instrument. *Music Education Research*, *4*, 143–158.

McPherson, G.E., Davidson, J.W. and Faulkner, R. (2012). *Music in our lives: Rethinking musical ability, development and identity.* Oxford: Oxford University Press.

McPherson, G.E. and Lehmann, A. (2012). Exceptional musical abilities—child prodigies. In G.E. McPherson and G. Welch (Eds.), *The Oxford handbook of music education* (pp. 31–50). New York: Oxford University Press.

McPherson, G.E. and McCormick, J. (2006). Self-efficacy and performing music. *Psychology of Music*, *34*(3), 321–336.

McPherson, G.E. and Williamon, A. (2006). Giftedness and talent. In G.E. McPherson (Ed.), *The child as musician: A handbook of musical development* (pp. 239–256). Oxford: Oxford University Press.

McPherson, G.E. and Williamon, A. (2015). Building gifts into musical talents. In G.E. McPherson (Ed.), *The child as musician: A handbook of musical development* (2nd ed., pp. 340–360). Oxford: Oxford University Press.

Miller, L.K. (1989). *Musical savants: Exceptional skill in the mentally retarded*. Hillsdale, NJ: Erlbaum.

Morley, I. (2013). *The prehistory of music: Evolutionary origins and archaeology of human musicality*. Oxford: Oxford University Press.

Ng, R., Lai, P., Levitin, D.J. and Bellugi, U. (2013). Musicality correlates with sociability and emotionality in Williams syndrome. *Journal of Mental Health Research in Intellectual Disabilities*, *6*, 268–279.

Papoušek, H. (1996). Musicality in infancy research: biological and cultural origins of early musicality. In I. Deliège and J.A. Sloboda (Eds.), *Musical beginnings: Origins and development of musical competence* (pp. 37–55). Oxford: Oxford University Press.

Parncutt, R. (2006). Prenatal development. In G.E. McPherson (Ed.), *The child as musician: A handbook of musical development* (pp. 1–32). Oxford: Oxford University Press.

Persson, R.S. (1996). Musical reality: exploring the subjective world of performers. In R. Monelle and 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. and Robson, C. (1996). Motivational and influential components of musical performance: a qualitative analysis. In A.J. Cropley and D. Dehn (Eds.), *Fostering the growth of high ability: European perspectives* (pp. 287–302). Norwood, NJ: Ablex.

Plomin, R. (1998). Genetic influence and cognitive abilities. *Behavioral and Brain Sciences*, *21*, 420–421.

Rauschecker, J.P. (2003). Functional organization and plasticity of auditory cortex. In I. Peretz and R. Zatorre (Eds.), *The cognitive neuroscience of music* (pp. 357–365). Oxford: Oxford University Press.

Rutkowski, J. (1996). The effectiveness of individual/small group singing activities on kindergartners' use of singing voice and developmental music aptitude. *Journal of Research in Music Education*, *44*, 353–368.

Ruthsatz, J. and Detterman, D.K. (2003). An extraordinary memory: the case study of a musical prodigy. *Intelligence*, *31*, 509–518.

Schlaug, G. (2003). The brain of musicians. In I. Peretz and R. Zatorre (Eds.), *The cognitive neuroscience of music* (pp. 366–381). Oxford: Oxford University Press.

Seashore, C.E. (1938, reprinted 1960). *Psychology of music.* New York: Dover.

Seashore, C.E., Lewis, L. and Saetveit, J.G. (1938). *Seashore measures of musical talents*. New York: Psychological Corporation.

Shavinina, L.V. (2009). A unique type of representation is the essence of giftedness: towards a cognitive-developmental theory. In L.V. Shavinina (Ed.), *The international handbook on giftedness* (pp. 231–257). Amsterdam: Springer Science and Business Media.

Shuter-Dyson, R. (1999). Musical ability. In D. Deutsch (Ed.), *The psychology of music* (pp. 627–651). New York: Harcourt Brace and Company.

Sloboda, J.A., Davidson, J.W., Howe, M.J.A. and Moore, D.G. (1996). The role of practice in the development of performing musicians. *British Journal of Psychology*, *87*, 287–309.

Sosniak, L.A. (1985). Learning to be a concert pianist. Developing talent in young people. In B.S. Bloom (Ed.), *Developing talent in young people* (pp. 19–67). New York: Ballantine.

Steele, C.J., Bailey, J.A., Zatorre, R.J. and Penhune, V.B. (2013). Early musical training and white-matter plasticity in the corpus callosum: evidence for a sensitive period. *The Journal of Neuroscience*, *33*(3), 1282–1290.

Trevarthen, C. and Malloch, S. (2002). Musicality and music before three: human vitality and invention shared with pride. *Zero to Three*, *23*(1), 10–18.

Ukkola-Vuoti, L., Oikkonen, J., Buck, G., Blancer, C., Raijas, P., Karma, K., Lähdesmäki, H. and Järvelä, I. (2013). Genome-wide copy number variation analysis in extended families and unrelated individuals characterized for musical aptitude and creativity in music. *PLoS ONE*, *8*(2), e56356.

Vandervert, L.R. (2007). Cognitive functions of the cerebellum explain how Ericsson's deliberate practice produces giftedness. *High Ability Studies*, *18*, 89–92.

Vandervert, L.R. (2009). Working memory, the cognitive functions of the cerebellum and the child prodigy. In L.V. Shavinina (Ed.), *The international handbook on giftedness* (pp. 295–316). Amsterdam: Springer Science and Business Media.

Vaughan, M.M. (1977). Measuring creativity: its cultivation and measurement. *Bulletin of the Council for Research in Music Education*, *50*, 72–77.

Wallin, N., Merker, B. and Brown, S. (2000). *The origins of music.* Cambridge, MA: The MIT Press.

Webster, P.R. (1988). New perspectives on music aptitude and achievement. *Psychomusicology*, *7*, 177–194.

Williamon, A. and Valentine, E. (2000). Quantity and quality of musical practice as predictors of performance quality. *British Journal of Psychology*, *91*, 353–376.

Wilson, S.J., Lusher, D., Martin, C.L. and McLachlan, N. (2012). Intersecting factors lead to absolute pitch acquisition that is maintained in a "fixed do" environment. *Music Perception*, *29*(3), 285–296.

Wing, H.D. (1981). *Standardised tests of musical intelligence*. Windsor: National Foundation for Educational Research.

Winner, E. and Martino, G. (1993). Giftedness in the visual arts and music. In K.A. Heller, F.J. Monks and A.H. Passow (Eds.), *International handbook of research and development of giftedness and talent* (pp. 253–281). New York: Pergamon.

Winner, E. and Martino, G. (2000). Giftedness in non-academic domains: the case of the visual arts and music. In K.A. Heller, F.J. Mönks, R.J. Sternberg and R.F. Subotnik (Eds.), *International handbook of giftedness and talent* (2nd ed.) (pp. 95–110). New York: Elsevier.

Young, L. and Nettelbeck, T. (1995). The abilities of a musical savant and his family. *Journal of Autism and Developmental Disorders*, *25*, 231–247.

CHAPTER 28

PRACTICING

HARALD JØRGENSEN AND SUSAN HALLAM

Introduction

Practice is central to the development of all aspects of musical expertise. The musician not only needs to consider the development of technical skills but must also develop musical interpretation, may have to play or sing from memory, rehearse and perform in cooperation with other musicians, improvise and contend with stage fright. These elements require aural, technical, cognitive, communication, performance and learning skills. These complex skills cannot be acquired, improved and maintained by simple repetitious practice.

Effective practice has been defined by Hallam (1997c) as "that which achieves the desired end-product, in as short a time as possible, without interfering negatively with longer-term goals" (p. 181). This definition assumes that effective practice might take many forms and implies that the musician requires considerable metacognitive skills to facilitate the completion of task requirements or, in the case of the novice, appropriate support. Practicing may be addressed from a psychological viewpoint as an act of learning, where theories of psychomotor learning and motor programs are relevant and it may also be viewed as "self-teaching" (Jørgensen, 2004). The multifaceted nature of practice has been encapsulated in models which provide a framework for understanding its relationships with creativity, performance and instruction (see Chaffin and Lemieux, 2004; Hallam, 1997c; Miksza, 2011a).

Empirical research on practice has a history that dates back to the beginning of the twentieth century, although the majority of research has been undertaken in the last 30 years. Its focus has almost exclusively been in relation to the training of classical musicians and the individual practitioner.

The Quantity of Practice: Time Spent Practicing

Practitioners and researchers agree that there are two important variables relating to practice that determine progress and attainment: the *quality* and *quantity* of practice in interaction

with prior knowledge and skills. In the following section we will concentrate on the quantity of practice returning to quality issues in the section on practice strategies.

Starting Age

Research on time spent practicing has addressed three different aspects: the initial starting age, the accumulated amount of practice from initial starting age to the present, and the amount of practice at one particular time or during a limited period of time. A major challenge to this type of research is the difficulty in obtaining reliable and valid measures of the amount of practice undertaken (Madsen, 2005).

Despite these difficulties some broad trends have emerged. First, most of those who reach a high level of expertise on an instrument have made an early start, on either their major instrument or another instrument. This phenomenon has been demonstrated for a broad range of instruments (Jørgensen, 2001; Sosniak, 1985). Pianists and violinists tend to be particularly early "starters," aged from 3 to 8 years old, while brass and woodwind performers start a little later with their major instrument (Jørgensen, 2001). Starting to play at an early age, when physically the body is more flexible, may be important. Certainly, Wagner (1988) has demonstrated that pianists' hands can change physically if they begin playing when very young.

Another trend is that time spent in practice usually increases as age and expertise develops with most young people practicing almost every day (Hallam et al., 2012; Sloboda, Davidson, Howe and Moore, 1996). There is evidence that the increase in practice time is greater for those who go on to become professional rather than amateur musicians. However, after entrance to the profession, duration of individual practice time is observed to decrease as pressures of rehearsals and public performance increase (Krampe, 1994).

Accumulated Practice Time

Since many students start early and gradually increase the amount of time that they practice, it follows that many of them have accumulated a large amount of practice time by their late teens, and that expert performers have invested several thousand hours of practice over a period of 15–16 years before reaching a high performance level in their twenties (Sosniak, 1985). Accumulated practice time has also been found to relate to the performance of rehearsed music in novice players aged 7–9 years, although use of specific strategies seems to be more important when children engage in sight-reading, playing from memory, playing by ear or improvising (McPherson, 2005).

Practice at a Particular Time

Most research on the amount of practice has not differentiated between instruments or has focused on only one instrument. An exception to this is a study by Jørgensen (1997). He found that the keyboard students in a conservatoire invested most time in practice, 25–30 hours a week, followed by strings, woodwind, brass and voice. There were also differences between specific instruments within these groups. Violinists, for instance, tended to practice for more time than double bass players, and trumpet players practiced more than tuba

players. Lammers and Kruger (2006) in a study of American and Japanese students reported similar results. Physiological restrictions related to the instrument's physical and technical demands (Jørgensen, 1997) and the nature and extent of the repertoire are probably important factors determining amount of practice.

Research on the relationship between amount of practice at a particular time and general achievement level at this time has considered a range of different instruments and age groups with varying outcomes. The different age groups and levels of expertise, lengths of time period studied as well as the variety of instruments included in the studies may partly explain why the results are different from study to study. All of the studies have found a positive correlation between amount of practice at a particular point in time and general achievement although Ericsson, Krampe and Tesch-Römer (1993) found no difference in length of weekly practice between the "best" and the "good" violin students. The difference between the "best" and "good" violinists was in amount of accumulated practice.

Ericsson et al. (1993) suggested a monotonic relationship between "deliberate practice" and an individual's acquired performance. Similarly, Sloboda et al. (1996, p. 308) stated that "We believe that we have established, beyond any reasonable doubt, that amount of relevant practice is a key variable in determination of music performance expertise." However, there are substantial individual differences in the relationship between the quantity of practice and attainment (Ericsson et al., 1993; Jørgensen, 2002; Sloboda et al., 1996) suggesting that attainment is not exclusively a question of quantity of practice, but also of quality, which is a result of individual engagement with and knowledge of practice strategies.

Several studies have related amount of current practice to more specific areas of achievement, with conflicting results. For instance, Williamon and Valentine (2000) looked at practice and performance among piano students from under 11 to more than 24 years in four levels of skill on one composition, and found that pianists at higher levels of expertise spent more time in each practice session, but that quantity of practice was not significantly related to quality of performance as rated by experienced teachers. In contrast, Wagner (1975), with college students, assessed performance on "a selection which best represented their level of musicianship at that time," and found a positive relationship between amount of practice and "level of musicianship."

Practice Time and a Single Composition

A specific issue is the time spent practicing a single composition. To date, research has focused on the memorization of piano music by professional musicians or students with high levels of expertise (Chaffin and Imreh, 1997), or pianists with a broad range of skill levels (Williamon and Valentine, 2000). The findings illustrate how time-consuming the memorization process can be, depending on the complexity of the piece. Lehmann and Ericsson (1998) studied a university student preparing for her degree recital, memorizing eight unfamiliar pieces by Haydn, Prokofiev and Debussy. She spent a total of 531 hours practicing to prepare for a concert with a total playing time of 37 minutes.

Practice Time and Assessment

Assessment, whether formal in examinations, or informal in a lesson, has an impact on practice time. Hallam (2001) reported that 95% of the novices and advanced students in her

study increased their practice time in the weeks preceding examinations. Practice activity increases as the number of lessons received increases (Sloboda et al., 1996), and there is an increase in practice time the day after a weekly lesson (Lehmann and Ericsson, 1998). Not surprisingly the quantity of practice decreases during holidays, even for students in a specialized music school (Sloboda et al., 1996).

Motivation to Practice and Drop Out

The amount of practice undertaken is one predictor of whether students will discontinue having instrumental lessons (Costa-Giomi, Flowers and Sasaki, 2005; Hallam, 1998; McPherson and Davidson, 2002; Sloboda et al., 1996), although other factors such as socioeconomic status, musical self-concept, academic and musical ability and motivation are also predictors (Hallam, 1998; Hurley, 1995). While most beginners report enjoying practicing, this declines as expertise develops (Hallam et al., 2012).

The Quality of Practice

Quality is an elusive matter. The concept of "deliberate practice" defined as goal-oriented, structured and effortful, was introduced by Ericsson et al. (1993) to address the issue of quality. They also outlined constraints which might determine the quantity and quality of practice: motivation, resources, attention. Much of the research exploring issues relating to the quality of practice has focused on the strategies that musicians adopt when practicing. Jørgensen (2004) has proposed four strategy types, that is, planning strategies, strategies for the conduct (execution) of practice, strategies to evaluate practice and metastrategies. A similar conception is that of practice as self-regulated learning (McPherson and Zimmerman, 2002), where the practitioner is recommended to engage in forethought, performance/volitional control and self-reflection.

Planning Strategies

The Organization of Practice

Instrumentalists and singers are expected to *practice regularly*. Several management strategies have been observed in relation to this. Some students in higher music education practice at the same time every day (Duke et al., 1997), while others integrate practice into a daily or weekly plan (Jørgensen, 1997). Most students, however, try to fit in practice sessions between other activities without any preconceived plan. The morning may be the best time for high levels of concentration (Lehmann and Ericsson, 1998). Ericsson et al. (1993) found that conservatoire students at the highest levels of expertise practiced in the morning, took naps in the afternoon, and then put in more practice in the evening. For novice students the regularity of practice may be more related to one specific day a week (Hallam, 2001), or a

specific period of the day, that is, "before bedtime" (Pitts and Davidson, 2000). Sloboda et al. (1996) showed that the students in a selective specialist music school distributed their repertory practice evenly to morning, afternoon and evening sessions. Studies have shown some overnight gain in performance speed and accuracy, but that the overnight consolidation of new skill memories is susceptible to interference from similar tasks (Allen, 2012; Simmons and Duke, 2006).

Practice may be most effective when it is organized in a sequential and logical manner (Barry, 1992). At the start of practice sessions many musicians use warm-up exercises, although there is considerable individual variation in the extent to which these are perceived to be necessary (Hallam, 1995a). Technical exercises often follow with repertory work left until last (Duke, Flowers and Wolfe, 1997). For conservatoire students, there are pronounced differences between instruments in the relative amount of warming up exercises, technical work and repertory practice (Jørgensen, 1998).

Setting Goals and Adopting Effective Practice Strategies

Ericsson et al. (1993) concluded that a well-defined task was one of four requirements for effective learning through practice, although the evidence suggests that novices and more accomplished students often fail to formulate goals for practice activities and mastering specific tasks (Jørgensen, 1998). Finding that the adoption of a range of effective practice strategies was not a statistically significant predictor of level of expertise among students ranging in level from beginners to the level required for entry to higher education conservatoires, but that the lack of ineffective practicing strategies was a relatively strong predictor, Hallam et al. (2012) concluded that we needed to know more about how the organization of practice contributes to the quality of expertise.

Musicians seem to approach practicing particular repertoire in different ways. Miklaszewski (1995) observed that professional musicians spent a much shorter time learning a late romantic miniature than three contemporary variations. Lehmann and Ericsson (1995) suggested that the increasing technical demands of twentieth-century music had influenced the nature of practice. Research on sight-reading and improvisation suggests that time spent engaged in these activities is the key element in their development to expert levels (see Lehmann and Kopiez, Chapter 34, this volume).

Developing Interpretation

A specific task in formulating goals is the "performance plan," and the way interpretation is planned and developed through practice sessions. Some musicians plan interpretation at the outset, based on a study of the score or from ideas gleaned from listening to a wide range of music and different interpretations of the same piece (Hallam, 1995b; Lisboa, Williamon, Zicari and Eiholzer, 2005), primarily letting the expressive ideas guide the technical work (Chaffin, Imreh, Lemiux and Chen, 2003). A second approach is to develop a performance plan after mastering most of the technical challenges (Nielsen, 2001). A study of conservatoire students showed that more than 40% considered themselves to be the primary source for an interpretation. They wanted to communicate something personal, especially feelings and emotions (Lindström, Juslin, Bresin and Williamon, 2003)

Strategies for the Conduct of Practice

Variable Practice

Schema theory suggests that motor programs, including those required for playing a musical instrument, are strengthened by increased variability in practice (for instance, practicing a passage with different articulations, at different tempi, or a technique using different examples), rather than repetition of the same actions. This facilitates transfer to other tasks (Schmidt, 1976). The evidence for the effectiveness of this is mixed (see Hallam, 1997c for a review).

Part–Whole Strategies

Particularly relevant to the acquisition of musical skill is the question of *part–whole transfer* of training. Given a reasonably short piece of music to practice, observational studies have shown that many novice pupils play through the music without stopping to focus on difficult sections, and usually repeat the whole piece several times (see Hallam 1997b; Renwick and McPherson, 2002). Some novice and advanced students use a combined approach, starting with the whole and stopping to practice difficult sections en route (Hallam 1997b; Miklaszewski, 1989). This gives the performer an overview of the music, and the opportunity to identify and select parts which require more intense work while relating the parts to longer sections or the whole (Chaffin and Imreh, 1997; Nielsen, 1999). Sections for concentrated work are selected on the basis of a range of criteria including those relating to the formal structure and motor aspects of the performance (Miklaszewski and Sawicki, 1992), new or related elements (Nielsen, 1999) and the visual layout of the music and its harmonic progression (Holmes, 2005; Williamon and Valentine, 2000). As practice progresses and the music is increasingly mastered technically, the sections worked on become longer (Chaffin and Imreh, 1997; Nielsen, 1999), although attention to detail and work on small sections may continue throughout practice sessions. It is clear from these examples that the relationship between practicing a piece in its entirety, focusing on parts, and mastery is complex. For different tasks, whole or part strategies may be more appropriate.

Transfer of Learning

Exercises are sometimes used to address *specific challenges* within a given composition (Hallam, 1995a; Nielsen, 1999), but the alternative and more common solution is to practice difficult sections within the music being learnt. Transfer of learning in music needs to be considered in relation to particular tasks and different timescales. In the short term, practice seems to be most effective when it relates specifically to the task being undertaken, with the conditions for learning and performance being as similar as possible.

Strategies for Increasing Tempo

When passages need to be played at speed, Drake and Palmer (2000) observed three approaches adopted by students at different levels of expertise. Beginners tended to stick to one tempo throughout practice sessions, novices increased tempo gradually until they

reached a limit, while the most accomplished students gradually increased tempo over each practice session. Research on the efficiency of these approaches has been equivocal probably due to the ambiguity of concepts such as "slow," "fast" and "in performance tempo"; differences between beginners and experts; the way strategies relating to tempo are often combined with other strategies; and the length and complexity of music involved. Since the adoption of these strategies involves motor and muscular considerations, the observation by Altenmüller and Schneider (2009) that fast and slow speeds of movement are controlled by different motor programs is important.

Mental Practice

Mental practice, where the learner thinks through the procedures without actually playing, has been compared with playing practice in several studies, with conflicting results (Kopiez, 1990; Ross, 1985). This is hardly surprising, taking into account: that the studies differ in the length, familiarity and complexity of the music used; that "mental strategy" has been operationalized differently; that the length of time using the strategies has differed; and that familiarity with the use of mental strategies has varied between those taking part in the studies. When mental practice and physical practice on a task is compared, mental practice is usually found to be less effective than physical practice. However, research in sports indicates that mental practice gives time for muscles and body to rest, and that the effect of mental practice is stronger the more the task involves cognitive elements. The conclusion by Ross (1985), that a combination of mental and physical practice is most effective because mental practice allows concentration on the cognitive aspects of music performance without the distractions of exercising motor control, is probably sound.

Strategies for Preparing for Performance

Even if the music is well prepared, performance anxiety may jeopardize all prior efforts, particularly where the performer has to play from memory. The most common strategy for overcoming performance nerves is to be well prepared and overlearn, investing more time than is required for basic mastery (Lehman and Ericsson, 1998) (see Altenmüller and Furuya, Chapter 33, Lehmann and Kopiez, Chapter 34, and Chaffin, Demos and Logan, Chapter 35, this volume, for issues relating to planning, memorization and anxiety).

Strategies to Evaluate Practice

Monitoring the Effectiveness of Practice

Monitoring the effectiveness of practice requires that appropriate schemata against which to evaluate progress are developed. Many inexperienced learners when practicing a new piece leave errors uncorrected (Hallam, 1997a), although beginners report high levels of recognition of errors. This recognition decreases as improved internal schemata against which to assess learning are developed but rises as expertise increases (Hallam et al., 2012). Monitoring skills need to be developed until at expert level current information about progress can be utilized to develop more sophisticated mental representations. Several external

remedies and techniques have been used in the process of developing schemata. Some studies have reported that using a recording of the music is an efficient strategy while others have found no such effect (see Jørgensen and Hallam, 2009). Students report making greater use of recordings as their expertise develops, of pieces to be learned and of themselves playing (Hallam et al., 2012) suggesting that the latter are used to evaluate progress and performance. Training students to self-evaluate performance or formalize the process appears to have no greater benefit to performance than normal practicing (Hewitt, 2011), although this may depend on learners' existing self-regulation skills.

Metastrategies

Metacognitive strategies are concerned with the planning, monitoring and evaluation of learning. There are considerable differences between beginners, novices and experts in their knowledge and deployment of different practicing and self-regulating strategies (Hallam, 1997b; Pitts and Davidson, 2000; Pitts, Davidson and McPherson, 2000) as well as individual differences among musicians and novices at the same level of competence (Austin and Berg, 2006; Nielsen, 1999, 2001). Hallam (1997b) demonstrated that professional musicians had well-developed metacognitive skills, including self-awareness of strengths and weaknesses, extensive knowledge regarding the nature of different tasks and what would be required to complete them satisfactorily, and strategies which could be adopted in response to perceived needs. This encompassed technical matters, interpretation and performance and issues relating to learning itself, concentration, planning, monitoring and evaluation. Novices demonstrated less metacognitive awareness. Knowledge about learning is related to the adoption of more effective practicing strategies (Miksza, Prichard and Sorbo, 2012) and there are also relationships between beliefs about metacognition, the nature of knowledge and conceptions of musical ability. Students holding complex beliefs about the nature of learning are more likely to use elaboration, organization and metacognitive strategies, while those who believe that ability is fixed are less likely to adopt metacognitive and effort regulation strategies (Nielsen, 2012). Constructive, expedient and impetuous learning patterns have also been identified, the latter frequently leading to lack of progress or failure (StGeorge, Holbrook and Cantwell, 2012).

High levels of concentration and focus are crucial for effective practice and seem to depend on individual differences (Miksza, 2011b) rather than increasing expertise (Hallam et al., 2012), although it is possible to reduce distraction in practicing by raising awareness of it as it occurs (Madsen and Geringer, 1981). Nielsen (2001) suggests that students can enhance self-guidance by covertly or overtly describing how to proceed, giving comments on progress, noting concentration lapses and changes in motivation. Focus is crucial to avoid mindless repetition.

Rehearsing in Small Groups

Research on rehearsals in small groups has shown that there is no single best strategy for rehearsing repertoire (Davidson and King, 2004), although rehearsal techniques become more effective with increasing expertise (Ginsborg, 2012). Berg (2000) found that high school student ensembles adopted four main activities: initiating, performing, orienting and

assisted learning. Seddon and Biasutti (2009) comparing rehearsals in a string quartet and a jazz sextet identified verbal and nonverbal interactions in three modes: instruction, cooperation and collaboration, and nonverbal communication as sympathetic and empathetic attunement, and empathetic creativity. When sympathetically attuned the musicians played with coherence but took no risks; when empathetically attuned they played more animatedly, took risks and challenged previously rehearsed interpretations. Empathetic creativity was in evidence when a novel musical variation developed. Adoption of the cooperative mode was related to cohesive performance, while the collaborative mode facilitated creativity. While group cohesiveness centers on the music in the long term it needs to be underpinned by strong social frameworks (for a full review see Davidson and King, 2004).

The Role of the Learning Environment in Practice

The impact that institutional learning environments have on practice has been little studied. Papageorgi et al. (2010) comparing students in different higher education institutions pursuing different programs of study found no differences in approaches to practicing. At conservatoire level in Norway, Jørgensen (1997) reported that music education students and church music students practiced more than expected, probably due to the predominant performance values in a conservatoire.

Instrumental teachers may influence practice although research on the way that they teach about practicing has had mixed results. Jørgensen (2000), in research with beginning conservatoire students in Norway, reported that 40% indicated that their previous teachers had invested "little" or "no" effort in teaching them how to practice. However, in the United States, teachers have reported that they always or almost always include instructions about practice in their lessons (Barry and McArthur, 1994). Students do seem to be able to learn how to use expert practicing strategies (Barry, 1992) and having done so report more positive attitudes towards practicing, are more likely to engage in practice planning and problem identification, are better able to select appropriate performance goals and are able to formulate more cognitively complex goals (Kenny, 1992). This suggests that there can be benefits in teaching about practice.

Conclusion

Over the last 30 years our understanding of the nature of practice and its importance in the development of expertise has increased enormously. We know that both the quantity and quality of practice contribute to the level of expertise attained and that the individual's ability to adopt more effective practicing strategies is inextricably linked with their level of expertise. There has also been recognition that musicians exhibit considerable diversity in the ways that they practice and that these can lead to equally successful outcomes. Despite the considerable progress made there are still areas where we know relatively little. In relation to the quantity of practice there is a need for more studies that address the interaction

between instrument, age, level of expertise and amount of practice within a range of different contexts. In relation to the quality of practice there is a need for studies exploring the following:

- How practice plans and goals are formulated and the way that these influence practice and subsequently performance.
- Skill transfer between warming up exercises, technical studies and repertory practice and the impact of these on performance.
- The effectiveness of aural models of what is to be learned and other types of feedback.
- Concentration in practice, and how self-regulating techniques and metacognitive skills can be developed.
- The relationships between learning approaches, motivation and practice efficiency.
- How best to teach practice strategies at all levels of expertise.
- The way that social interaction in groups, including nonverbal communication, affects performance.
- The ways in which practice is undertaken on a variety of different tasks, for example, sight reading, improvisation and in different genres, for example, popular music, jazz and world musics.

Such research will not only increase our understanding but also contribute towards enhancing learning and teaching.

References

Allen, S.E. (2012). Memory stabilization and enhancement following musical practice. *Psychology of Music*, *41*(6), 794–803.

Altenmüller, E. and Schneider, S. (2009). Planning and performance. In S. Hallam, I. Cross and M. Thaut (Eds.), *The Oxford handbook of music psychology* (pp. 332–343). Oxford: Oxford University Press.

Austin, J.R. and Berg, M.H. (2006). Exploring music practice among sixth grade band and orchestra students. *Psychology of Music*, *34*(4), 535–558.

Barry, N.H. (1992). The effects of practice strategies, individual differences in cognitive style, and gender upon technical accuracy and musicality of student instrumental performance. *Psychology of Music*, *20*(2), 112–123.

Barry, N.H. and McArthur, V. (1994). Teaching practice strategies in the music studio: a survey of applied music teachers. *Psychology of Music*, *22*(1), 44–55.

Berg, M.H. (2000). Thinking for yourself: the social construction of chamber music experience. In R.R. Rideout and S.J. Paul (Eds.), *On the sociology of music: Vol. 2. Papers from the Music Education Symposium at the University of Oklahoma* (pp. 91–112). Amherst, MA: University of Massachusetts Press.

Chaffin, R. and Imreh, G. (1997). Pulling teeth and torture: musical memory and problem solving. *Thinking and Reasoning*, *3*(4), 315–336.

Chaffin, R., Imreh, G., Lemieux, A. and Chen, C. (2003). Seeing the big picture: piano practice as expert problem solving. *Music Perception*, *20*(4), 465–490.

Chaffin, R. and Lemieux, A.F. (2004). General perspectives on achieving musical excellence. In A. Williamon (Ed.), *Musical excellence: Strategies and techniques to enhance performance* (pp. 19–40). Oxford: Oxford University Press.

Costa-Giomi, A., Flowers, P.J. and Sasaki, W. (2005). Piano lessons of beginning students who persist or drop out: teacher behaviour, student behaviour, and lesson progress. *Journal of Research in Music Education*, *53*(3), 234–247.

Davidson, J. and King, E.C. (2004). Strategies for ensemble practice. In A. Williamon (Ed.), *Musical excellence* (pp. 105–122). Oxford: Oxford University Press.

Drake, C. and Palmer, C. (2000). Skill acquisition in music performance: relations between planning and temporal control. *Cognition*, *74*(1), 1–32.

Duke, R.A., Flowers, P.J, and Wolfe, D.E. (1997). Children who study with piano with excellent teachers in the United States. *Bulletin of the Council for Research in Music Education*, *132*, 51–84.

Ericsson, K.A., Krampe, R.T. and Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review*, *100*(3), 363–406.

Ginsborg, J. (2012). Rehearsal talk: familiarity and expertise in singer-pianist duos. *Musicae Scientiae*, *16*(2), 148–167.

Hallam, S. (1995a). Professional musicians' orientations to practice: implications for teaching. *British Journal of Music Education*, *12*(1), 3–19.

Hallam, S. (1995b). Professional musicians' approaches to the learning and interpretation of music. *Psychology of Music*, *23*(2), 111–128.

Hallam, S. (1997a). The development of memorisation strategies in musicians: implications for instrumental teaching. *British Journal of Music Education*, *14*(1), 87–97.

Hallam, S. (1997b). Approaches to instrumental music practice of experts and novices: implications for education. In H. Jørgensen and A. Lehman (Eds.), *Does practice make perfect? Current theory and research on instrumental music practice* (pp. 89–108). Oslo: Norges Musikkhøgskole.

Hallam, S. (1997c). What do we know about practising? Towards a model synthesising the research literature. In H. Jørgensen and A. Lehman (Eds.), *Does practice make perfect? Current theory and research on instrumental music practice* (pp. 179–231). Oslo: Norges Musikkhøgskole.

Hallam, S. (1998). Predictors of achievement and drop out in instrumental tuition. *Psychology of Music*, *26*(2), 116–132.

Hallam, S. (2001). The development of expertise in young musicians: strategy use, knowledge acquisition and individual diversity. *Music Education Research*, *3*(1), 7–23.

Hallam, S., Rinta, T., Varvarigou, M., Creech, A., Papageorgi, I., Gomes, T. and Lanipekun, J. (2012). The development of practicing strategies in young people. *Psychology of Music*, *40*, 652–680.

Hewitt, M.P. (2011). The impact of self-evaluation instruction on student self-evaluation, music performance, and self-evaluation accuracy. *Journal of Research in Music Education*, *59*(1), 6–20.

Holmes, P. (2005). Imagining in practice: a study of the integrated roles of interpretation, imagery and technique in the learning and memorization process of two experienced solo performers. *British Journal of Music Education*, *22*(3), 217–235.

Hurley, C.G. (1995). Student motivations for beginning and continuing/discontinuing string music tuition. *The Quarterly Journal of Music Teaching and Learning*, *6*, 44–55.

Jørgensen, H. (1997). Time for practicing? Higher level students' use of time for instrumental practicing. In H. Jørgensen and A.C. Lehmann (Eds.), *Does practice make perfect? Current theory and research on instrumental music practice* (pp. 123–140). Oslo: Norges Musikkhøgskole.

Jørgensen, H. (1998). *Planlegges øving?* [Is practice planned?] Oslo: Norwegian Academy of Music.

Jørgensen, H. (2000). Student learning in higher instrumental education: who is responsible? *British Journal of Music Education*, *17*(1), 67–77.

Jørgensen, H. (2001). Instrumental learning: is an early start a key to success? *British Journal of Music Education*, *18*(3), 227–239.

Jørgensen, H. (2002). Instrumental performance expertise and amount of practice among instrumental students in a conservatoire. *Music Education Research*, *4*(1), 105–119.

Jørgensen, H. (2004). Strategies for individual practice. In A. Williamon (Ed.), *Musical excellence* (pp. 85–104). Oxford: Oxford University Press.

Jørgensen, H. and Hallam, S. (2009). Practising. In S. Hallam, I. Cross and M. Thaut (Eds.), *The Oxford handbook of music psychology* (pp. 265–273). Oxford: Oxford University Press.

Kenny, W.E. (1992). *The effect of metacognitive strategy instruction on the performance proficiency and attitude toward practice of beginning band students*. (Unpublished doctoral dissertation.) University of Illinois, Urbana-Champaign, IL.

Kopiez, R. (1990). *Der Einfluss kognitiver Strukturen auf das Erlernen eines Musikstucks am Instrument.* [*The influence of cognitive structures on the learning of instrumental music*.] Frankfurt: Peter Lang.

Krampe, R.T. (1994). *Maintaining excellence: Cognitive-motor performance in pianists differing in age and skill level*. Studien und Berichte /MPI für Bildungsforschung, 58. Berlin: Sigma.

Lammers, M. and Kruger, M. (2006). Brass and woodwind student practice habits in Norway, Japan and the United States. *NACWPI Journal*, *54*, 4–13.

Lehmann, A.C. and Ericsson, K.A. (1995). *The relationship between historical constraints of musical practice and increase of musicians' performance skills*. Paper presented at the 7th European Conference on Developmental Psychology, Poland, 23–27 August 1995.

Lehmann, A.C. and Ericsson, K.A. (1998). Preparation of a public piano performance: the relationship between practice and performance. *Musicae Scientae*, *2*(1), 67–94.

Lindström, E., Juslin, P.N., Bresin, R. and Williamon, A. (2003). "Expressivity comes from within your soul": a questionnaire study of music students' perspectives on expressivity. *Research Studies in Music Education*, *20*, 23–47.

Lisboa, T., Williamon, A., Zicari, M. and Eiholzer, H. (2005). Mastery through imitation: a preliminary study. *Musicae Scientiae*, *19*(1), 75–110.

Madsen, C.K. (2005). A 30-year follow-up study of actual applied music practice versus estimated practice. *Journal of Research in Music Education*, *52*(1), 77–88.

Madsen, C.K. and Geringer, J.M. (1981). The effect of a distraction index on improving practice attentiveness and musical performance. *Bulletin of the Council for Research in Music Education*, *66–67*, 46–52.

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. and Davidson, J. (2002). Musical practice: mother and children interactions during the first year of learning an instrument. *Music Education Research*, *4*(1), 141–156.

McPherson, G.E. and Zimmerman, B.J. (2002). Self-regulation of musical learning. In R. Colwell and C. Richardson (Eds.), *The new handbook of research on music teaching and learning* (pp. 348–372). Oxford: Oxford University Press.

Miklaszewski, K. (1989). A case study of a pianist preparing a musical performance. *Psychology of Music*, *17*(1), 95–109.

Miklaszewski, K. (1995). Individual differences in preparing a musical composition for public performance. In M. Manturzewska, K. Milaszewski and A. Bialkowski (Eds.), *Psychology of music today: Proceedings of the International Seminar of Researchers and Lecturers in the Psychology of Music* (pp. 138–147). Warsaw: Fryderyk Chopin Academy of Music.

Miklaszewski, K. and Sawicki, L. (1992). Segmentation of music introduced by practicing pianists preparing compositions for public performance. In R. Dalmonte and M. Baroni (Eds.), *Secudo Convegno Europeo di Analasi Musicale* [*Proceedings of the Second European Conference on Musical Analysis*] (pp. 113–121). Trento: University of Trento Press.

Miksza, P. (2011a). A review of research on practicing: summary and synthesis of the extant research with implications for a new theoretical orientation. *Bulletin of the Council for Research in Music Education*, *190*, 51–92.

Miksza, P. (2011b). Relationships among achievement goal motivation, impulsivity and the music practice of collegiate brass and woodwind players. *Psychology of Music*, *39*(1), 50–67.

Miksza, P., Prichard, S. and Sorbo, D. (2012). An observational study of intermediate band students' self-regulated practice behaviours. *Journal of Research in Music Education*, *60*(3), 254–266.

Nielsen, S.G. (1999). Learning strategies in instrumental music practice. *British Journal of Music Education*, *16*(3), 275–291.

Nielsen, S.G. (2001). Self-regulating learning strategies in instrumental music practice. *Music Education Research*, *3*(2), 155–167.

Nielsen, S.G. (2012). Epistemic beliefs and self-regulated learning in music students. *Psychology of Music*, *40*(3), 324–338.

Papageorgi, L.E., Haddon, A., Creech, A., Morton, F., de Bezenac, C., Himonides, E., ... Welch, G.F. (2010). Institutional culture and learning 1. Perceptions of the learning environment musicians' attitudes to learning. *Music Education Research*, *12*(2), 151–178.

Pitts, S. and Davidson, J. (2000). Developing effective practising strategies: case studies of three young instrumentalists. *Music Education Research*, *2*(1), 45–56.

Pitts, S.E., Davidson, J.W. and McPherson, G.E. (2000). Models of success and failure in instrumental learning: case studies of young players in the first 20 months of learning. *Bulletin of the Council for Research in Music Education*, *146*, 51–69.

Renwick, J.M. and McPherson, G.E. (2002). Interest and choice: student-selected repertoire and its effect on practicing behaviour. *British Journal of Music Education*, *19*(2), 173–188.

Ross, S.L. (1985). The effectiveness of mental practice in improving the performance of college trombonists. *Journal of Research in Music education*, *33*(4), 221–230.

Schmidt, R.A. (1976). The schema as a solution to some persistent problems in motor learning theory. In G.E. Stelmach (Ed.), *Motor control: Issues and trends* (pp. 41–65). New York: Academic Press.

Seddon, F. and Biasutti, M. (2009). A comparison of models of communication between members of a string quartet and a jazz sextet. *Psychology of Music*, *37*(4), 395–415.

Simmons, A.L. and Duke, R.A. (2006). Effects of sleep on performance of a keyboard melody. *Journal of Research in Music Education*, *54*(3), 257–269.

Sloboda, J.A., Davidson, J.W., Howe, M.J.A. and Moore, D.G. (1996). The role of practice in the development of performing musicians. *British Journal of Psychology*, *87*, 287–309.

Sosniak, L.A. (1985). Learning to be a concert pianist. Developing talent in young people. In B.S. Bloom (Ed.), *Developing talent in young people* (pp. 19–67). New York: Ballantine.

StGeorge, J.M., Holbrook, A.P. and Cantwell, R.H. (2012). Learning patterns in music practice: links between disposition, practice strategies and outcomes. *Music Education Research*, *14*(2), 243–263.

Wagner, C. (1988). The pianist's hand: anthropometry and biomechanics. *Ergonomics*, *31*, 97–131.

Wagner, M.J. (1975). The effect of a practice report on practice time and musical performance. In C.K. Madsen, R.D. Greer and C.H. Madsen Jr (Eds.), *Research in music behaviour* (pp. 125–130). New York: Teachers College Press.

Williamon, A. and Valentine, E. (2000). Quantity and quality of musical practice as predictors of performance quality. *British Journal of Psychology*, *91*, 353–376.

CHAPTER 29

INDIVIDUALITY IN THE LEARNING OF MUSICAL SKILLS

HELENA GAUNT AND SUSAN HALLAM

Introduction

The potential for individual differences in musicians is very great, in part because of the diversity of the music profession, which includes musicians who make music in a wide range of different genres; in different combinations; who teach, compose, and arrange music and contribute in various ways to its technological production; and who write about, analyze and critique music. Musicians also work in different musical cultures which impact on them in terms of the nature of the music itself; the kinds of behavior associated with making, teaching and listening to it; and ideas about music and its place in society. Different genres are also associated with different expectations of performance from those where participation is regarded as normal for all players to those where only the most expert and technically able perform. The speed of technological change has also impacted on musicians in different ways depending on their genre and specialism. Many digital devices now support music sound files, and software is available to support editing, notation, graphics-based composition, CD/DVD creation, video/podcast presentations, teaching and learning (Webster, 2011) in addition to the many developments in interactive musical networking communities (Webb and Seddon, 2012).

Historically, research concerned with individual differences in music has tended to focus on how musicians as a group differ from nonmusicians, and the key characteristics which differentiate between musicians including those relating to sex, physiology, age, personality, cognitive and learning styles, approaches to learning music and musical ability (see McPherson and Hallam, Chapter 27, this volume for a consideration of musical potential). While these issues are still of interest, advances in neuroscience which have demonstrated the plasticity of the brain (Altenmuller, 2003), genetic research which acknowledges the importance of the environment in determining behavior and in modifying gene behavior (Byrd and Manuck, 2014) and ecological and biosocial theoretical frameworks which

suggest that individual and environmental characteristics interact in a reiterative manner (Bronfenbrenner, 1979; Hettema and Kenrick, 1992) all suggest that new approaches to considering individuality are needed.

The Interactionist Approach

Gaunt and Hallam (2009) developed a model to map the complexity of interactions informing the individual's development of musical skills. This drew on Bronfenbrenner's (1979) ecological model of human behavior and Hettema and Kenrick's (1992) biosocial model of interactions. Bronfenbrenner's systems model conceptualized interactions and interdependence between a microsystem (an individual and their immediate environment), a mesosystem (referring to the individual's interactions in a wider group of settings) and an exosystem (where the individual does not interact with others directly but in which another person close to the individual interacts). In addition, the model identifies a macrosystem encompassing the subculture in which particular beliefs, values and ideologies of the lower-order systems are embodied. Hettema and Kenrick's biosocial model of development outlined six categories of interaction and their impact: static person–environment mesh (the individual is situated in an unchanging environment); choice of environments by persons (the individual selects new environments which meet his/her needs); choice of persons by environments (typified by a variety of selection processes, for instance, in education and the workplace); transformation of environments by persons (individuals through their actions change environments, for instance, through leadership or disruption); transformation of persons by environments (individuals are socialized into new environments); and person–environment transactions or mutual transactions in which both persons and environments change over time (Hettema and Kenrick, 1992). Each category represents different degrees of fit and influence between the individual and the environment. Combining this model with Bronfenbrenner's systems approach, Gaunt and Hallam have highlighted a dynamic set of relationships between the individual and their environment, with multilayered factors involved in the acquisition of musical skills and at times mutually transformative interactions that stimulate both individual musical development and transformation of the musical environment. Figures 29.1 to 29.3 set out how these might develop in a teenager learning the guitar. Figure 29.1 sets out the relevant macro, meso and exo systems. Figure 29.2 sets out in more detail how the interactions might operate taking account of the specific areas where there might be fit or difference between the elements within each system. Figure 29.3 indicates how these interactions might develop over time.

Much of the research exploring individuality has neglected to consider the dynamic interactions between the individual and his/her environment which influence behavior. As Figure 29.3 suggests, there is a need to reconceptualize the way we think about individuality in musicians and the way that the environment influences individuals' musical journeys and identities (see also Hargreaves, MacDonald and Dorothy Miell, Chapter 46, this volume). In the following sections, using different life-periods as a framework and drawing on existing research, we will attempt to illustrate how such a reconceptualization might be taken forward.

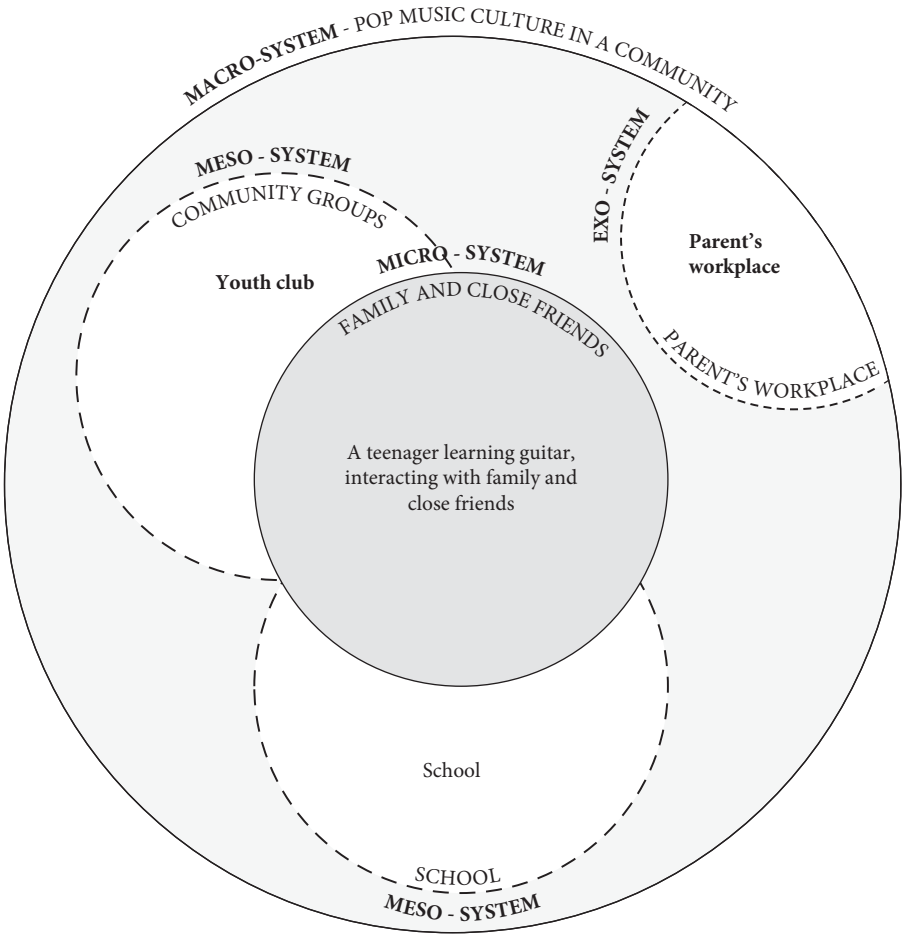

FIGURE 29.1 Possible macro, meso and exo systems for a teenager learning to play the guitar.

(Adapted from Hettema J and Kenrick DT, "Models of person-situation interactions," In GV Caprara and GL Van Heck, (eds.), *Modern personality psychology: critical reviews and new directions*, pp. 393–417, Harvester Wheatsheaf, New York © 1992, The Authors.)

Early Years and the Home Environment

The implicit musical knowledge which adults acquire over time is built on structures present in infancy. These provide the basis for perceptual learning and enculturation, the process by which the child develops internal schemata of the music of its culture. This process is mediated by the learning environment and begins when the fetus is in the womb (see Parncutt, Chapter 23, this volume). In early infancy, parents and the family play a crucial role in musical enculturation through preverbal quasimusical interactions and the singing of lullabies and other songs (see Adachi and Trehub, 2012). Infants are similar to adults in their sensitivity to the pitch and rhythmic grouping of sounds but the tonal framework of their culture

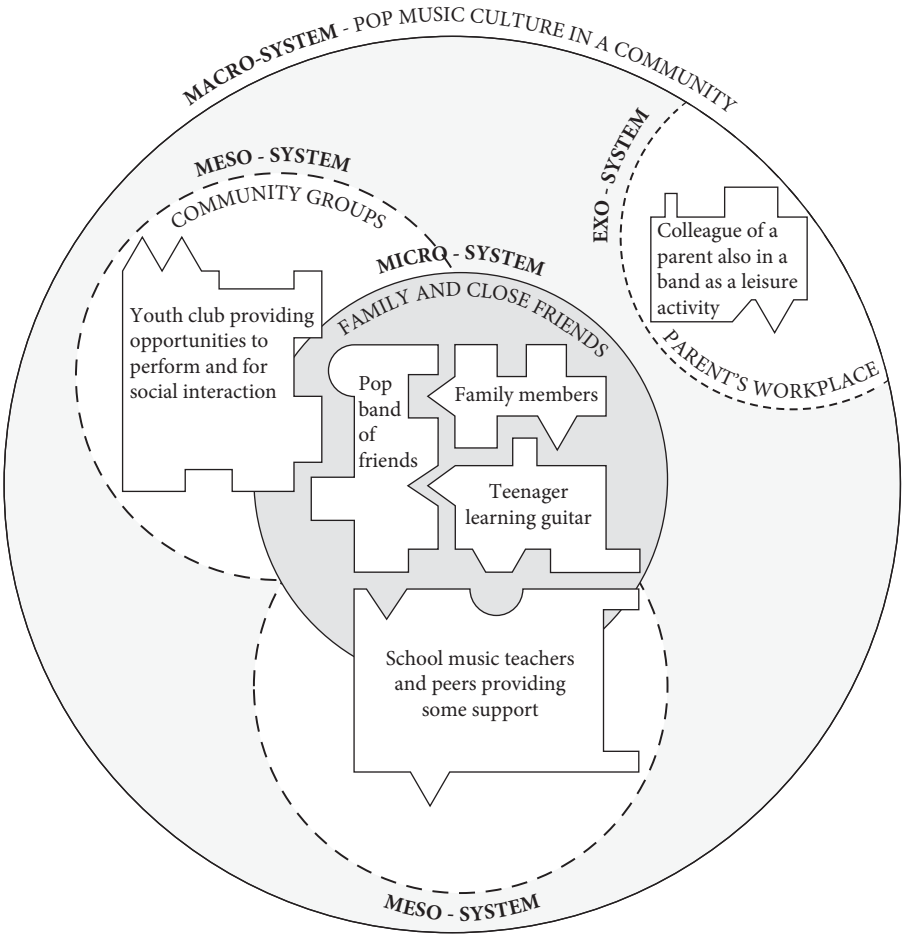

FIGURE 29.2 Systemic and bio-social developmental interactions for a teenager learning to play the guitar.

needs to be learned (see Bigand and Poulin-Charronnat, Chapter 7, this volume). This takes time to develop and depends on the type and extent of exposure to music of any particular child, although by the age of 5 most children in Western cultures can sing songs around stable tonal keys. However, this does not mean that they can distinguish similar pitch differences from other cultures, for instance, within the Javanese pelog scale (Lynch, Eilers, Oller and Urbano, 1990). The environment influences the development of singing. Children with musically enriched environments learn to sing in tune earlier (Tafuri, 2009). Such environments are more likely to be provided by parents with higher educational levels. First-born children may also be advantaged as they benefit from more singing interactions than their later-born siblings (Custodero, Britto and Brooks-Gunn, 2003). The extent of musical exposure also supports the transformation of musical representations. Using relative pitch cues seems to depend on how familiar the infant is with the piece of music (Schellenberg and Trehub, 1999).

Overall, we know relatively little about individual differences in the early years as most research has focused on musical development at a species level. Retrospective evidence

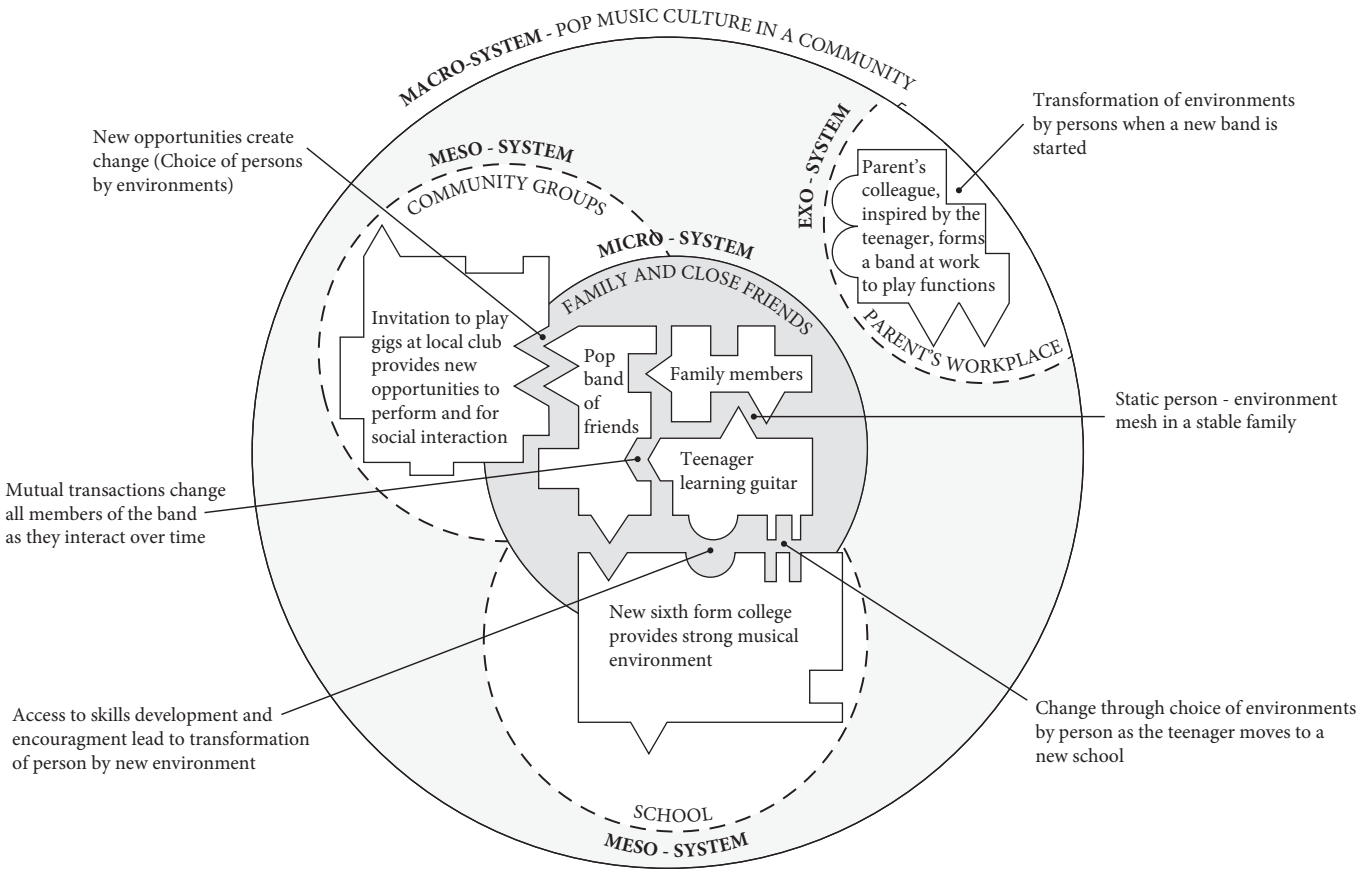

FIGURE 29.3 Changes within systems as the teenager develops increasing musical expertise.

suggests that children who go on to develop high levels of musical expertise tend to be early singers (Davidson, Howe, Moore and Sloboda, 1996), frequently begin to play an instrument when very young (see Jørgensen and Hallam, Chapter 28, this volume), show a strong interest in music (McPherson, 2007) and have parents who are supportive, recognize their accomplishments and provide an enriched musical environment (Hallam, 2015).

The School Years

During the school years, developing musical identities are established or reinforced through formal education and extracurricular activities, including those available through social media where a wide range of musical expertise is accessible for children to observe, emulate and share with peers.

Musical opportunities available within formal education systems vary internationally and locally. In some countries, music is taught by generalists at the elementary level (see Jeanneret and Degraffenreid, 2012) whereas in others, music is taught by specialists. At secondary level, music is more frequently taught by specialists but curriculum content differs depending on national curricula, option choices or the skills of the teacher (see Hargreaves and North, 2001). The musical opportunities available inevitably influence what is learned and how it is learned, contributing to each child's musical journey and distinctive identity. Some children also have the opportunity for individual or small-group instrumental lessons (see Hallam and Creech, 2010).

Choice of Instrument

Where children have the opportunity to learn to play an instrument, the nature of that instrument contributes to the development of a specific musical identity. Some children are able to select their instrument, although teachers may manipulate the pool of instruments available or use demonstrations to influence choice (Bayley, 2004). Others' choices may be restricted by availability or cost, while size, appearance and familiarity through the media are all influential (de Vous, 2011). Instruments make different physiological demands both in terms of how a basic sound is produced and the coordination required to play patterns of notes. These physiological requirements can inhibit some children from taking up some instruments. The nature of the sound that a particular instrument makes is also important in its selection, as are the views of teachers, parents and friends (de Vous, 2011; Fortney, Boyle and DeCarbo, 1993). Societal influences are also evident in relation to gendered instrument choices. Early studies in Western cultures revealed that drums, trombone and trumpet tended to be played more by boys, while flute, violin and clarinet tended to be played by girls (Abeles and Porter, 1978). Despite the increasing equality of women in Western cultures, stereotypical choice of instruments has continued (Abeles, 2009; Hallam, Rogers and Creech, 2008; Sheldon and Price, 2005) although girls tend to select a wider variety of instruments to play along the feminine–masculine continuum than boys. Gendered choices also occur in non-Western cultures (Ho, 2001) and are shared by parents (Abeles and Porter, 1978; Delzell and Leppla, 1992). Presenting instruments to children aurally and visually without players

can encourage boys to select more feminine instruments (Abeles and Porter, 1978) as can changing the sex-role model playing the instrument (Bruce and Kemp, 1993). However, there can be consequences of choosing perceived gender-inappropriate instruments in terms of peer relationships (Howe and Sloboda, 1992).

Gender Differences

The gender differences seen in relation to instrument choice are reflected in other musical activities. More girls tend to take up playing an instrument than boys, although the proportions vary across studies and cultures (Hallam et al., 2008; Sheldon and Price, 2005), despite the fact that no reliable sex differences have been found in a range of measures of musical ability (Hallam, 2004; Shuter-Dyson and Gabriel, 1981). Girls tend to perform better in school music examinations (Agak, 2002), have more positive attitudes toward music and musical activities (Ho, 2009; McPherson and O'Neill, 2010), and are perceived to be interested and successful in singing, playing classical music and in dealing with notation and to have a broader listening repertoire, while boys are perceived to have greater confidence in improvisation and composition (Green, 1997). The evidence related to self-efficacy and musical competence is mixed with some studies showing girls to be more self-efficacious than boys (Eccles, Wigfield, Harold and Blumenfeld, 1993) while other studies show the reverse (Ho, 2001). These differences seem to depend on the particular musical activities being studied. Boys tend to be more interested in and confident about music when it is linked to technology (Hanley, 1998; Ho, 2001) or when musical instruments depend on technology (Hallam et al., 2008). However, when composing using computers, girls can produce equally good work although the boys show more interest (Cooper, 2007). There are gender differences in approaches to composing popular music in that boys seem to prefer to communicate through musical gestures which also accompany talking while girls separate out talking and playing (Abramo, 2011).

Through the school years, singing is increasingly designated as a feminine activity (Green, 1997; Hanley, 1998). This may be exacerbated by the changes that occur in boys' voices during adolescence which coincide with other major social, academic and physical changes. Collectively these may discourage boys from participation in group singing (Freer, 2007).

Ways of Learning

Some musical genres depend almost entirely on being able to play by ear while others, particularly Western classical music, tend to rely almost exclusively on reading from notation. Learning to play by ear enhances some aural skills in comparison with learning from notation (Baker and Green, 2013). Training in jazz or folk music supports speedier aural learning of new music through the development of a range of aural learning strategies and the application of a sophisticated body of knowledge (Woody and Lehman, 2010). Green (2012) identified four learning styles related to playing by ear—impulsive, shot in the dark, practical and theoretical—the latter two being the most effective. Differences in conceptions of learning from notation have also been identified. For some learners, typically in the early stages of learning, the focus is on accuracy; others focus on musical interpretation, with this approach increasingly adopted as expertise is developed (Marin, Perez-Echeverria and Hallam, 2012).

Alongside this, learners tend to enhance their understanding of the complexity involved in learning music and increase their personal agency (StGeorge, Holbrook and Cantwell, 2012).

Adulthood

Higher Education

Much research with adult musicians (professional and amateur) has focused on issues of musical identity. Identities are constructed and over time contested, negotiated and renegotiated as the individual interacts with others. To successfully make the transition to the music profession young people need to have strong musical identities (Bennett, 2009; Creech et al., 2008a; Smilde, 2009). During higher education, aspirations can change in response to a wide range of events. On entry to higher education young people typically aspire to careers as performers or composers. Initially, there is a dip in self-esteem, self-efficacy and motivation with an increase in anxiety. In the second year, this confidence is frequently recovered but students become more realistic in their aspirations as they are made aware of the fiercely competitive nature of the music profession (Long, 2013). For those accepting that they are not going to pursue a performing career this can have a negative impact on motivation and self-perceptions (Creech, Gaunt and Hallam, 2009; Long, 2013). The key mediators of students' renegotiation of their musical identities are comparisons made with others. During this process, students are frequently self-deprecating and highly self-critical (Juuti and Littleton, 2010). Only those with high levels of self-belief are ultimately able to cope successfully with the critical and competitive environment in the music profession (Creech et al., 2008a).

Many young people making music in nonclassical genres now progress to the music profession through higher education, although some continue to develop their skills through informal learning or self- or family tuition (Coulson, 2010). Comparisons between classical and jazz, folk and popular musicians have shown that the classical musicians have a stronger focus on excelling musically and technically, emphasizing the importance of notation and aural skills, while nonclassical musicians emphasize skills relating to memorization and improvisation (Creech et al., 2008b). Institutional ethos is important in the way that students learn and the values and beliefs that they hold, although many beliefs are held in common including those related to musical skills, perceived effort, practicing and self-regulation (Papageorgi et al., 2010).

Practice, Approaches to Learning and Interpretation

Several studies indicate that for professional musicians and those aspiring to become professionals the relationship with practice is ambivalent (Chaffin, Imreh and Crawford, 2002). The amount and type of practice undertaken is varied, depending to some extent on instrument, genre and the nature of employment (Chaffin et al., 2002; Jorgensen, 2002). Changes in life goals can also induce a reduction or increase (Krampe, 2006; Long, 2013; Olbertz, 2006).

There are also changes in approaches to learning music as expertise develops. Reid (2001) identified five conceptions from a focus on the technical aspects of learning and copying teachers to a final conception where personal meanings are expressed through music. Such changes have been identified in several studies, with a particular emphasis on changes in personal agency as students progress and an increasing recognition that technical skill is merely a means toward achieving a musical end (Bautista, Pérez Echeverría, Pozo and Brizuela, 2009; Marin, Perez-Echeverria and Scheur, 2013; Marin, Scheur and Perez-Echeverria, 2013). Students' conceptions are mediated to some extent by those of their teachers (López-Íñiguez and Pozo, 2014). Different approaches to learning emphasizing technique or musical expression continue into the music profession (Hallam, 1995). However, the approach adopted may not be related to the musical outcome as much musical knowledge, particularly that relating to phrasing and musical communication, becomes automated as expertise develops and is not available to conscious cognitive control. So adopting an analytic approach to developing interpretation, listening extensively to other music and planning interpretation in advance of practice may not produce recognizably different outcomes to adopting an intuitive approach where interpretation is developed as music is learned avoiding extensive listening to minimize undue influence on ideas (Hallam, 1995).

The Professional Musician

Professional musicians increasingly have portfolio careers participating in a wide variety of musical activities, the balance of which varies between musicians and through the lifespan. Nonclassical musicians tend to engage in very diverse activities, performing in a range of genres and environments but also composing, recording, accompanying, conducting, arranging, teaching, working as session musicians, managing, publishing, organizing events and running workshops. Many of the skills required for these activities are developed informally, through self-teaching or learning with peers, privately arranged sessions, workshops or learning from new experiences as they adapt to changing circumstances (Coulson, 2010). Whatever the nature of their employment, musicians frequently have to reconcile tensions between employability and remaining true to their artistic ideals (Smilde, 2009).

There are individual differences between professional musicians in the extent to which they may experience physical problems relating to their profession, psychological stress (Williamon, 2004) and performance anxiety (see Kenny and Ackermann, Chapter 39, this volume). While many musicians experience medical problems, the majority are preventable (for a review see Wynn Parry, 2004) and music conservatoires now inform students about the nature of prospective problems and have initiatives to help prevent them developing (see Williamon, 2004). However, the increase in retirement age in many Western countries has presented new challenges relating to arthritis and other age-related conditions (Gembris and Heye, 2012).

Pathways to careers as teachers begin in very different ways. Some musicians begin instrumental teaching when they are still students, having been asked to do so. For others, positive musical experiences as a child or adult and/or a long-standing desire to teach are strong motivators as is inspiration from a previous teacher (Haddon, 2009). Some become instrumental teachers when they experience difficulties in other careers having been enthusiastic amateur musicians (Taylor and Hallam, 2011). For those committed to a career teaching

class music, positive and varied past musical experiences are critical factors in their motivation and identity construction (Dolloff, 2007). Major reasons for selecting a school teaching career seems to be the desire to become a role model for others, enjoyment of teaching and wanting to make music fun (Jones and Parkes, 2010). In comparison with performers, class music teachers value the personal, social and communicative aspects of music rather than its intrinsic value (Hargreaves, Purves, Welch and Marshall, 2007) and the enjoyment it can bring (Georgii-Hemming, 2006).

Amateur Musicians

While amateur adult musicians are not motivated by financial rewards, for some, musical activity constitutes a serious leisure activity and their commitment shares many characteristics with professional musicians (Gates, 1991). It forms a key element of their identity with considerable investment of time and energy (Pitts, 2005; Taylor, 2010; Taylor and Hallam, 2008). As for professional musicians, interest is largely developed in childhood but frequently interrupted with the increasing demands of family life and careers. Reasons for re-engagement as these demands decline include love of music, the desire to develop skills and respond to challenge, and in some cases to meet with like-minded others (Cooper, 2001; Creech, Hallam, McQueen and Varvarigou, 2014; Taylor and Hallam, 2008). For those taking up an instrument for the first time, being able to play music rather than just listen leads to high levels of satisfaction (Perkins and Williamon, 2013), although taking up or relearning an instrument as an adult frequently presents physical challenges which can lead to frustration as lack of dexterity and control are insufficient to meet musical expectations developed through a lifetime of listening (Cope, 2002; Taylor and Hallam, 2008).

Personality

Research exploring the personality characteristics of Western classical musicians suggests that they are bold introverts who direct energy inward and appear outwardly reserved, the nature of solitary practice encouraging autonomy and independence of thought (Kemp, 1996). Differences have been identified between players of different instruments and those working in different genres (Kemp, 1996; Wills and Cooper, 1988). String players tend to be introverted, imaginative and radical, while brass players are more extraverted and have lower levels of self-discipline and intelligence in comparison to other performing groups. Percussionists also tend toward extroversion. These findings suggest that the extent of practice required for these different instruments (typically more for string players) and their role in the orchestra (more prominent for brass, wind and percussion players) either attracts people with personality characteristics suited to these roles or that these characteristics develop in response to the particular demands being made of them by their chosen roles in the music profession. More recent research, comparing classical and pop/rock musicians in terms of sensation seeking, which found higher levels in the pop/rock musicians supports the notion that particular types of music attract those with particular temperaments (Vuust et al., 2010).

Gender Differences

Men tend to dominate the music profession despite girls' success in the school years. Gendered behaviors seem to increase during the college years. For instance, more girls participate in playing jazz in high school than in college (McKeage, 2004), and band conducting programs in the United States continue to be male dominated (Sheldon and Hartley, 2012). The adoption of less dominant roles for females is illustrated by attitudes toward master classes which young women view as opportunities for hearing others play, an approach less in evidence in the young men. Females are also more critical of the "master's" lack of rapport with the audience and the limited extent of constructive criticism (Long, Hallam, Creech, Gaunt and Robertson, 2012).

Conclusion

This chapter has set out a broader conceptualization of individuality in musicians than has previously been the case. It has stressed the importance of individual interactions within musical and wider environments in determining identity and behavior throughout the lifespan, and has highlighted ways in which diverse experiences may be transformative, both for an individual and for the environments they influence, directly or indirectly. This conceptualization clearly indicates the extent to which contemporary developments, for example, through technology and the access this provides to music-making, or through cultural diasporas and the ways in which these cross-pollinate musical genres and their pedagogical underpinnings, are creating increasing complexity in how people learn musical skills. This means that there is a real need for more research that takes account of a fuller picture of diverse musical communities and wider societal factors that inform and transform individuality in musical learning.

References

Abeles, H. (2009). Are musical instrument gender associations changing? *Journal of Research in Music Education*, *57*(2), 127–139.

Abeles, H.F. and Porter, S.Y. (1978). The sex-stereotyping of musical instruments. *Journal of Research in Music Education*, *26*, 65–75.

Abramo, J.M. (2011). Gender differences of popular music production in secondary schools. *Journal of Research in Music Education*, *59*(1), 21–43.

Adachi, M. and Trehub, S.E. (2012). Musical lives of infants In G.E. McPherson and G.F. Welch (Eds.), *The Oxford handbook of music education* (Vol. 1) (pp. 229–247). Oxford: Oxford University Press.

Agak, H. (2002). Gender difference and academic achievement in music among form four students in Kenya 1991–1994. *Bulletin of the Council for Research in Music Education*, *153*, 94–101.

Altenmuller, E.O. (2003). How many music centres are in the brain? In I. Peretz and R. Zatorre (Eds.), *The cognitive neuroscience of music* (pp. 346–356). Oxford: Oxford University Press.

Baker, D. and Green, L. (2013). Ear playing and aural development in the instrumental lesson: results from a case-control experiment. *Research Studies in Music Education*, *35*(2), 141–159.

Bautista, A., Pérez Echeverría, M.P., Pozo, J.I. and Brizuela, B.M. (2009). Piano students' conceptions of musical scores as external representations: a cross-sectional study. *Journal of Research in Music Education*, *57*(3), 181–202.

Bayley, J.G. (2004). The procedure by which teachers prepare students to choose a musical instrument. *UPDATE: Applications of Research in Music Education*, *22*(2), 23–34.

Bennett, D. (2009). *Understanding the classical music profession: The past, the present and strategies for the future*. Aldershot: Ashgate.

Bronfenbrenner, U. (1979). *The ecology of human development*. Cambridge, MA: Harvard University Press.

Bruce, R. and Kemp, A. (1993). Sex stereotyping in children's preferences for musical instruments. *British Journal of Music Education*, *10*, 213–217.

Byrd, A.L. and Manuck, S.B. (2014). MAOA, childhood maltreatment, and antisocial behavior: meta-analysis of a gene-environment interaction. *Biological Psychiatry*, *75*(1), 9–17.

Chaffin, R., Imreh, G. and Crawford, M. (2002). *Practicing perfection: Memory and piano performance*. New York: Laurence Erlbaum Associates.

Cooper, L. (2007). The gender factor: teaching composition in music technology lessons to boys and girls in year 9. In J. Finney and P. Burnard (Eds.), *Music education with digital technology* (pp. 30–40). London: Continuum International Publishing Group.

Cooper, T.L. (2001). Adults' perceptions of piano study: achievements and experiences. *Journal of Research in Music Education*, *49*(2), 156–168.

Cope, P. (2002). Informal learning of musical instruments: the importance of social context. *Music Education Research*, *4*, 93–104.

Coulson, S. (2010). Getting "capital" in the music world: musicians' learning experiences and working lives. *British Journal of Music Education*, *27*(3), 255–270.

Creech, A., Gaunt, H. and Hallam, S. (2009). *Plans and aspirations of young musicians: An investigation into aspirations and self-perceptions in the conservatoire*. Paper presented at the Reflective Conservatoire Conference 2009, London.

Creech, A., Hallam, S., McQueen, H. and Varvarigou, M. (2014). *Active ageing with music: Supporting wellbeing in the third and fourth Ages*. London: IOE Press.

Creech, A., Papageorgi, I., Duffy, C., Morton, F., Hadden, E., Potter, J., ... Welch, G. (2008a). From music student to professional: the process of transition. *British Journal of Music Education*, *25*(3), 315–331.

Creech, A., Papageorgi, I., Duffy, C., Morton, F., Hadden, E., Potter, J., ... Welch, G. (2008b). Investigating musical performance: commonality and diversity among classical and non-classical musicians. *Music Education Research*, *10*(2), 215–234.

Custodero, L.A., Britto, P.R. and Brooks-Gunn, J. (2003). Musical lives: a collective portrait of American parents and their young children. *Journal of Applied Developmental Psychology*, *24*, 553–572.

Davidson, J.W., Howe, M.J.A., Moore, D.G. and Sloboda, J.A. (1996). The role of family influences in the development of musical ability. *British Journal of Developmental Psychology*, *14*, 399–412.

Delzell, J.K. and Leppla, D.A. (1992). Gender association of musical instruments and preferences of fourth-grade students for selected instruments. *Journal of Research in Music Education*, *40*, 93–103.

De Vous, N.R. (2011). *Societal influences on the musical instrument choices of 5th and 6th grade beginning band students in Fotsom, California*. California State University, CA: Sacramento State Scholarworks.

Dolloff, L. (2007). "All the things we are": balancing our multiple identities in music teaching. *Action, Criticism, and Theory for Music Education*, *6*(2), 2–21.

Eccles, J., Wigfield, A., Harold, R.D. and Blumenfeld, P. (1993). Age and gender differences in children's self- and task perceptions during elementary school. *Child Development*, *64*, 830–847.

Fortney, P.M., Boyle, J.D. and DeCarbo, N.J. (1993). A study of middle school band students' instrument choices. *Journal of Research in Music Education*, *41*, 28–39.

Freer, P.K. (2007). Between research and practice: how choral music loses boys in the "middle." *Music Educators Journal*, *94*(2), 28–34.

Gates, J.T. (1991). Music participation: theory, research, and policy. *Bulletin of the Council for Research in Music Education*, *109*, 1–35.

Gaunt, H. and Hallam, S. (2009). Individuality in the learning of musical skills. In S. Hallam, I. Cross, and M. Thaut (Eds.), *The Oxford handbook of music psychology* (pp. 274–284). Oxford: Oxford University Press.

Gembris, H. and Heye, A. (2012). *Älter werden im Orchester. Eine empirische Studie*. Münster: Lit Verlag.

Georgii-Hemming, E. (2006). Personal experiences and professional strategies. *Music Education Research*, *8*(2), 217–236.

Green, L. (1997). *Music, gender and education*. New York: Cambridge University Press.

Green, L. (2012). Musical "learning styles" and "learning strategies" in the instrumental lesson: Some emergent findings from a pilot study. *Psychology of Music*, *40*(1), 42–65.

Haddon, E. (2009). Instrumental and vocal teaching: how do music students learn to teach? *British Journal of Music Education*, *26*(1), 57–70.

Hallam, S. (1995). Professional musicians' approaches to the learning and interpretation of music. *Psychology of Music*, *23*, 111–128.

Hallam, S. (2004). Gender differences in the factors which predict musical attainment in school aged students. In J. Tafuri (ed.) *Research for music education: Proceedings of the 20th Seminar of the ISME Research Commission, Las Palmas, Gran Canaria, July 4–11th 2004* (pp. 101–107). Malvern: ISME Research Commission.

Hallam, S. (2015). Musicality. In G. McPherson (Ed.), *The child as musician: A handbook of musical development* (2nd ed., 67–80). Oxford: Oxford University Press.

Hallam, S. and Creech, A. (Eds.) (2010). *Music education in the 21st century in the United Kingdom: Achievements, analysis and aspirations*. London: Institute of Education, University of London.

Hallam, S., Rogers, L. and Creech, A. (2008). Gender differences in musical instrument choice. *International Journal of Music Education*, *26*(1), 7–19.

Hanley, B. (1998). Gender in secondary music education in British Columbia. *British Journal of Music Education*, *15*, 51–6.

Hargreaves, D.J. and North, A.C. (2001). *Musical development and learning: The international perspective*. London: Continuum.

Hargreaves, D.J., Purves, R.M., Welch, G.F. and Marshall, N.Q. (2007). Developing identities and attitudes in musicians and classroom music teachers. *British Journal of Educational Psychology*, *77*(3) 665–682.

Hettema, J. and Kenrick, D.T. (1992). Models of person-situation interactions. In G.V. Caprara and G.L. Van Heck (Eds.), *Modern personality psychology: Critical reviews and new directions* (pp. 393–417). New York: Harvester Wheatsheaf.

Ho, W.-C. (2001). Musical learning: differences between boys and girls in Hong Kong Chinese co-educational schools. *British Journal of Music Education*, *18*, 41–54.

Ho, W.-C. (2009). Gender differences in instrumental learning among secondary school students in Hong Kong. *Gender and Education*, *21*(4), 405–422.

Howe, M.J.A. and Sloboda, J. (1992). Problems experienced by talented young musicians as a result of the failure of other children to value musical accomplishments. *Gifted Education*, *8*, 16–18.

Jeanneret, N. and Degraffenreid, G.M. (2012). Music education in the generalist classroom. In G.E. McPherson and G.F. Welch (Eds.), *The Oxford handbook of music education* (pp. 399–416). Oxford: Oxford University Press.

Jones, B.D. and Parkes, K.A. (2010). The motivation of undergraduate music students: the impact of identification and talent beliefs on choosing a career in music education. *Journal of Music Teacher Education*, *19*(2), 41–56.

Jorgensen, H. (2002). Instrumental performance expertise and amount of practice among instrumental students in a conservatoire. *Music Education Research*, *4*, 105–119.

Juuti, S. and Littleton, K. (2010). Musical identities in transition: solo-piano students' accounts of entering the academy. *Psychology of Music*, *38*(4), 481–497.

Kemp, A.E. (1996). *The musical temperament: Psychology and personality of musicians*. Oxford: Oxford University Press.

Krampe, R.T. (2006). Musical expertise from a lifespan perspective In H. Gembris (Ed.), *Musical development from a lifespan perspective* (pp. 91–106). Frankfurt: Peter Lang.

Long, M. (2013). Conservatoire students' attitudes, self-efficacy and aspirations. In M. Stakelum (ed.), *Contemporary perspectives on teaching and learning* (pp. 29–44). Farnham: Ashgate.

Long, M., Hallam, S., Creech, A., Gaunt, H. and Robertson, L. (2012). Do prior experience, gender or level of study influence music students' perspectives on master classes? *Psychology of Music*, *40*(6), 683–699.

López-Íñiguez, G. and Pozo, J.I. (2014). The influence of teachers' conceptions on their students learning: children's understanding of sheet music. *British Journal of Educational Psychology*, *84*(Pt 2):311–328.

Lynch, M.P., Eilers, R.E., Oller, D.K. and Urbano, R.C. (1990). Innateness, experience, and music perception. *Psychological Science*, *1*, 272–276.

Marin, C., Perez-Echeverria, M.P. and Hallam, S. (2012). Using the musical score to perform: a study with Spanish flute students. *British Journal of Music Education*, *29*(2), 193–212.

Marin, C., Perez-Echeverria, M.P. and Scheur, N. (2013). Conceptions of woodwind students regarding the process of learning a piece of music. *Research Papers in Education*. Advance online publication. doi: 10.1080/02671522.2013.825310

Marin, C., Scheur, N. and Perez-Echeverria, M.P. (2013). Formal music education not only enhances musical skills but also conceptions of teaching and learning: a study with woodwind students. *European Journal of Psychology of Education*, *28*(3), 781–805.

McKeage, K.M. (2004). Gender and participation in high school and college instrumental jazz ensembles. *Journal of Research in Music Education*, *52*, 343–356.

McPherson, G.E. (2007). Diary of a child music prodigy. In A. Williamon and D. Coimbra (Eds.), *Proceedings of the International Symposium of Performance Science 2007* (pp. 213–218). Utrecht: European Association of Conservatoires.

McPherson, G.E. and O'Neill, S.A. (2010). Students' motivation to study music as compared to other school subjects: a comparison of eight countries. *Research Studies in Music Education*, *32*(2), 101–137.

Olbertz, F. (2006). Job satisfaction of professional orchestra musicians. In H. Gembris (Ed.), *Musical development from a lifespan perspective* (pp. 55–74). Frankfurt: Peter Lang.

Papageorgi, I., Creech, A., Haddon, E., Morton, F., De Bezenac, C., Himonides, E., ... Welch, G. (2010). Investigating musical performance: perceptions and prediction of expertise in advanced musical learners. *Psychology of Music*, *38*(1), 31–66.

Perkins, R. and Williamon, A. (2013). Learning to make music in older adulthood: a mixed methods exploration of impacts on well-being. *Psychology of Music*. Advance online publication. doi: 10.1177/0305735613483668

Pitts, S. (2005). *Valuing music participation*. Aldershot: Ashgate.

Reid, A. (2001). Variation in the way that instrumental and vocal students experience learning music. *Music Education Research*, *3*, 25–40.

Sheldon, D.A. and Hartley, L.A. (2012). What color is your baton, girl? Gender and ethnicity in band conducting. *Bulletin of the Council for Research in Music Education*, *192*(Spring), 39–52.

Sheldon, D.A. and Price, H.E. (2005). Sex and instrumentation distribution in an international cross-section of wind and percussion ensembles. *Bulletin of the Council for Research in Music Education*, *163*, 43–51.

Schellenberg, E.G. and Trehub, S.E. (1999). Culture-general and culture-specific factors in the discrimination of melodies. *Journal of Experimental Child Psychology*, *74*, 107–127.

Shuter-Dyson, R. and Gabriel, S. (1981). *The psychology of musical ability* (2nd ed.). London: Methuen.

Smilde, R. (2009). *Musicians as lifelong learners: Discovery through biography*. Delft: Eburon Academic Publishers.

StGeorge, J.M., Holbrook, A.P. and Cantwell, R.H. (2012). Learning patterns in music practice: links between disposition, practice strategies and outcomes. *Music Education Research*, *14*(2), 243–263.

Tafuri, J. (2009). *Infant musicality: New research for educators and parents*. Farnham: Ashgate.

Taylor, A. (2010). Participation in a master class: experiences of older amateur pianists. *Music Education Research*, *12*(2), 199–218.

Taylor, A. and Hallam, S. (2008). Understanding what it means for older learners to learn basic musical skills on a keyboard instrument. *Music Education Research*, *10*(2), 285–306.

Taylor, A. and Hallam, S. (2011). From leisure to work: amateur musicians taking up instrumental or vocal teaching as a second career. *Music Education Research*, *13*(3), 307–326.

Vuust, P., Gebauer, L., Hansen, N.C., Jorgensen, S.R., Moller, A. and Linnet, J. (2010). Personality influences career choice: sensation seeking in professional musicians. *Music Education Research*, *12*(2), 219–230.

Webb, M. and Seddon, F.A. (2012). Musical instrument learning, music ensembles and musicianship in a global and digital age. In G.E. McPherson and G.F. Welch (Eds.), *The Oxford handbook of music education* (pp. 752–768). Oxford: Oxford University Press.

Webster, R. (2011). Key research in music technology and music teaching and learning. *Journal of Music, Technology and Education*, *4*(2–3), 115–130.

Williamon, A. (Ed.) (2004). *Musical excellence: Strategies and techniques to enhance musical performance*. Oxford: Oxford University Press.

Wills, G. and Cooper, C.L. (1988). *Pressure sensitive: Popular musicians under stress*. London: Sage.

Woody, R.H. and Lehman, A.C. (2010). Student musicians' ear-playing ability as a function of vernacular music experiences. *Journal of Research in Music Education*, *58*(2), 101–115.

Wynn Parry, C.B. (2004). Managing the physical demands of musical performance. In A. Williamon (Ed.), *Musical excellence: Strategies and techniques to enhance musical performance* (pp. 41–60). Oxford: Oxford University Press.

CHAPTER 30

MOTIVATION TO LEARN

SUSAN HALLAM

The Historical Perspective

Human motivation is extremely complex. Historically, numerous theories have been developed in attempts to explain it. These, to varying degrees, emphasize motivation as deriving from within the individual, within the environment or as a complex interaction between the two mediated by cognition. The most recent theories emphasize the way that our perceptions of events are determined by our construction of them, these interpretations subsequently influencing our self-esteem, self-efficacy and motivation. They acknowledge the capacity of individuals to determine their own behavior, whilst also recognizing the role of the environment in rewarding or punishing particular behaviors influencing subsequent cognitions and later actions. There has also been increasing recognition that motivation operates at different levels and across different timescales (for more detail of generic theories of motivation and earlier reviews of motivation in relation to music see Asmus, 1994; Austin, Renwick and McPherson, 2006; Hallam 2002, 2009; O'Neill and McPherson, 2002).

Much of the early research on motivation in music was not embedded within any specific motivational research paradigm or theoretical position, although expectancy-value models which have been proposed to explain motivation for particular tasks in education have provided a framework for some work. The research has also focused almost exclusively on motivation for school music or to learn and continue to play an instrument. There has been little interest in motivation to listen to music, compose or engage in other musical activities.

A Framework for Understanding Motivation in Music

Recent research has recognized the complexity of musical motivation and several models have been developed which take account of that complexity (see Hallam, 2002, 2009;

MacIntyre, Potter and Burns, 2012; Sichivitsa, 2007). One such model is set out in this chapter. The model integrates the various theoretical approaches to understanding motivation embedded within a broadly systemic approach as set out in Gaunt and Hallam, Chapter 29, this volume, which suggests that the process of human development depends on mutual accommodation which occurs throughout the life course between an individual and the various systems which they or others close to them encounter in their environment.

Figure 30.1 sets out the framework which illustrates the complex interactions which occur over time in relation to motivation. Certain aspects of our individuality are predetermined, for instance, our biological temperament, our sex and our age. These are shaped through interaction with the environment to develop our personality, gender identity, cognitive processes and our self-perceptions. We are motivated because we desire social approval, particularly from those we admire and respect. Such praise from

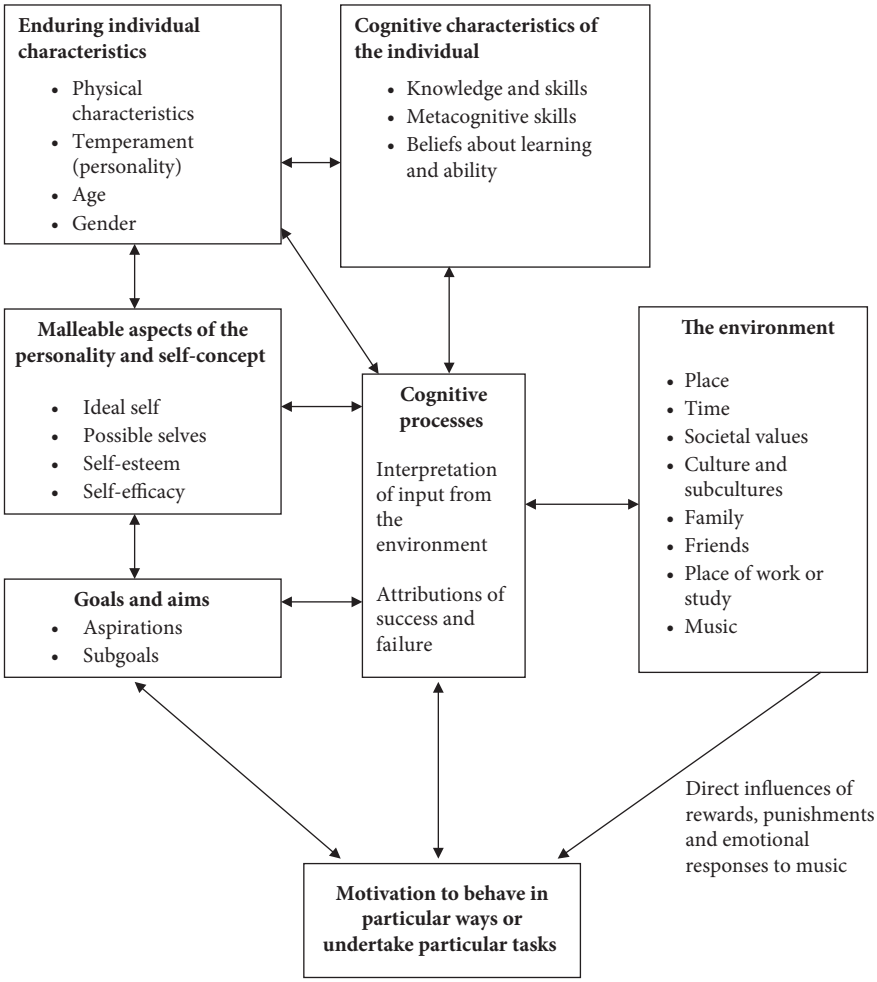

FIGURE 30.1 Interactions between individual and environmental factors in determining musical motivation.

others is internalized, raises self-esteem, and enhances confidence. Some environmental influences are internalized to such an extent that they come to affect the individual's functioning over time in a fairly consistent way. Individuals set themselves goals which determine their behavior. These goals are influenced by individual and self-perception characteristics as well as environmental factors. Where the environment satisfies individual needs and facilitates personal goals, motivation is likely to be enhanced. Where the environment presents obstacles, the individual may give up or be spurred on to greater efforts to overcome them, perhaps by finding a more conducive environment. Behavior is the end link in the chain but at the time of enactment it too can be influenced and changed by environmental factors. There is interaction between the environment and the individual at every level and in the long and short term. Individuals can act upon the environment to change it, or seek out new environments more conducive to their needs (see Gaunt and Hallam, Chapter 29, this volume). The model recognizes the importance of cognitive factors and self-determination in behavior, while also taking account of the power of our emotions. While we have needs and desires we are aware that we need to consider the consequences of our actions before we attempt to satisfy them. Cognition plays a role in the ways in which we attempt to enhance our self-esteem leading us to attribute our success or failure to causes which will allow us to maintain a consistent view of ourselves. When a learner has completed a learning task successfully this has a positive emotional impact and, subsequently, impacts on self-esteem and motivation which will be carried forward to subsequent learning tasks. Conversely, when learning outcomes are negative, motivation may be impaired. In the following sections I provide a more detailed account of what we know about each of the elements outlined in the model as they relate to motivation in music.

Individual Characteristics

Enduring Individual Characteristics: Physical, Gender and Personality Factors

Gaunt and Hallam in Chapter 29, this volume, consider many elements of individuality which may influence the nature of engagement with music including physical, gender and personality characteristics. These are not discussed further here. The focus in this section is the complex and multifaceted nature of motivation to become actively involved in music-making which includes the way that it intrinsically acts to meet needs which vary between individuals in relation to their personality characteristics. For instance, Nagel (1987) stressed the need for personal fulfilment met by the emotion-inducing quality of music, satisfaction of a positive social response within performance settings, exploration of aggressive drives through the exploitation of the motor skills entailed in musical performance and some voyeuristic and exhibitionist desires. Persson, Pratt and Robson (1996) studying pianists also emphasized the importance of hedonic drive, while acknowledging the role of social and achievement motives, and Makris and Mullet (2009) exploring motives for becoming a conductor found that those most strongly evoked were linked with emotion and emotional

needs. Musicians, it seems, experience considerable personal fulfilment and emotional benefits from the act of making music, in addition to the social rewards that it offers. The balance between these motives may change over time as individuals progress through their musical careers and may contribute to determining individual career trajectories (see Hallam, 2015). The diversity of individual motivation has been explored in relation to amateur musicians in addition to professionals. Some amateurs view music as personal amusement while for others it constitutes serious leisure and they invest huge energy and time in it (Pitts, 2005). Their amateur status suggests that they find their musical activities intrinsically motivating although social interaction can also be an important motivator particularly for older people (Creech, Hallam, McQueen and Varvarigou, 2014).

Malleable Aspects of the Personality and Self-Concept

An individual's identity or self-concept represents the way s/he thinks about him/herself and his/her relationships with others (see Hargreaves, MacDonald and Miell, Chapter 46, this volume) and plays a crucial role in motivation. Behavior is influenced by the individual's interpretation of situations and events, their expectations and the goals that they have set for themselves related to their identity. Music self-concept has been shown to be linked to motivation, interest and participation in school and out-of-school musical activities (Austin, 1991) and develops early as quite young children are able to assess how well they can complete particular musical tasks (Greenberg, 1970). However, being good at something does not necessarily transfer to interest in it. Asmus and Harrison (1990) working with nonmusic major college students found no relationship between music motivation and aptitude. They argued that engagement with music stems from love of it.

Children's self-concept in relation to classroom music and the value that they place on music appear to decline as they get older (McPherson and O'Neill, 2010; Mota, 1999; Wigfield et al., 1997), although those actively engaged in music-making through playing an instrument have higher levels of musical self-belief (Ivaldi and O'Neill, 2010; Ritchie and Williamon, 2011) which continues to be enhanced as musical expertise develops (Hallam, 2013b). Transitions between educational environments, for instance, to higher education, or into the music profession may lead to temporary lowering of self-beliefs as comparisons are made with high-attaining others. This process is influenced by whether the context is supportive or critical (Creech et al., 2008; Long, 2013).

Self-efficacy beliefs based on evaluations of the likelihood of success in relation to particular tasks or areas of work also play a part in determining whether particular goals will be pursued and subsequently achieved. Unsurprisingly, self-efficacy has been found to be the most important predictor of examination success (McPherson and McCormick, 2006) as it depends on feedback from teachers and family, comparisons with peers and self-assessment of progress in completing a task (Hendricks, 2013). Bandura (1989) suggested that motivation for an activity is at its peak when a person feels competent but challenged. However, for intrinsic motivation to flourish, feelings of self-determination are also necessary. Evidence of the links between intrinsic motivation, self-determination and the use of self-regulating practicing strategies support this (Austin et al., 2006). When children can choose the repertoire that they learn, they practice with heightened attention, persistence and enhanced strategy use (Renwick and McPherson, 2002).

Goals and Aims

The goals and aims that individuals strive to attain are related to their identity, self-concept, self-efficacy and what they believe is possible for them. These take account of both context and cognition. If an individual perceives him- or herself as successful and attributes this success to high ability they may come to include in their self-concept a "positive possible future self" in that domain (Markus and Ruvolo, 1989). Schnare, MacIntyre and Doucette (2012) studied 204 musicians at varying levels of expertise aged from 18–69 and found that their "hoped-for possible selves" were related to improvement, social connection, success and enjoyment, while "feared selves" focused on being a poor musician, injury/illness, financial difficulty, lack of knowledge and lack of connection/recognition.

Possible selves can be powerful motivators providing long-term goals and encouraging the setting up of interim goals which need to be achieved en route. If an individual does not have a positive possible self as a musician (professional, amateur or listener) in the long, medium, or short term they are unlikely to maintain their interest in music. Such musical identities can develop at any time, during the school years (Hallam, 2013a; MacNamara, Holmes and Collins, 2006) through to later life (Creech et al., 2014), although for some they never develop (McPherson and McCormick, 2000). Different musical aspirations including wanting to be a professional musician, an amateur or seeing active engagement with music as contributing to other career aspirations (Hallam, 2013a) can emerge early in life (McPherson and Lehmann, 2012). Strong aspirations to become a professional musician are reflected in dedication, commitment, determination and a willingness to make sacrifices with self-belief becoming increasingly important as more critical appraisal and greater competition is experienced (MacNamara et al., 2006). However, goals can sometimes conflict with each other and their fulfilment can be disrupted by others (Harnischmacher, 1997). Individuals may have to make trade-offs between goals at different levels and undertake some activities to attain a particular goal which they may not find particularly enjoyable, for instance, most young people do not enjoy practicing but recognize that it is necessary to attain high levels of musical expertise (Hallam et al., 2012).

Cognition: Individual Characteristics and Processes

All modern theories of motivation take account of cognition—an acceptance that much of our behavior is mediated by our thoughts about and perceptions of events. This process is influenced, in part, by locus of control: the extent to which the individual perceives that s/he has control over situations (Rotter, 1966). While prior knowledge and skills in a domain are powerful determinants of performance in that domain our beliefs about our current capabilities also play a part. Also important are our beliefs about the nature of learning. A distinction has been made between performance and learning goals, the former concerned with gaining positive judgments of competence as compared with others and avoiding negative ones, the latter with increasing mastery, reflecting the desire to learn new skills, master new tasks or understand new things (Elliott and Dweck, 1988).

Typically, children who are successful in learning an instrument, where it is necessary to sustain motivation to practice, adopt mastery goals as their dominant approach to learning (Miksza, 2011; O'Neill, 1997). Schmidt (2005) found that instrumental students defined their success in relation to mastery and cooperative orientations placing less emphasis on competitive and ego orientations, although the context of learning, particularly teacher behavior, played a part in the type of goals adopted (Sandene, 1998). Studying advanced students and professional musicians, Bonneville-Roussy, Lavigne and Vallerand (2011) found that mastery learning was related to what they described as "harmonious passion" for music, while "obsessive passion" tended to be related to the adoption of performance goals.

Research in other domains has shown a relationship between students' theories of intelligence and their goal choices. Where students hold an entity theory of intelligence (fixed and immutable) they are more likely to adopt performance goals while those holding an incremental view of intelligence are more likely to choose a learning goal (Dweck and Leggett, 1988). In music, there is some support for this. Nielsen (2012) found that advanced music students who believed that ability was fixed were less likely to adopt metacognitive strategies and effort regulation strategies in practice, although the relationships were weak.

Individuals are motivated to establish, maintain and promote a consistent and usually positive self-image, so they develop a variety of coping strategies to maintain self-worth some of which may be self-defeating, for instance, reducing effort. How individuals attribute successes and failures is important in maintaining self-esteem. The causes of success or failure can be seen as stable or unstable, controllable or uncontrollable, and internal or external. Overall, five major attribution categories have been found in music: effort, musical background, classroom environment, musical ability and affect for music (Asmus, 1986a), although findings specifically related to performance in an examination also included effort in preparation, effort in the examination, nervousness, luck and task difficulty (McPherson and McCormick, 2000). Musical ability and effort are the most frequently cited attributions by music students. Highly motivated music students tend to make effort attributions, while students with low motivation cite ability (e.g., Austin and Vispoel, 1998). These findings seem to be broadly consistent across grade levels (Asmus, 1986b; McPherson and McCormick, 2000), school settings and music populations, although there is some evidence that ability attributions become more frequent as children get older (Asmus, 1986b). Considering the effect of attributing success or failure to the use of particular learning strategies, Vispoel and Austin (1993) found that explaining failure in terms of the adoption of less than optimal learning strategies was effective in improving these and increasing effort.

Metacognition (the term given to our knowledge of our own learning) is relevant for motivation insofar as it indicates our awareness of our own strengths and weaknesses and the ways in which we learn best, and may be implicated in the way that we manage our attributions. Metacognitive strategies are concerned with the planning, monitoring and evaluation of learning and performance (see Jørgensen and Hallam, Chapter 28, this volume). For most musicians life is dominated by public performance and preparation for it. As practice is not always intrinsically motivating, developing strategies for managing motivation is crucial. Preparing for public performance necessitates giving priority to practice, mobilizing arousal specifically for performance and managing anxiety (see Altenmüller and Furuya, Chapter 33 and Kenny and Ackermann, Chapter 39, this volume). These all depend on the development of appropriate metacognitive skills.

The Environment

The environment is crucial in determining the opportunities that individuals have to engage with music and the extent to which they will be supported while doing so. Music is not valued equally in all cultures. In some it is viewed as decadent and is forbidden. In others it is highly valued and those involved in its composition or execution are highly revered members of society. Economic, demographic and political factors can have a major impact on musical engagement particularly as they impact on opportunity (Driscoll, 2009; Hallam and Rogers, 2010) with children from stable families with higher socioeconomic status more likely to have instrumental tuition (Kinney, 2010). Over time, the value placed on music can change and within any particular culture different types of music may be valued by specific subgroups. We know relatively little about how these cultural and societal factors mediate motivation to engage with music or the type of activity selected, although in the Western world, children's musical role models tend to be pop stars, typically vocalists. Emulating them is an aspiration held by many young people (Ivaldi and O'Neill, 2010).

At the institutional level, environment has been demonstrated to impact on musical motivation. Studies in Spain at primary level (Sanz and Orbea, 2013) and in Australia at secondary level (McEwan, 2013) have shown that school cultures influence active participation in music, with class teachers playing an important role in motivating students. An ideal school environment for encouraging engagement with music is one where there are plentiful performing opportunities, teachers are inspiring, and at primary level where there are opportunities for singing (Pitts, 2009). The quality of specific musical activities is also important (Sichivitsa, 2007), while at conservatoire level, a dominating value system focused on musical performance can influence practice even for those students enrolled on other programs (Jorgensen, 1997).

Teachers, particularly instrumental teachers, play a crucial role in motivating students (Creech and Hallam, 2011; Pitts, 2009). Where school teachers motivate pupils to engage with music, identities as musicians develop leading to more positive attitudes toward school music (Lamont, 2002). In adolescence the peer group is very powerful and can exert positive or negative pressure in relation to musical activities (Driscoll, 2009; Hallam, 2013b). To withstand negative pressure in adolescence musical identities need to be well developed. The influence of early teachers, who are viewed as warm and sympathetic, seems to be particularly important in encouraging the initial development of a positive musical identity (Sloboda and Howe, 1991) with inspiring teachers, who act as role models, increasingly important as expertise develops (Pitts, 2009).

Parents have a critical influence on children's motivation for involvement with music and the acquisition of musical skill (see Creech, Chapter 31, this volume). In the early years the family is likely to be the main source of musical stimulation. The age at which children first sing is related to the number of musical behaviors initiated by parents (Howe, Davidson, Moore and Sloboda, 1995) and the development of perfect pitch occurs with particularly systematic exposure to music in early childhood (Bahr, Christensen and Bahr, 2005). The influence of parents can also contribute to the choice of instrument to be played (see Gaunt and Hallam, Chapter 29, this volume) and their ongoing support plays a crucial role in whether children persist and commit to musical engagement in the long term. They can act as role

models through their enjoyment of listening to and playing music in addition to providing financial and moral support for lessons and practice (Pitts, 2009).

Recognizing the complexity of motivation, recent research has explored the interactions between different environmental influences. Pitts (2009) in a retrospective study of musical experiences identified some individuals whose primary influence was the home, others where the school was the dominant element and some where it was both. The common element to all environments was an inspiring instrumental teacher. Creech and Hallam (2011) in a survey of 337 violin students studied the relationships between children, parents and teachers. Interpersonal dynamics in pupil–parent and pupil–teacher dyads represented a powerful influence in pupils' experiences of learning. Enjoyment of playing was well predicted by pupil–teacher rapport and receptiveness to parental support, while the latter made the strongest unique contribution to explaining variation in motivation. Parental support is most important for those beginning to play, declining in perceived importance as expertise develops (Creech and Hallam, 2011; Hallam, 2013b). As children become more expert their musical identity is strengthened and support and social affirmation from others is perceived as less important, while a musical social life, enjoyment of a wide range of musical activities (listening to music, attending concerts), increases as does enjoyment of playing, lessons and performing (Hallam, 2013b). Despite the evidence indicating the importance of having a highly supportive and encouraging home background, it is clearly not essential for the development of high levels of musical expertise. Highly effective individuals in a range of domains have been found to have histories marked by severe frustration, deprivation and traumatic experiences (MacKinnon, 1965).

Direct Influences of Rewards and Punishments from the Environment

Intrinsic motivation is a crucial aspect of developing an identity as a musician. A key element of this is enjoyment of making music, through playing alone for pleasure but also playing and engaging in group activities, listening to music and attending concerts (Driscoll, 2009). Beginner instrumentalists who remain enthusiastic about continuing to play focus on the instrument and the repertoire, while less motivated children refer to participation in a band, or the opinions of their parents and friends as shaping their own attitudes (Pitts, Davidson and McPherson, 2000). The satisfaction, confidence and sense of achievement derived from instrumental playing is motivating as is being successful in external examinations as this provides an indication of progress. For some students lessons are the least enjoyable aspects of playing an instrument (Driscoll, 2009) while even advanced students may not enjoy individual practice (Hallam et al., 2012).

Musical tasks are intrinsically motivating when they are set at a level which is challenging and in balance with a person's current skills, creating the experience of a state of flow. If the task is too easy the person becomes bored, too difficult and anxiety is created (Csikszentmihalyi, Rathunde and Whalen, 1993). Custodero (1999) observed 4- and 5-year-old children in a music classroom over 8 weeks and flow experience was associated with high self-concept or skill, perceived challenge and active engagement.

Lack of Motivation

For a full understanding of musical motivation it is important to study those who do not engage with music or commence tuition but then drop out. Some children are unable to engage with musical activities because of lack of opportunity, financial constraints or negative parental attitudes. Others choose not to engage because of lack of interest, competing interests, dislike of lessons or teachers, or perceived lack of musical ability (Driscoll, 2009). In relation to drop outs, no single explanatory factor has emerged. Those who drop out may have commenced lessons for nonmusical reasons, for instance, because of pressure from friends or parents (Pitts et al., 2000). Lower levels of practice are related to dropping out (e.g., Driscoll, 2009; Hallam, 1998) as are boring lessons, lack of progress, dislike of taking examinations, poor relationships with teachers and social factors such as lack of musical friendships or opportunities for group activities (Driscoll, 2009). Costa-Giomi (2005) showed that those dropping out early missed more lessons, practiced less, completed less homework and achieved less in the first 6 weeks of instruction than their more persistent peers. Observations of those who continued into a second year and then dropped out showed that they more frequently sought approval from the teacher, received less positive affirmation and had lower levels of attainment than their peers. Educational transitions can also impact on drop out with children often dropping out following transition to secondary school (Driscoll, 2009). Much of this research has focused on participation in formal music tuition in the Western classical tradition. Different factors may apply to those dropping out of other musical activities.

Future Research Directions

Increasingly, there has been recognition in research that motivation to be involved in active music-making is determined by complex interactions between the individual and the environment within which they find themselves along with a love of music and the satisfaction derived from it (Hallam 2002, 2013a, 2013b; MacIntyre et al., 2012; Sichivitsa, 2007). Some of the environmental effects, in particular those relating to early musical experiences, learning outcomes, self-efficacy and subsequently self-esteem are internalized by the individual in such a way that they become part of that individual's identity rendering it both impossible and pointless to disentangle them. Once internalized, they impact on motivation to continue to be involved in music. The individual's commitment to and involvement in music-making can also affect their environment and the people in it. Families may make changes to support their musical offspring, friends may be influenced to participate in making music. The transaction is bidirectional. The nature of the music profession, which is extremely competitive, means that only the highly motivated will have sufficient determination to succeed, although many more may become highly skilled amateurs, some of whom may ultimately leave a previous nonmusical career to become part of the wider music profession (Taylor and Hallam, 2011).

Increasingly, research has begun to explore issues of motivation in different learning contexts, informal and formal, and for learners of different ages and across different types of

music (see Gaunt and Hallam, Chapter 29, this volume), although the main focus continues to be within formal educational environments. We know little about drop out at higher levels of expertise than have so far been considered, for instance, those who study music in higher education, who do not then go on to make their living from musical activities, or indeed those who become professional musicians and then leave the profession early. In addition, most of the research has focused on motivation to become a musician. Listening to music plays an important part in the daily lives of most people in the Western world but there is little research relating to those individuals for whom listening to music is a passion, who have extensive collections of recorded music and are extremely knowledgeable about music without necessarily actively participating in making it. There is also a need to explore why music plays no part in the lives of some people.

References

Asmus, E.P. (1986a). Achievement motivation characteristics of music education and music therapy students as identified by attribution theory. *Bulletin of the Council for Research in Music Education*, *86*, 71–85.

Asmus, E.P. (1986b). Student beliefs about the causes of success or failure in music: a study of achievement motivation. *Journal of Research in Music Education*, *34*, 262–278.

Asmus, E.P. (1994). Motivation in music teaching and learning. *The Quarterly Journal of Music Teaching and Learning*, *5*, 5–32.

Asmus, E.P. and Harrison, C.S. (1990). Characteristics of motivation for music and musical aptitude of undergraduage nonmusic majors. *Journal of Research in Music Education*, *38*, 258–268.

Austin, J.R. (1991). Competitive and non-competitive goal structures: an analysis of motivation and achievement among elementary band students. *Psychology of Music*, *19*, 142–158.

Austin, J.R., Renwick, J. and McPherson, G.E. (2006). Developing motivation. In G.E. McPherson (Ed.), *The child as musician: A handbook of musical development* (pp. 213–238). Oxford: Oxford University Press.

Austin, J.R. and Vispoel, W.P. (1998). How American adolescents interpret success and failure in classroom music: relationships among attributional beliefs, self-concepts and achievement. *Psychology of Music*, *26*, 26–45.

Bahr, N., Christensen, C.A. and Bahr, M. (2005). Diversity of accuracy profiles for absolute pitch recognition. *Psychology of Music*, *33*(1), 58–93.

Bandura, A. (1989). Self-regulation of motivation and action through internal standards and goal systems. In L.A. Pervin (Ed.), *Goal concepts in personality and social psychology* (pp. 19–86). Hillsdale, NJ: Erlbaum.

Bonneville-Roussy, A., Lavigne, G.L. and Vallerand, R.J. (2011). When passion leads to excellence: the case of musicians. *Psychology of Music*, *39*(1), 123–138.

Costa-Giomi, E., Flowers, P.J. and Sasaki, W. (2005). Piano lessons of beginning students who persist or drop out: teacher behaviour, student behaviour and lesson progress. *Journal of Research in Music Education*, *53*(3), 234–247.

Creech, A. and Hallam, S. (2011). Learning a musical instrument: the influence of interpersonal interaction on outcomes for school-aged pupils. *Psychology of Music*, *39*(1), 102–122.

Creech, A., Hallam, S., McQueen, H. and Varvarigou, M. (2014). *Active ageing with music: supporting wellbeing in the third and fourth ages*. London: IOE Press.

Creech, A., Papageorgi, I., Duffy, C., Morton, F., Hadden, E., Potter, J., . . . Welch, G. (2008). From music student to professional: the process of transition. *British Journal of Music Education*, *25*(3), 315–331.

Csikszentmihalyi, M., Rathunde, K. and Whalen, S. (1993). *Talented teenagers: The roots of success and failure*. Cambridge: Cambridge University Press.

Custodero, L.A. (1999). *Construction of musical understandings: The cognition-flow interface*. Paper presented at the Cognitive Processes of Children Engaged in Music Activity Conference, Champaign, Urbana, IL, June, 1999.

Driscoll, J. (2009). If I play my sax my parents are nice to me: opportunity and motivation in musical instrument and singing tuition. *Music Education Research*, *11*(1), 37–55

Dweck, C.S. and Leggett, E.L. (1988). A social cognitive approach to motivation and personality. *Psychological Review*, *95*, 256–373.

Elliott, E.S. and Dweck, C.S. (1988). Goals: an approach to motivation and achievement. *Journal of Personality and Social Psychology*, *54*, 5–12.

Greenberg, M. (1970). Musical achievement and self-concept. *Journal of Research in Music Education*, *18*, 57–64.

Hallam, S. (1998). Predictors of achievement and drop out in instrumental tuition. *Psychology of Music*, *26*, 116–132.

Hallam, S. (2002). Musical motivation: towards a model synthesising the research. *Music Education Research*, *4*, 225–244.

Hallam, S. (2009). Motivation to learn. In S. Hallam, I. Cross and M. Thaut (Eds.), *The Oxford handbook of music psychology* (pp. 285–294). Oxford: Oxford University Press.

Hallam, S. (2013a). What predicts level of expertise attained, quality of performance and future musical aspirations in young instrumental players? *Psychology of Music*, *41*(3), 267–291.

Hallam, S. (2013b). Musical talent: Conceptualisation, identification and development. Paper presented at Managing your Talents, Conservatorium van Amsterdam, 29–30 August, 2013, Amsterdam.

Hallam, S. (2015). Developing and maintaining motivation in advanced music performance. In I. Papageorgi and G. Welch (Eds.), *Advanced musical performance: Investigations in higher education learning* (pp. 343–348). London: Ashgate.

Hallam, S., Rinta, T., Varvarigou, M., Creech, A., Papageorgi, I. and Lani, J. (2012). The development of practising strategies in young people. *Psychology of Music*, *40*(5), 652–680.

Hallam, S. and Rogers, L. (2010). Music services. In S. Hallam and A Creech (Eds.), *Music education in the 21st Century in the United Kingdom: Achievements, analysis and aspirations* (pp. 279–294). London: Institute of Education, University of London

Harnischmacher, C. (1997). The effects of individual differences in motivation, volition, and maturational processes on practice behaviour of young instrumentalists. In H. Jorgensen and A. Lehman (Eds.), *Does practice make perfect? Current theory and research on instrumental music practice* (pp. 71–88). Oslo: Norges Musikkhøgskole.

Hendricks, K.S. (2013). Changes in self-efficacy beliefs over time: contextual influences of gender, rank-based placement and social support in a competitive orchestra environment. *Psychology of Music*, *42*(3), 347–365.

Howe, M.J.A., Davidson, J.W., Moore, D.M. and Sloboda, J.A. (1995). Are there early childhood signs of musical ability? *Psychology of Music*, *23*, 162–176.

Ivaldi, A. and O'Neill, S. (2010). Adolescents' attainability and aspiration beliefs for famous musician role models. *Music Education Research*, *12*(2), 179–197.

Jorgensen, H. (1997). Time for practising? Higher level music students' use of time for instrumental practising. In H. Jorgensen and A. Lehman (Eds.), *Does practice make perfect?*

Current theory and research on instrumental music practice (pp. 123–140). Oslo: Norges Musikkhøgskole.

Kinney, D.W. (2010). Selected non-music predictors of urban students' decisions to enrol and persist in middle school band programs. *Journal of Research in Music Education*, *57*(4), 334–350.

Lamont, A. (2002). Musical identities and the school environment. In R.A.R. MacDonald, D.J. Hargreaves and D. Miell (Eds.), *Musical identities* (pp. 41–59). Oxford: Oxford University Press.

Long, M. (2013). Conservatoire students' attitudes, self-efficacy and aspirations. In M. Stakelum (Ed.), *Contemporary perspectives on teaching and learning* (pp. 29–44). Farnham: Ashgate.

MacIntyre, P.D., Potter, G.K. and Burns, J.N. (2012). The socio-educational model of music education. *Journal of Research in Music Education*, *60*(2), 129–144.

MacKinnon, D.W. (1965). Personality and the realization of creative talent. *American Psychologist*, *20*, 273–281.

MacNamara, A., Holmes, P. and Collins, D. (2006). The pathway to excellence: the role of psychological characteristics in negotiating the challenges of musical development. *British Journal of Music Education*, *23*, 285–302.

Makris, I. and Mullet, E. (2009). A systematic inventory of motives for becoming an orchestra conductor: a preliminary analysis. *Psychology of Music*, *37*(4), 443–458.

Markus, H. and Ruvolo, A. (1989). Possible selves: personalized representations of goals. In L.A. Pervin (Ed.), *Goal concepts in personality and social psychology* (pp. 211–242). Hillsdale, NJ: Lawrence Erlbaum Associates.

McEwan, R. (2013). Secondary student motivation to participate in a year 9 Australian elective classroom music curriculum. *British Journal of Music Education*, *30*(1), 103–124.

McPherson, G.E. and Lehmann, A. (2012). Exceptional musical abilities: musical prodigies. In G.E. McPherson and G. Welch (Eds.), *The Oxford handbook of music education* (Vol. 2) (pp. 31–50). Oxford: Oxford University Press.

McPherson, G.E. and McCormick, J. (2000). The contribution of motivational factors to instrumental performance in a performance examination. *Research Studies in Music Education*, *15*, 31–39.

McPherson, G.E. and McCormick, J. (2006). Self-efficacy and performing music. *Psychology of Music*, *34*, 322–336.

McPherson, G.E. and O'Neill, S. (2010). Students' motivation to study music as compared to other school subjects: a comparison of eight countries. *Research studies in Music Education*, *32*(2), 1–137.

Miksza, P. (2011). Relationships among achievement goal motivation, impulsivity and the music practice of collegiate brass and woodwind players. *Psychology of Music*, *39*(1), 50–67.

Mota, G. (1999). Young children's motivation in the context of classroom music: an exploratory study about the role of music content and teaching style. *Bulletin of the Council for Research in Music Education*, *141*, 119–123.

Nagel, J.J. (1987). *An examination of commitment to careers in music: Implications for alienation from vocational choice*. (Unpublished doctoral dissertation.) University of Michigan, Ann Arbor, MI.

Nielsen, S.G. (2012). Epistemic beliefs and self-regulated learning in music students. *Psychology of Music*, *40*(3), 324–338.

O'Neill, S.A. (1997). The role of practice in children's early musical performance achievement during the early years of learning a musical instrument. In H. Jorgensen and A. Lehmann

(Eds.), *Does practice make perfect? Current theory and research on instrumental music practice* (pp. 3–70). Oslo: Norges Musikkhøgskole.

O'Neill, S.A. and McPherson, G.E. (2002). Motivation. In R. Parncutt and G.E. McPherson (Eds.), *The science and psychology of musical performance: Creative strategies for teaching and learning* (pp. 31–46). Oxford: Oxford University Press.

Persson, R.S., Pratt, G. and Robson, C. (1996). Motivational and influential components of musical performance: a qualitative analysis. In A.J. Cropley and D. Dehn (Eds.), *Fostering the growth of high ability: European perspectives* (pp. 287–301). Norwood, NJ: Ablex.

Pitts, S. (2005). *Valuing musical participation.* Ashgate: Aldershot.

Pitts, S. (2009). Roots and routes in adult musical participation: investigating the impact of home and school on lifelong musical interest and involvement. *Psychology of Music*, *26*(3), 241–256.

Pitts, S.E., Davidson, J.W. and McPherson, G.E. (2000). Models of success and failure in instrumental learning: case studies of young players in the first 20 months of learning. *Bulletin of the Council for Research in Music Education*, *146*, 51–69.

Renwick, J.M. and McPherson, G.E. (2002). Interest and choice: student-selected repertoire and its effect on practising behaviour. *British Journal of Music Education*, *19*, 173–188.

Ritchie, L. and Williamon, A. (2011). Primary school children's self-efficacy for music learning. *Journal of Research in Music Education*, *59*(2), 146–151.

Rotter, J.B. (1966). Generalised expectancies for internal versus external control of reinforcement. *Psychological Monograph*, *80* (Whole no. 609).

Sandene, B.A. (1998). An investigation of variables related to student motivation in instrumental music. *Dissertation Abstracts International*, *58*, 3870A. (UMI No. 9811178.)

Sanz, C.A. and Orbea, J.-M. M. (2013). Is the perception of music related to musical motivation in school? *Music Education Research*. Advance online publication. doi: 10.1080/14613808.2013.847074

Schmidt, C.P. (2005). Relations among motivation, performance achievement, and music experience variables in secondary instrumental music students. *Journal of Research in Music Education*, *53*, 134–147.

Schnare, B., MacIntyre, P. and Doucette, J. (2012). Possible selves as a source of motivation for musicians. *Psychology of Music*, *40*(1), 94–111.

Sichivitsa, V.O. (2007). The influences of parents, teachers, peers and other factors on students' motivation in music. *Research Studies in Music Education*, *29*, 55–67.

Sloboda, J.A. and Howe, M.J.A. (1991). Biographical precursors of musical excellence: an interview study. *Psychology of Music*, *19*, 3–21.

Taylor, A. and Hallam, S. (2011). From leisure to work: amateur musicians taking up Instrumental or vocal teaching as a second career. *Music Education Research*, *13*(3), 307–325.

Vispoel, W.P. and Austin, J.R. (1993). Constructive response to failure in music: the role of attribution feedback and classroom goal structure. *British Journal of Educational Psychology*, *63*, 110–129.

Wigfield, A., Eccles, J.S., Yoon, K.S., Harold, R.D., Arbreton, A.J.A., Freedman-Doan, C. and Blumenfield, P.C. (1997). Changes in children's competence beliefs and subjective task values across the elementary school years: a 3-year study. *Journal of Educational Psychology*, *89*, 451–469.

CHAPTER 31

THE ROLE OF THE FAMILY IN SUPPORTING LEARNING

ANDREA CREECH

Introduction

Powerful images of musicians' parents have been immortalized in accounts of the lives of many iconic figures in Western music. Parents have been depicted as exerting enormous influence on their children's musical development, as in the cases of Mozart (Solomon, 1994), Clara Schumann (Galloway, 2002), Yehudi Menuhin (1977), and Jacqueline du Pré (Easton, 1989), to name but a few. At the other end of the spectrum are exceptional accounts of musicians who attained high levels of expertise and musical intelligence without parental support, as in the case of Louis Armstrong (Collier, 1983). Pruett (2003, p. 154) invites us to conjure up our "most enduring stereotype of the musician's parent. Then consider the opposite pole. Next, reflect on the intermediaries." This chapter will attempt to respond to Pruett's challenge by considering these "intermediaries" and suggesting the ways in which parents may most constructively support their children's musical development.

Years of educational research, theory, and wisdom sustain the view that parents play a key role in their children's academic achievements, educational aspirations, well-being, and motivation (Baker, 1997; Gonzalez-DeHass, Willems and Doan Holbein, 2005; Grolnick, Gurland, DeCourcey and Jacob, 2002). In the domain of music, and specifically relating to the acquisition of expertise on musical instruments, the question of how families can best support their children's musical progress has been a preoccupation of many researchers. Positive relationships between musical home environments and the musical responsiveness of children from these homes have been reported (Shelton, 1965; Wermuth, 1971); these findings have been elucidated by research that has found children's musical development to be influenced by parental musical background (Bloom and Sosniak, 1981), socioeconomic background (Klinedinst, 1991), parent support for practice and lessons (Davidson, Howe and Sloboda, 1995; Margiotta, 2011; Sloboda and Howe, 1991; Zdzinski, 1992), parental goals, aspirations, and values (Davidson and Scott, 1999; McPherson, 2009; Sosniak, 1985), parental self-efficacy (Creech and Hallam, 2003), family interaction patterns (Davidson and Borthwick, 2002), and parent–teacher–pupil relationships (Creech, 2009). It has been

acknowledged that the conditions which facilitate the development of musical gifts and talents involve considerable investment of time and financial resources as well as parental belief and philosophical commitment (Chadwick, 1996). The process of facilitating developing talents is seen by Feldhusen (2001) as a long-range one in which parents work together with pupils and teachers. This growing body of research suggests that the ways parents might support their children in persisting with learning musical instruments and developing musical expertise are diverse and complex.

The advent of the Japanese Suzuki method, which came to the West during the 1960s holding as a central tenet the importance of the parent as "home teacher," played a powerful role in highlighting the issue of parent participation in the realm of children's instrumental learning. The Suzuki method, however, cannot claim sole ownership of the concept of parent–teacher–pupil partnership in instrumental learning. Empirical studies into the role of parents in instrumental learning (Bugeja, 2009; Creech, González-Moreno, Lorenzino and Waitman, 2013; Creech and Hallam, 2009; Davidson, Howe, Moore and Sloboda, 1996; Sloboda and Howe, 1992; Sosniak, 1985) have indicated that parental involvement in their children's musical development is not unusual. Parents from diverse contexts, with children learning by a range of teaching methods, have supported their children in pursuit of musical excellence, exerting a significant influence on musical development (Creech et al., 2008).

Parent–pupil dynamics in the context of instrumental learning are represented in a model proposed by McPherson (2009). Drawing on self-determination theory (Deci and Ryan, 2008), McPherson's framework demonstrates how children benefit when parenting style (the emotional climate) and parenting practices (behaviors) support the developing musician's sense of competence, autonomy, relatedness, and purpose. This may be achieved when parents place a high value on their children's musical endeavors and demonstrate a deep interest and emotional engagement with their children's music-making. A particularly important responsibility on the part of parents is to reinforce in their children an incremental theory of self (i.e., belief that with effort they are capable of progression) as opposed to an entity theory of self (i.e., belief in fixed innate talent), promoting this mindset by praising hard work rather than natural talent (McPherson, 2009; Scripp, Ulibarri and Flax, 2013).

Parent involvement has been defined as "the dedication of resources by the parent to the child within a given domain" (Grolnick, Benjet, Kurowski and Apostoleris, 1997, p. 538) and conceptualized as comprising behavioral (at school) support, cognitive/intellectual support, and personal support. With regard to all three of these dimensions, a challenge for parents is to provide support that encourages children to develop as autonomous learners. In a later paper that focused specifically on this issue, Grolnick (2009) proposed that self-regulated learning and positive school adjustment among children from pre-school through adolescence are facilitated when parents provide autonomy support alongside structure and caring personal involvement. Structure is not to be confused with control such as surveillance or directive behavior driven from the parental perspective. Rather, structure involves clear rules and guidance, allowing scope for the child to experience him- or herself as competent and autonomous.

This chapter begins with a brief discussion of the ways in which behavioral support, cognitive/intellectual support, and personal support have been found to influence children's musical development. Emphasis is given to the latter category of personal support, an area of parental involvement that has been shown in the domain of music to have far-reaching consequences for pupils, parents, and teachers alike (Pruett, 2003). A discussion of whether

interpersonal relating styles determine the extent to which parents engage in various types of involvement will follow, paying particular attention to the findings of a recent investigation into the influence of interpersonal relationships on learning outcomes (Creech, 2009). A typological approach will be taken, with parental support of their children's musical development discussed within the framework of six distinct types of parent–pupil–teacher partnerships in instrumental learning.

Parental Support

Behavioral Support

Overt manifestations of parental support, including participatory activities and modeling the importance of the subject area, are included under the umbrella of *behavioral support* (Grolnick et al., 1997). In the domain of instrumental learning, children may benefit when parents offer behavioral support in the form of participating in practice, attending lessons, and adopting the role of home teacher (Margiotta, 2011).

In a study of American concert pianists, Sosniak (1985) found that although many of the parents of her cohort had little musical background, their role of stimulating and supporting practice had been vital in sustaining their children's growth in musical competence. Sloboda and Howe (1991) concurred with Sosniak when they found that high achieving students in a specialist music school had benefited from the support and encouragement of parents who, with little formal knowledge of music, took responsibility for providing the structure for home practice. Davidson et al. (1995) demonstrated that parental commitment to assisting, encouraging, and supporting the child in the early stages of learning was a more important predictor of successful musical outcomes than any specialist knowledge on the part of the parent: "Without the positive involvement of the parent in the process, the highest levels of achievement are likely to remain unattainable" (p. 44).

Zdzinski (1992), in a study involving teenage woodwind players, demonstrated that the effects of behavioral support upon musical achievement may differ with student age. This view was supported by the findings from a study involving 337 violin pupils and their parents (Creech, 2010) where a considerable drop in monitoring and assisting with practicing, providing feedback during practice sessions, and attending instrumental lessons was found among the parents of 13–14-year-olds, as compared to those with children up to the age of 12. Furthermore, high parental behavioral support during adolescent years was significantly associated with inhibited pupil–teacher accord and with limitations on the child's autonomous learning. The ages of 12–18 have been described as the mid-life crisis of young musicians, when the need to acquire or disown the interest in music becomes paramount (Bamberger, 1987). This is the point at which directive behavioral support may become less helpful, while an increasing emphasis on cognitive/intellectual support and personal support may become more valuable to the developing musician.

Parents who have engaged in considerable behavioral support during the early years of their children learning musical instruments face a special challenge of managing the transition to pupil–parent independence, in relation to the instrumental learning. Creech and Hallam (2009) reported that this transition to independent pupil learning and the shift of

emphasis from behavioral support to cognitive/intellectual and personal support sometimes involved the difficult risk that their child would make the choice to discontinue, a choice that carried implications of rejection of parental values. In addition, for many parents this shift entailed the loss of a role they had constructed for themselves, and despite being supportive of their children becoming independent learners many reluctantly surrendered their participation in practice and lessons. Teenage children often took the lead, "encouraging" parents to relinquish their home teacher role by making it clear that this type of parental input was not welcome. Teachers too sometimes took the initiative, asking parents to cease attending lessons in order to allow a more independent relationship to flourish between pupil and teacher. The most successful transitions were experienced by parents whose children had established strong and positive relationships with their teachers, remaining receptive to parental interest yet taking responsibility for learning without external motivation provided by parents.

Cognitive/Intellectual Support

Exposing the child to cognitively stimulating activities and resources and engaging in domain-specific activities in the home have been found to comprise an important area of parental support. For example, Kulieke and Olszewski-Kubilius (1989) demonstrated that families of gifted children engaged in this form of support by espousing values relating to persistence and achievement in the subject area and by facilitating the progress of their children along particular domain-specific paths. McPherson (2009) suggests that young developing musicians internalize their parents' values and educational aspirations and that this may influence motivation and attainment. Whether adolescents are likely to incorporate the parents' orientation and persevere on these paths has been found by Smith (1991) to be dependent upon parent–adolescent communication regarding educational aims, together with perceived agreement between the two parents.

According to Csikszentmihalyi, Rathunde, and Whalen (1993), high levels of cognitive/intellectual support and challenge have a positive effect on teenagers across all talent areas. Parents of these accomplished children typically:

- Devote great amounts of time and energy to meeting the needs of their children.
- Set high standards.
- Encourage productive use of time.
- Provide challenging opportunities.
- Make sure lessons and materials are available.
- Set aside areas of the home where child can work privately.

In the context of instrumental learning, parents offering this type of support provide the opportunities and materials that will assist in musical progression and development, including arranging instrumental lessons, attending professional concerts with their children, listening to and discussing music in the home, encouraging participation in extracurricular musical activities, and accessing appropriate resources.

A study investigating parental influence on the musical development of musically involved young Australians (Chadwick, 1996) suggested that parents who perceived their

children to be exhibiting characteristics of musical giftedness provided high levels of cognitive support for home-based musical activities. When parents provided opportunities for children to engage in challenging and rigorous musical activities from an early age, this enhanced normative musical development and provided a foundation for the development of musical expertise (Chadwick, 2000).

Creech (2010) reported that parents of violin pupils aged 13–18 who had persisted with learning for 7 or more years and had attained relatively high levels of expertise on their instruments (beyond grade 5, practicing 6 or more hours per week) engaged in higher levels of cognitive/intellectual support than those with children below the age of 13 and in the beginning stages of playing. In the same study, when 337 parent–pupil pairs were grouped according to parent scores for cognitive/intellectual support, increased pupil enjoyment and parent satisfaction were found in the groups where the parents offered the greatest amount of this type of support. Cognitive/intellectual support was also found to be associated with increased professional satisfaction on the part of the teachers and with pupil–teacher influence, whereby pupils demonstrated independent learning, contributed to setting goals, and effected changes in the learning agenda.

Personal Support

Education researchers have found that children in all age groups, including secondary school students, value personal support in the form of their parents' help, interest, and guidance, and that parental influence on children's behavior remains extensive in adolescence (Brown, Mounts, Lamborn and Steinberg, 1993; Crozier, 1999). However, Crozier highlights the importance of negotiation rather than imposition of psychological control characterized by intrusive or manipulative controlling/surveillance measures (Baumrind, 2005; Crozier, 1999). Crozier here touches on the issue, so stark in adolescence, of the delicate balance between dimensions of "agency" (the drive for independence) and "communion" (the need to be engaged with others), which has been identified both in the literature relating to parenting style (Baumrind, 1989; Brown et al., 1993; Noack, 1998) and that concerned with interpersonal style (van Tartwijk, Brekelmans and Wubbels, 1998) and relationships (Birtchnell, 1993; Noller, Feeney and Peterson, 2001). To illustrate, Ginsburg and Bronstein (1993) found that behavioral support in the form of surveillance and monitoring of homework was associated with an extrinsically motivated orientation among children, yet they also noted that when parents provided encouragement and praise the children were more likely to demonstrate curiosity and an intrinsic interest in challenging learning tasks. It has been suggested that emotional support offered by parents in the form of interest and enthusiasm for their children's learning establishes "a foundation for socializing children's motivation to learn" (Gonzalez-DeHass et al., 2005, p. 111). Furthermore, there is strong evidence that regardless of social class parental involvement in the form of home interest, support and discussion has a major impact on educational outcomes (McNeal, 2001; Sui-Chu and Willms, 1996).

In music, a growing body of evidence demonstrates that high levels of personal support represents a key area of parent involvement associated with sustaining children's musical engagement and progression (Creech, 2010; Pruett, 2003). Personal support has been associated with persistence with learning and musical attainment as well as with

increasing pupil enjoyment of music and motivation (Creech, 2010). Those parents with the highest scores for personal support were interested in understanding their child's point of view and prepared to compromise when their personal goals or expectations conflicted with those of the child, subscribing to the stated aim of supporting the child in whatever course of action was chosen (i.e., to continue or not with musical studies). These parents were deeply interested in their children's learning, and were involved with their child learning an instrument to the extent that they considered this endeavor to have been a life-changing experience for themselves. A predominant view among these parents was that their children should develop independent learning skills and yet continue to feel supported by their parents. These findings echo the view put forth by Ryan, Stiller, and Lynch (1994, p. 227) who argues that "people function most cohesively and confidently in contexts in which they experience significant others as being both caring and autonomy-supportive."

The Potential for Conflict

Considering the potential for conflict among those involved with musical instrument learning, particularly over practice, musical preferences, and time commitment expectations, it is perhaps rather surprising that little research to date has been directly concerned with this issue.

The emotional demands made on parents by their musical children can be considerable. The parent–child relationship is particularly vulnerable when adolescents reach the aforementioned musical mid-life crisis (Bamberger, 1987) and as young musicians become increasingly susceptible to performance anxiety and the fear of negative judgment (Robson, 1987). Clearly it is important for children to sustain a sense of being emotionally supported by their parents even in the face of disagreements. Research with gifted children and their families advocates family meetings as a forum where conflicts and power struggles may be resolved via shared responsibility and negotiation (Silverman, 1992).

While parents of young musicians have been found to make frequent references to reluctant practicing and to parent–pupil conflict these issues did not, as many parents fear, inevitably diminish either their children's persistence with learning or their own personal satisfaction (Creech and Hallam, 2009). Strategies that parents have identified as being successful in dealing with this potential battleground include simply leaving the room, discussions at times other than practice time, lowering expectations of daily practice, challenging the child, and offering praise as a reward. Parents did not acknowledge that material rewards would be a useful strategy to resolve conflict over practice, and considered the most successful strategy to have been allowing the child to choose when and how much to practice, within parameters negotiated with the teacher.

Pruett (2003, p. 155) identifies transcultural qualities of "good enough parenting," among which the challenges of personal support are encapsulated. Included on his list are sensitivity to children and their ever-changing needs, the ability to make children feel loved, adored, and enjoyed, devotion to sustaining strong values, affirmation of the child's uniqueness while expecting competence, and sustaining an abiding presence through thick and thin. Research in the domain of music supports the enduring importance of these qualities, suggesting that pupils function best when they perceive the adults as both caring and supportive

of autonomy and when they are able to engage in ongoing mutual interaction with adults who continue to have a stake in their development and to act as their advocate (Creech and Hallam, 2011; McPherson, 2009).

Parent–Pupil–Teacher Interaction: A Typological Approach

Any discussion of the parental role in children's musical development must take into account the interpersonal context. Systems theory provides a framework in which this context, comprising parents, teachers, and pupils, may be conceptualized as a microsystem characterized by *holism*, whereby a human system is understood as the sum of its individual members, and *exchange*, whereby any change in one member of the system produces change throughout the system (Becvar and Becvar, 1996). O'Neill (1996) argues that the parent–pupil–teacher relationship in the context of musical instrument learning can justifiably be conceptualized as a microsystem because all three participants experience new patterns of action and communication as a direct result of their interaction, and because many motivational issues can be understood and possibly resolved when considered as a function of the microsystem. From this perspective parental support may be seen as part of the functioning of the parent–teacher–pupil system, influenced by the parent's position on a *control–responsiveness* axis, in relation to teacher and pupil.

Control and Responsiveness

Baumrind (2005) suggests that the extent to which parents engage in supportive behavior is associated with interpersonal qualities she labels as responsiveness and demandingness (interpreted here as *control*). Trusty and Lampe (1997) investigated the dimension of parent control and suggest that this interpersonal dynamic, when manifested in the context of relationships where parents offer cognitive and personal support in the form of discussing school, current events, or troubling issues with their teenagers, is associated with an internal locus of control on the part of the young people whereby they experience pride and satisfaction for their successes. However, Ginsburg and Bronstein (1993) investigated the impact of behavioral support on student motivation and found that when parents monitored, enforced, or helped with homework in a controlling fashion their early adolescent children showed less autonomy, satisfaction, persistence, and intrinsic motivation related to their schoolwork. Garland (2005) discusses control as a dimension that varies from controlling to autonomy supportive behavior, putting forth the view that while the former encourages children's obedience and compliance the latter promotes choice, self-reliance, and participation in decision-making.

Baumrind's model of demandingness–responsiveness interpersonal relating style is reflected in Birtchnell's relating theory (2001) whereby interaction is conceptualized on a horizontal closeness–distance axis intersecting with a vertical upperness–lowerness axis. Birtchnell does not privilege different positions on his interpersonal model, pointing out that while closeness holds people together, distance provides the space to become autonomous,

and while upperness allows the opportunity for people to exert influence on others, lowerness enables individuals to benefit from the care and leadership of others.

Categories of Parent–Teacher Pupil Interaction

The models proposed by Baumrind and Birtchnell resemble Leary's model for interpersonal interaction (1957) that served as the basis for the examination of parent control and responsiveness in the context of their relationships with their children who were learning the violin, as well as their relationships with their children's instrumental teachers (Creech, 2009). Parent control, on the vertical axis, was found to be comprised of underlying dimensions that were: (1) perceived teacher leadership, (2) parent–teacher communication, (3) parent isolation within the learning partnership, (4) parent ambition and (5) parent preponderance. Responsiveness, on the horizontal axis, comprised: (1) perceived teacher approachability, (2) teacher–parent intimidation, (3) parent–pupil reciprocity and (4) parent–teacher acquiescence. Parent control and responsiveness were found to account for variability in pupils' enjoyment of music, motivation, satisfaction with music lessons, self-efficacy, and self-esteem.

Six distinct clusters of parent–teacher–pupil interaction types, determined by dimensions of control and responsiveness, were found among the parent–teacher–pupil trios. A model (Figure 31.1) representing these six types of learning partnerships demonstrates that clusters one, two, and three may be conceptualized as a primary dyad plus a third party, while cluster four is represented as two primary dyads connected by one common member. Cluster five is characterized by very little communication between any two of the three individuals, while cluster six is characterized by reciprocity among all three participants.

Differences Among the Clusters of Parent–Teacher–Pupil Interaction Types

Parent Support

Significant differences were found between the parents of each cluster with respect to the types of support they were most likely to engage in. Parents in the *dynamic duo* and *discordant trio* clusters, characterized by a distant and powerless parent–teacher relation, offered the least amount of support, overall. Those occupying the *solo leader* cluster, where the parent took responsibility for ensuring that parent and pupil together followed the directive teacher, were found to offer the most behavioral support. The highest levels of cognitive/intellectual support were offered by parents occupying the *dominant duo* cluster, characterized by parents who adopted a predominant and controlling role in relation to both pupil and teacher. The *harmonious trio* cluster, where parents balanced ambitions for their children with responsiveness in relation to both teacher and pupil, had parents who engaged in the most personal support (Figure 31.2).

Pupil Age

As pupils matured, parent–pupil–teacher trios tended to gravitate toward the *dynamic duo* (pupil–teacher relationship becoming the primary dyad and parents becoming less

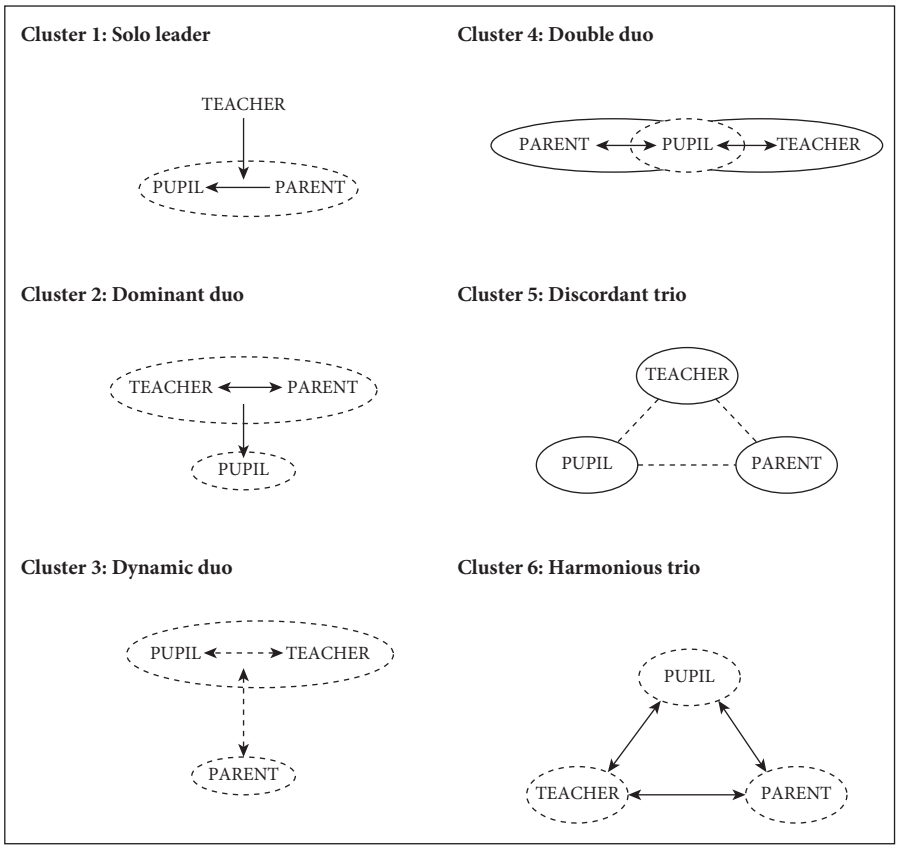

FIGURE 31.1 Parent–teacher–pupil interaction types.

influential), adding to the body of evidence showing that while parent–child relationships are typically hierarchical, family relationships undergo transformations toward more egalitarian patterns during adolescence (Noack, 1998). While younger pupils were more likely to occupy the categories of *solo leader* and *dominant duo* where the basis for teacher–parent cooperation was the perceived dependency of the child, during the adolescent years pupils ceased to be dependent on the parent for motivation and structure (Johnson, 1991). It was evident that some parents became isolated third parties (*dynamic duo*) while others shifted from an emphasis on behavioral support to personal and cognitive/intellectual support, continuing to support their children at home but becoming remote from the teacher (*double duo*). Still others (likely to be found in the *harmonious trio*) achieved a balance of agency and communion with their children and teachers within a relationship characterized by continued moderate behavioral support together with an emphasis on both cognitive/intellectual and personal support.

Persistence with Learning

Numbers occupying the *discordant trio* category decreased sharply after 3 years of study, suggesting that characteristics of this type may have led to pupil drop-out, or alternatively to changes to other teachers. Conversely, there was a large increase in numbers occupying

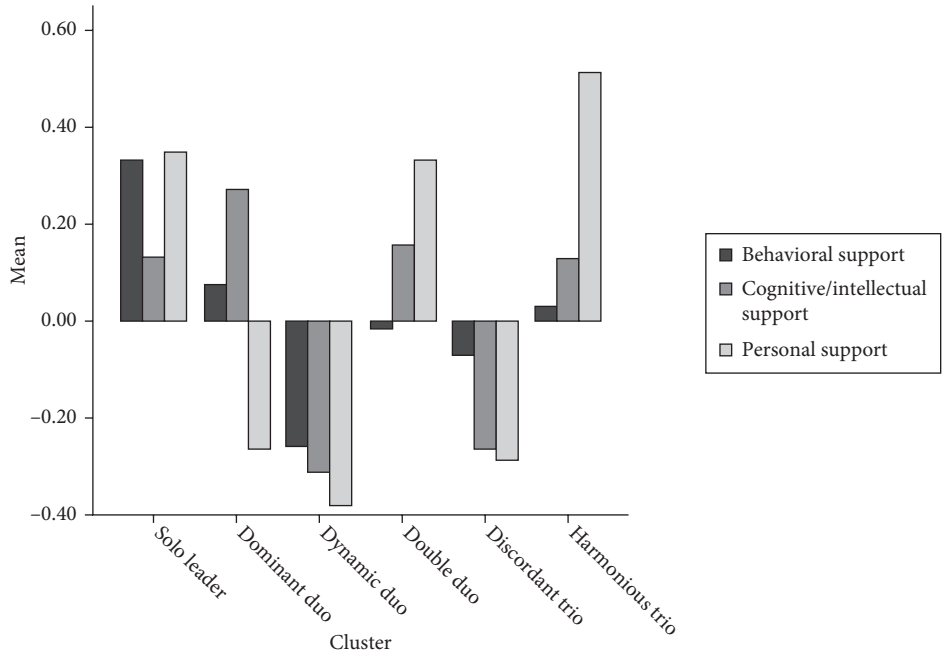

FIGURE 31.2 Parent support according to parent–teacher–pupil interaction type (standardized scores).

harmonious trios, after 3 years of study. The numbers in the *dynamic duo* category remained stable and were not sensitive to years of study, while numbers occupying *dominant duo* and *double duo* categories declined after 6 years of study. Thus it would seem that the balance of parent support achieved by those in *harmonious trios*, which included moderate behavioral support, higher levels of cognitive/intellectual support, and a great deal of personal support, may be associated with their children's perseverance on the instrument.

Few pupils occupying the *discordant trio* cluster progressed beyond grade 5, while the *dominant duo* and *harmonious trio* clusters contained greater proportions of pupils who had attained a minimum of grade 4. Parents occupying these two clusters, while differing in respect of personal support, were similar in that they demonstrated high parent–teacher acquiescence and perceptions of strong teacher leadership but low teacher–parent intimidation and isolation.

The *harmonious trio* and the *solo leader* were the clusters where the greatest proportion of pupils did in excess of 3 hours of practice per week. Parents in these two clusters were most similar in that they perceived strong leadership on the part of the teachers and also offered a great deal of personal support to their children. Again, perceived teacher leadership, on the part of the parent, seems to be a key factor in sustaining persistence with learning.

Pupil Learning Outcomes

Differences among the clusters of interaction types were evident in respect of pupil learning outcomes including enjoyment of music, personal satisfaction, motivation, self-efficacy,

and self-esteem. Overall, the *discordant trio* produced the least positive outcomes while the *harmonious trio* produced the most consistently positive outcomes for pupils. With reference to the former, this finding adds to earlier research that suggests where parents place a low value on the subject matter, have low expectations of success, do not have the wherewithal to help their children at home, and/or are intimidated by teachers the result can be a downward spiral of mutual distrust, lack of communication, and absence of shared purpose among parents, teachers, and pupils alike (Bandura, 1997; Hurley, 1995). In contrast, the findings in respect of the latter elucidate earlier research that has proposed a model of parent–professional–child partnership whereby parents lie at the heart of a system which advances the child's development while professionals take primary responsibility for advancement of knowledge and skills (Henry, 1996). Furthermore, these findings support the view that pupils benefit greatly when parents are perceived as being caring yet also supportive of autonomy, and when they are able to engage in ongoing mutual interaction with adults who continue to have a stake in their development and to act as their advocate (Ryan, Stiller, and Lynch, 1994).

Summary: The Versatile Parent

The message that parents may take from this chapter is that effective and supportive parental involvement in instrumental learning requires parents to be versatile, adept at moving between the close and distant positions on the responsiveness axis and between directive and acquiescent positions on the control axis of the model for interpersonal dimensions. This involves providing much practical assistance and personal support during the early years of learning yet seeking and following the teacher's advice in musical matters and allowing the child and teacher the space to develop an autonomous relationship. It also involves remaining resilient in the face of reluctant practicing while remaining as the child's interested and supportive advocate long after practical help has ceased to be appropriate or welcomed by the teacher and pupil. Most importantly, parents should not become uninvolved in their children's learning in the name of agency, nor disempower their children in the name of communion. Specifically, positive outcomes may be achieved when parents: (a) elicit their children's views regarding appropriate parental involvement; (b) negotiate with their children over practicing issues, within parameters set by the teacher; (c) provide a structured home environment for practice; (d) take an interest in promoting good teacher–pupil rapport; (e) communicate with the teacher in relation to the child's progress; and (f) remain as a supremely interested audience.

References

Baker, A. (1997). *Parent involvement in children's education: A critical assessment of the knowledge base*. Paper presented at the Annual Meeting of the American Education Research Association, Chicago, IL. Retrieved from http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/16/85/c2.pdf.

Bamberger, J.S. (1987). The mind behind the musical ear. In *The biology of music making: Music and child development. Proceedings of the 1987 Denver conference* (pp. 291–305). St Louis, MO: MMB Music.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: W.H. Freeman and Company.

Baumrind, D. (1989). Rearing competent children. In W. Damon (Ed.), *Child development today and tomorrow* (pp. 349–378). London: Jossey-Bass.

Baumrind, D. (2005). Patterns of parental authority and adolescent autonomy. *New Directions for Child and Adolescent Development*, *108*, 61–69.

Becvar, D. and Becvar, R. (1996). *Family therapy: A systemic integration.* Boston, MA: Allyn and Bacon.

Birtchnell, J. (1993). *How humans relate: A new interpersonal theory.* Hove: Psychology Press.

Birtchnell, J. (2001). Relating therapy with individuals, couples and families. *Journal of Family Therapy*, *23*, 63–84.

Bloom, B. and Sosniak, L. (1981). Talent development. *Educational Leadership*, *November*, 86–94.

Brown, B.B., Mounts, N., Lamborn, S.D. and Steinberg, L. (1993). Parenting practices and peer group affiliation in adolescence. *Child Development*, *64*, 467–482.

Bugeja, C. (2009). Parental involvement in the musical education of violin students: Suzuki and "traditional" approaches compared. *Australian Journal of Music Education*, *1*, 19–28.

Chadwick, F. (1996). *Gifted education: Proceedings from the 1996 national conference in Adelaide, South Australia.* Adelaide: Australian Association for the Education of the Gifted and Talented.

Chadwick, F. (2000). *An Australian perspective on talent development in music: The influence of environmental catalysts upon the provision of opportunities for learning, training, and practice in the musical domain* (Unpublished doctoral dissertation). University of New South Wales, Sydney, Australia.

Collier, J.L. (1983). *Louis Armstrong: An American genius.* Oxford: Oxford University Press.

Creech, A. (2009). Teacher-parent-pupil trios: a typology of interpersonal interaction in the context of learning a musical instrument. *Musicae Scientiae*, *XIII*(2), 163–182.

Creech, A. (2010). Learning a musical instrument: the case for parental support. *Music Education Research*, *12*(1), 1–19.

Creech, A., González-Moreno, P., Lorenzino, L. and Waitman, G. (2013). *El Sistema and Sistema-inspired programmes: A literature review*. London: Institute of Education, for Sistema Global. Retrieved from http://sistemaglobal.org/litreview/.

Creech, A. and Hallam, S. (2003). Parent-teacher-pupil interactions in instrumental music tuition: a literature review. *British Journal of Music Education*, *20*(1), 29–44.

Creech, A. and Hallam, S. (2009). Interaction in instrumental learning: the influence of interpersonal dynamics on outcomes for parents. *International Journal of Music Education (Practice)*, *27*(2), 93–104.

Creech, A. and Hallam, S. (2011). Learning a musical instrument: the influence of interpersonal interaction on outcomes for school-aged pupils. *Psychology of Music*, *39*(1), 102–122.

Creech, A., Papageorgi, I., Potter, J., Haddon, E., Duffy, C., Morton, F., … Welch, G. (2008). Investigating musical performance: commonality and diversity amongst classical and non-classical musicians. *Music Education Research*, *10*(2), 215–234.

Crozier, G. (1999). Parent involvement: who wants it? *International Studies in Sociology of Education*, *9*(2), 111–130.

Csikszentmihalyi, M., Rathunde, K. and Whalen, S. (1993). *Talented teenagers: The roots of success and failure*. Cambridge: Cambridge University Press.

Davidson, J. and Borthwick, S.J. (2002). Family dynamics and family scripts: a case study of musical development. *Psychology of Music*, *30*(1), 121–136.

Davidson, J., Howe, M., Moore, D. and Sloboda, J. (1996). The role of parental influences in the development of musical performance. *British Journal of Developmental Psychology*, *14*(4), 399–412.

Davidson, J., Howe, M. and Sloboda, J. (1995). The role of parents and teachers in the success and failure of instrumental learners. *Bulletin of the Council for Research in Music Education*, *127*, 40–44.

Davidson, J. and Scott, S. (1999). Instrumental learning with exams in mind: a case study investigating teacher, student and parent interactions before, during and after a music examination. *British Journal of Music Education*, *16*(1), 79–95.

Deci, E. and Ryan, R. (2008). Facilitating optimal motivation and psychological well-being across life's domains. *Canadian Psychology*, *49*(1), 14–23.

Easton, C. (1989). *Jacqueline du Pré: A biography*. Cambridge, MA: Da Capo Press.

Feldhusen, J.F. (2001). *Talent development in gifted education* (No. ERIC Digest E610). Arlington, VA: ERIC Clearinghouse on Disabilities and Gifted Education.

Galloway, J. (2002). *Clara*. London: Jonathan Cape.

Garland, S. (2005). Perceived threat, controlling parenting, and children's achievement orientations. *Motivation and Emotion*, *29*(2), 103–120.

Ginsburg, G.S. and Bronstein, P. (1993). Family factors related to children's intrinsic/extrinsic motivational orientation and academic performance. *Child Development*, *64*, 1461–1474.

Gonzalez-DeHass, A.R., Willems, P.P. and Doan Holbein, M.F. (2005). Examining the relationship between parental involvement and student motivation. *Educational Psychology Review*, *17*(2), 99–123.

Grolnick, W., Benjet, C., Kurowski, C. and Apostoleris, N. (1997). Predictors of parent involvement in children's schooling. *Journal of Educational Psychology*, *89*(3), 538–548.

Grolnick, W., Gurland, S., DeCourcey, W. and Jacob, K. (2002). Antecedents and consequences of mothers' autonomy support: an experimental investigation. *Developmental Psychology*, *38*(1), 143–155.

Grolnick, W.S. (2009). The role of parents in facilitating autonomous self-regulation for education. *Theory and Research in Education*, *7*(2), 164–173.

Henry, M. (1996). *Young children, parents, and professionals: Enhancing the links in early childhood*. London: Routledge.

Hurley, C.G. (1995). Student motivations for beginning and continuing/discontinuing string music instruction. *The Quarterly Journal of Music Teaching and Learning*, *VI*(1), 44–55.

Johnson, D. (1991). Parents, students and teachers: a three-way relationship. *International Journal of Educational Research*, *15*(2), 171–181.

Klinedinst, R. (1991). Predicting performance achievement and retention of fifth-grade instrumental students. *Journal of Research in Music Education*, *39*(3), 225–238.

Kulieke, M.J. and Olszewski-Kubilius, P. (1989). The influence of family values and climate on the development of talent. In J.L. VanTassel-Baska and P. Olszewski-Kubilius (Eds.), *Patterns of influence on gifted learners* (pp. 40–59). New York: Teachers College Press.

Leary, T. (1957). *Interpersonal diagnosis of personality: A functional theory and methodology for personality evaluation*. New York: Ronald Press Company.

Margiotta, M. (2011). Parental support in the development of young musicians: a teacher's perspective from a small-scale study of piano students and their parents. *Australian Journal of Music Education*, 1, 16–30.

McNeal, R.B. (2001). Differential effects of parental involvement on cognitive and behavioural outcomes by socioeconomic status. *Journal of Socio-Economics*, *30*, 171–179.

McPherson, G.E. (2009). The role of parents in children's musical development. *Psychology of Music*, *37*(1), 91–110.

Menuhin, Y. (1977). *Unfinished journey.* London: Macdonald and Jane's Publishers Ltd.

Noack, P. (1998). School achievement and adolescents' interactions with their fathers, mothers, and friends. *European Journal of Psychology of education*, *XIII*(4), 503–513.

Noller, P., Feeney, J.A. and Peterson, C. (2001). *Personal relationships across the lifespan*. Hove: Psychology Press.

O'Neill, S. (1996). *Factors influencing children's motivation and achievement during the first year of instrumental music tuition* (Unpublished doctoral dissertation). Keele University, Keele, UK.

Pruett, K. (2003). *First patrons: Parenting the musician.* Paper presented at the 21st Annual Symposium on the Medical Problems of Musicians and Dancers (24–27 June), Aspen, Colorado.

Robson, B. (1987). Post-performance depression in arts students. *Medical Problems of Performing Artists*, *2*, 137–141.

Ryan, R. M., Stiller, J. D. and Lynch, J. H. (1994). Representations of relationships to teachers, parents, and friends as predictors of academic motivation and self esteem. *Journal of Early Adolescence*, *14*(2), 226–249.

Scripp, L., Ulibarri, D. and Flax, R. (2013). Thinking beyond the myths and misconceptions of talent: creating music education policy that advances music's essential contribution to twenty-first-century teaching and learning. *Arts Education Policy Review*, *114*(2), 54–102.

Shelton, J. (1965). *The influence of home musical environment upon musical response of first grade children* (Unpublished PhD thesis). George Peabody College for Teachers, Vanderbilt University, Tennessee.

Silverman, L. (1992). *How parents can support gifted children* (No. ERIC Digest E515). Reston, VA: Council for Exceptional Children.

Sloboda, J. and Howe, M. (1991). Biographical precursors of musical excellence: an interview study. *Psychology of Music*, *19*(1), 3–21.

Sloboda, J. and Howe, M. (1992). Transitions in the early musical careers of able young musicians: choosing instruments and teachers. *Journal of Research in Music Education*, *40*(4), 283–294.

Smith, T.E. (1991). Agreement of adolescent educational expectations with perceived maternal and paternal educational goals. *Youth and Society*, *23*(2), 155–174.

Solomon, M. (1994). *Mozart: A life*. London: Hutchinson.

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.

Sui-Chu, E.H. and Willms, J.D. (1996). Effects of parental involvement on eighth-grade achievement. *Sociology of Education*, *69*(2), 126–141.

Trusty, J. and Lampe, R.E. (1997). Relationship of high-school seniors' perceptions of parental involvement and control to seniors' locus of control. *Journal of Counselling Development*, *75*(5), 375–384.

Van Tartwijk, J., Brekelmans, M. and Wubbels, T. (1998). Students' perceptions of teacher interpersonal style: the front of the classroom as the teacher's stage. *Teaching and Teacher Education*, *14*(6), 607–617.

Wermuth, R. (1971). *Relationship of musical aptitude to family and student activity in music, student interest in music, socioeconomic status, and intelligence among Caucasian and Negro middle school students* (Unpublished PhD dissertation). Ohio State University, Columbus, OH.

Zdzinski, S. (1992). Relationships among parental involvement, music aptitude, and musical achievement of instrumental music students. *Journal of Research in Music Education*, *40*(2), 114–125.

CHAPTER 32

THE ROLE OF THE INSTITUTION AND TEACHERS IN SUPPORTING LEARNING

GRAHAM WELCH AND ADAM OCKELFORD

Introduction

Musical behavior and development are natural byproducts of the interface between intrapersonal maturational processes and an individual's enculturation into locally dominant sound worlds (e.g., Hallam and Lamont, 2004; Welch, 2001, 2006a; Barrett, 2011) and are basic to human design. They are not dependent on the input of an institution or a "teacher" as such, but are related to the evolution of generative skills in a sonic environment—our natural propensity to "continually create, recreate and develop new ideas and materials" (Hallam and Lamont, 2004, p. 243). Within such environments, there are various "institutions" (including cultural settings as well as educational establishments) and "teachers," i.e., people who have a role in musical learning, with both exemplified in the peer-to-peer popular music skill development of musicians and adolescents (Green, 2001; Tarrant, North and Hargreaves, 2002). Other examples are found in the interweaving of indigenous musics with the rituals of daily life, such as in the *iorram* or rowing songs of the Isle of Mull (Macnab, 1970) and as practiced by the Northern Ewe children of Eastern Ghana:

> *6.00 a.m.* The day's work has begun in earnest. In one home, girls are pounding dried cassava in a mortar to make *kokonte*. In another, they are pounding recently harvested rice in order to remove the husks. As with other forms of daily pounding … the work … is made a little less routine by incorporating some rhythmic interest. In place of a regularly spaced alternation between two pounders … a variant may be introduced. Pounder 1 keeps a steady pace while Pounder 2 pushes her strokes closer to Pounder 1's. Here as elsewhere in Northern Ewe culture, work merges into play and reemerges into work.
>
> (Agawu, 1995, p. 12)

Contemporary explanations of the mechanism for the process of learning in social and cultural settings often draw on the work of Vygotsky, Luria, and Leont'ev from the first half of

the twentieth century (cf. Cole, 1999; Kaptelinin, 2014), as well as being related to systems theory (the interlinking of relationships within some form of organization—von Bertalanffy, 1968) and social ecology theory (the nurturing of development within social contexts—Bronfenbrenner, 1979). The early Russian investigators and those who developed their work subsequently (such as the Finnish researcher, Engeström) explored how learning and development are the product of inter- and intrapersonal behaviors that are shaped by cultural artifacts (e.g., literature), alongside tools (including psychological tools, e.g., language and other symbol systems), expectations, "rules"/conventions and norms. The internalization of artifacts is also seen to facilitate the agency of the individual, such that the artifacts themselves are modified through personal use, enabling the possibility of consequent change within the culture. Thus there is an ongoing mediation process in how individuals interact with the world around them and make sense of their reality.

A key concept in this view of culturally based learning is "activity" which has been defined as "the engagement of a subject toward a certain goal or objective" (Ryder, 2005). One widely cited model of activity within a system is provided by Engeström (1999, 2001—see Figure 32.1). In his interrelated system of elements as applied to education, the "subject" (the learner) is supported in reaching the "object" (the intended learning outcome) through interaction with various "mediating artifacts" (such as language and other symbol systems), a conceptualization strongly associated with the work of Vygotsky. This process is seen as being embedded in a social context that provides support for the activity through the subject and intended outcome being located within a "community" that has "rules" (expectations for behavior) and also the likelihood of a "division of labour" (diversity of effort). Because of the possibility of tensions within the activity system, it may be that the actual "outcome" is at variance with the intended "object" (i.e., that there are unintended outcomes—as explored below).

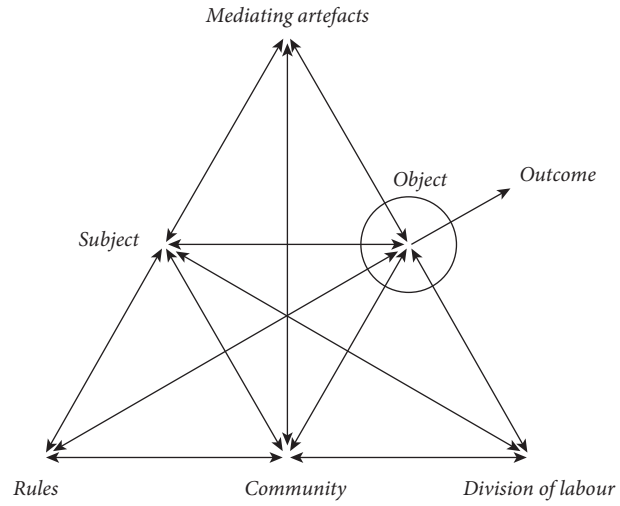

FIGURE 32.1 The structure of a human activity system.

(Reproduced from Expansive Learning at Work: Toward an activity theoretical reconceptualization, Yrjö Engeström, *Journal of Education and Work*, *14*(1), pp. 133–56, Figure 2, DOI: 10.1080/13639080020028747 © 2001, Taylor & Francis Ltd, http://www.tandfonline.com.)

If the activity system is seen in relation to learning within an institution (such as a school or social collective, e.g., the family) in which certain people either adopt or are expected to have roles as "teachers," then it is possible to envisage how the theorized activity system might be able to support the intended learning in music (or fail to). The world of music has certain characteristics:

- There are many different musical genres and subgenres.
- Each has its own customary view of what counts as musical learning, or at least the outcomes of musical learning in relation to performance, as well as the traditions (custom and practice) in how learning is usually fostered in relation to the genre's characteristic features, as illustrated in the "institutions" of India (e.g., the tradition of musical "households" or *Gharanas*; Farrell, 2001) and Japan (e.g., the "culture schools" managed by major business and voluntary organizations; Murao and Wilkins, 2001).
- In many diverse musics, there is evidence of the high status accorded to the accomplished expert who demonstrates solo mastery over the sonic material.
- Certain cultures, such as China, Afghanistan, and India, continue to have strong traditional music genres. These are characterized by expertise transmission within families across several (or many) generations (Jones, 1995; Doubleday and Baily, 1995; Farrell, 1997). In such traditional cultures, the "teacher" is in a master/apprentice relationship with the "pupil" within a strong local community, often fostered by pupils playing for each other in the presence of the master.

Aspects of the role of institutions and teachers in the process by which musical expertise is learned and demonstrated are illustrated in the four examples that follow (see below). The first relates to musical development in a special education context, the second to advanced music learning in higher education, the third to the relatively new music education world of the female cathedral chorister, and the fourth to pupils' experiences of lower secondary school classrooms in England. In the first three cases, the intention is to suggest how the teacher and institution support the "activity" of learning within a social context, whilst the last demonstrates that not all music learning within an institution is necessarily positive or as intended.

The Role of Institutions and Teachers in Supporting Musical Learning: Four Examples

Example 1: Supporting Musical Learning in a Young Prodigious Musical Savant

Derek Paravicini is a musical savant, now approaching his mid-thirties, who is well known to the public through success on the concert platform as a jazz and popular pianist on both sides of the Atlantic. His early life was very difficult, and the initial development of his musical expertise was highly unconventional (Ockelford, 2007).

Derek was born premature at 26 weeks, weighing a little over 700 g. In the fight for survival that followed, he lost his sight through *retinopathy of prematurity*, and developed unspecified neurological impairments that meant he grew up with severe learning difficulties. His family was upper class and employed the services of an experienced nanny to care for him and oversee his upbringing. Neither she, nor anyone else, expected Derek to develop musically in a way that was at all out of the ordinary (there was no history of exceptional musical development in the family). However, following the diagnosis of Derek's blindness, a few weeks after returning home from hospital, Nanny decided that sound was likely to play an important part in his life. So she sang to him constantly and surrounded him with sound-making toys. And just like any other baby's environment, Derek's day-to-day life was perfused with music from the TV, radio, and other incidental sources.

Derek was attracted to music as a potential source of stimulation and order in the world around him, and unbeknown to Nanny or his family, his ability to process musical sounds developed rapidly and precociously. Desperate to find an activity that would keep the 1-year-old Derek gainfully occupied, Nanny gave him his grandfather's little electric keyboard to play with. From the start, Derek loved the sounds that it produced and discovered that he could imitate some of the musical sounds with which he had come into contact. With no intervention on the part of Nanny or his family, and with no visual model to guide him, Derek taught himself how to get his hands and fingers in the right places at the right times to recreate some of the snatches of melody and harmony that were familiar to him. This situation—Stage 1 in the journey of Derek's musical learning—is summarized in terms of Engeström's model in Figure 32.2.

One day, after about 6 months of self-directed exploration at the keyboard, Nanny heard Derek play a version of the Irish folksong "Cockles and Mussels"—using both hands, with a tune and rudimentary accompaniment. His repertoire soon widened, and Derek's relationship with Nanny, his extended family, and friends took a new course with the addition of this unexpected but welcome dimension. Still there was no *formal* intervention or guidance from those around Derek in terms of supporting his learning. And in the months and years that followed, Derek continued to chart his own, unique, autodidactic course (Stage 2: Figure 32.3).

At the age of 5, Derek came to the attention of the second author (AO), who was then teaching in a school for the blind in southwest London. Derek's raw talent was evident, as were his technical eccentricities—including the use of his knuckles, hands, and even the occasional judicious dip of his nose which enabled him to reproduce sonorities that were beyond the reach of his limited span (around a fifth on the standard-sized keyboard). In AO's view, while Derek's achievements up to that point were remarkable, particularly given his blindness and severe developmental delay, it was essential that he should come to accept the intervention of another, to guide his further musical development and realize his creative intent. However, Derek had never experienced anything approaching a conventional "teacher–pupil" relationship, and he was not remotely inclined even to share *his* piano with anyone else, let alone engage in a structured learner–teacher dyad. Hence, a large part of AO's effort for the first 6 months of working with Derek was directed towards showing him that interaction through music could be productive and, above all, enjoyable. And gradually, involving an initial degree of physical intervention, Derek did come to appreciate that discourse through the medium of musical improvisation was possible and could indeed be a source of great pleasure.

Engaging in social discourse through sound alone could not solve Derek's technical challenges, however, and a final stage in AO's early relationship with him was necessary, whereby

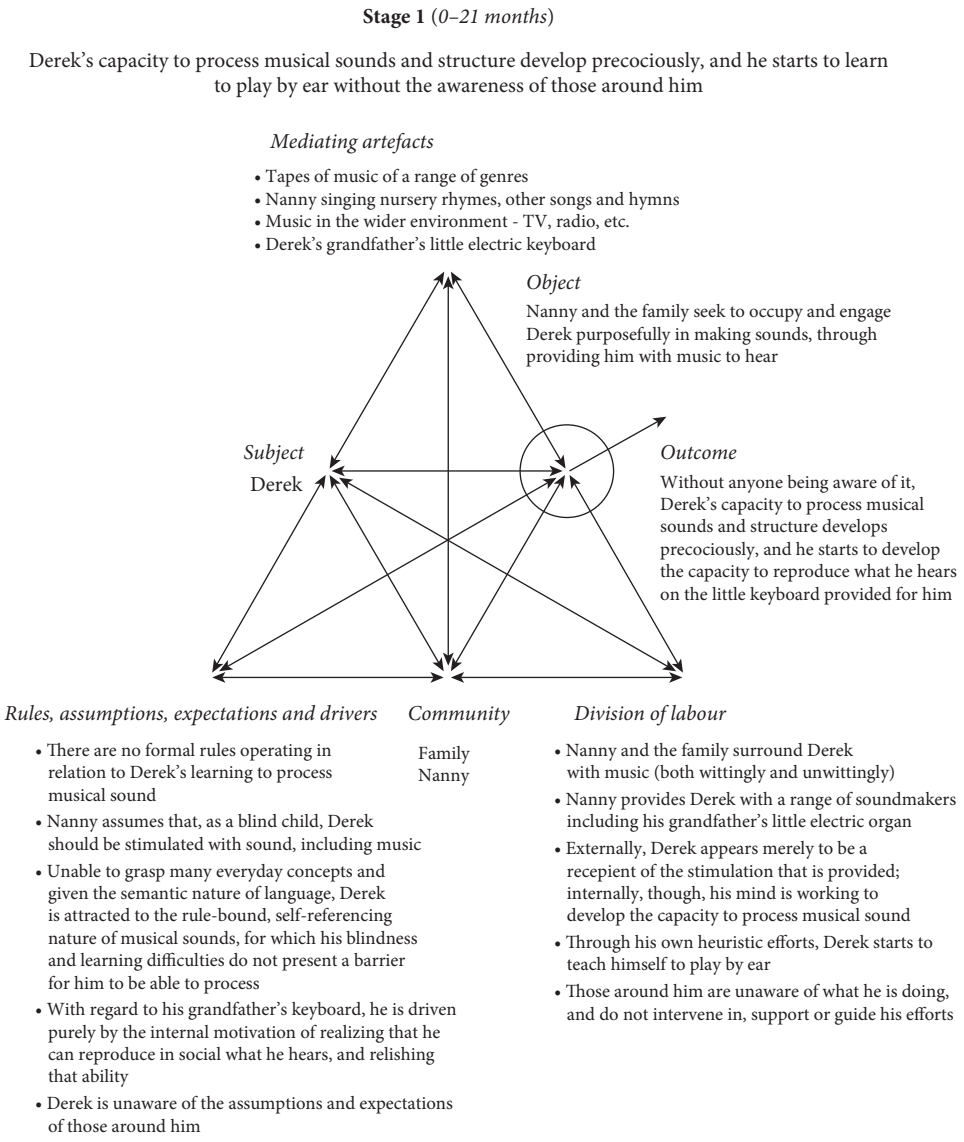

FIGURE 32.2 The activity system pertaining to Derek's musical life, 0–15 months.

(Adapted from Expansive Learning at Work: Toward an activity theoretical reconceptualization, Yrjö Engeström, *Journal of Education and Work*, *14*(1), pp. 133–56, Figure 2, DOI: 10.1080/13639080020028747 © 2001, Taylor & Francis Ltd, http://www.tandfonline.com.)

Derek would allow AO to show him—physically—how to hold his hands and use his fingers in conventional patterns that would facilitate his technical development. Clearly, Derek had no concept of the goals that AO was pursuing, so it was critical that he enjoyed being guided through the daily ritual of technical exercises, scales, and arpeggios that AO devised for him. Luckily, Derek relished the one-to-one attention and the orderliness of his practice routine, and the pattern of highly formalized intervention with AO continued throughout his childhood on a daily basis (Stage 3: Figure 32.4).

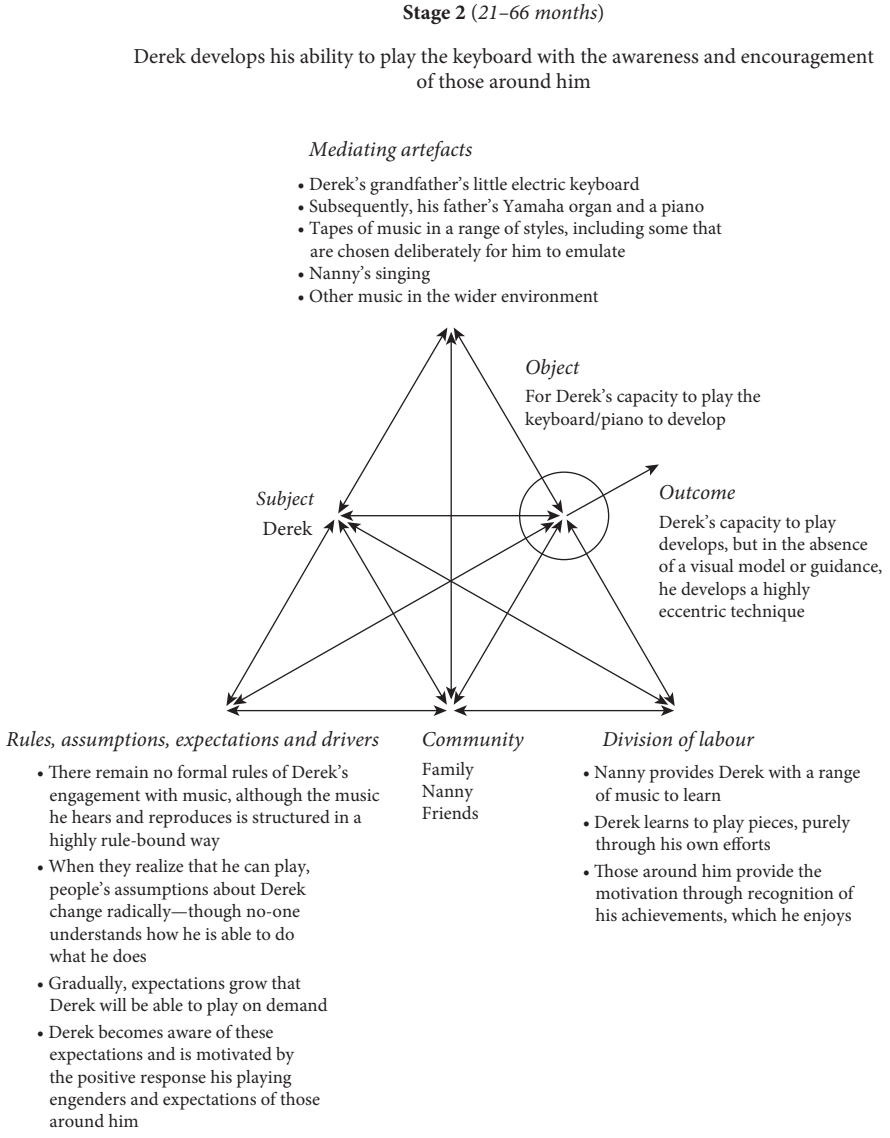

FIGURE 32.3 The activity system pertaining to Derek's musical life, 15–21 months.

(Adapted from Expansive Learning at Work: Toward an activity theoretical reconceptualization, Yrjö Engeström, *Journal of Education and Work*, *14*(1), pp. 133–56, Figure 2, DOI: 10.1080/13639080020028747)

There is much to learn from Derek's story: most obviously, the fact that an individual can be motivated to pursue musical learning to a highly advanced level at an early age with no direct intervention or encouragement on the part of others, and with no global sense of moving toward the goal of becoming a competent performer (see also Ockelford, 2008; Ockelford, Pring, Welch and Treffert, 2006; Ockelford, 2013). Beyond this, however, it is also

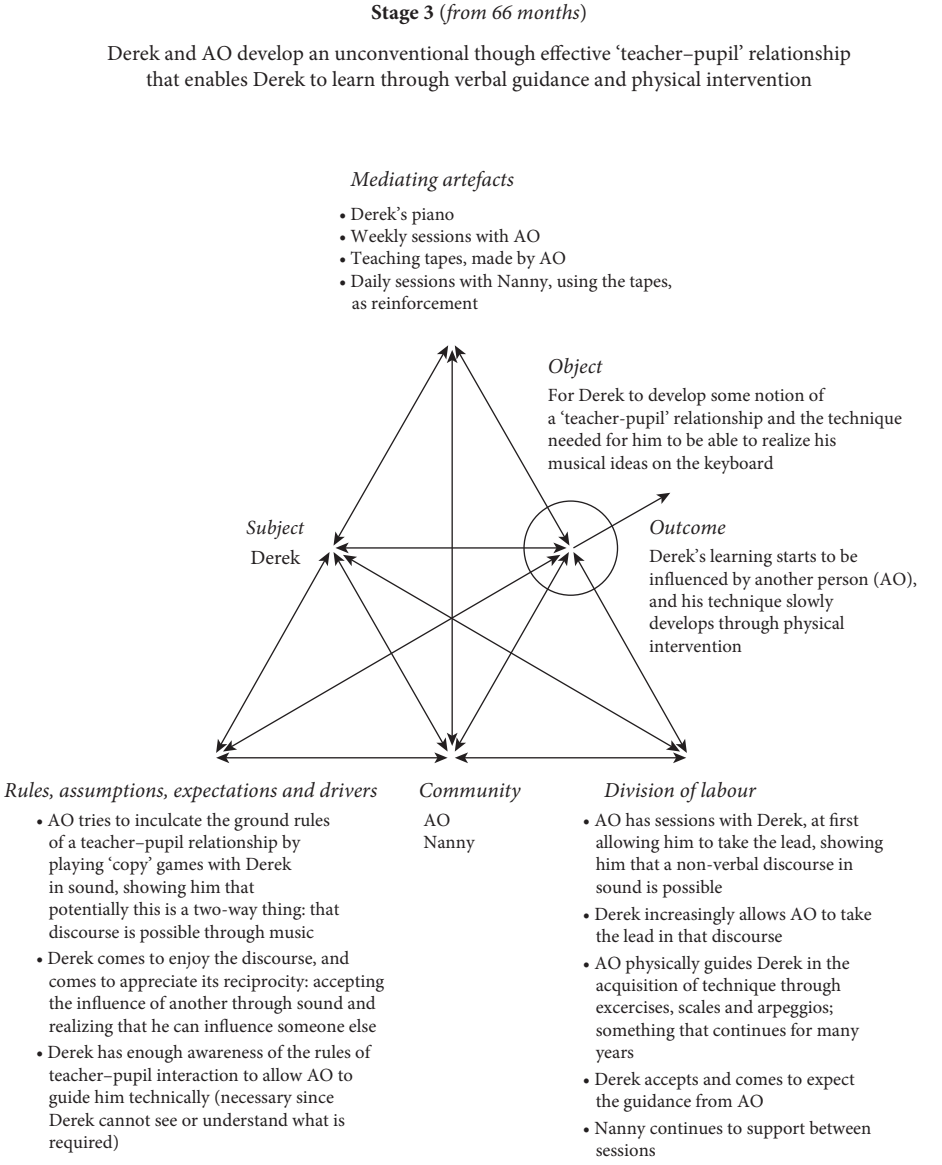

FIGURE 32.4 The activity system pertaining to Derek's musical life, 21–66 months.

(Adapted from Expansive Learning at Work: Toward an activity theoretical reconceptualization, Yrjö Engeström, *Journal of Education and Work*, *14*(1), pp. 133–56, Figure 2, DOI: 10.1080/13639080020028747 © 2001, Taylor & Francis Ltd, http://www.tandfonline.com.)

the case that Derek, as someone with severe learning difficulties, could, initially through a discourse comprising nothing but musical sounds, develop a relatively conventional teacher–pupil relationship that eventually enabled him as an adult to have a career as an internationally recognized musician.

Example 2: Supporting Musical Learning in Higher Education

Higher education (HE), on the other hand, is a relatively (often highly) selective educational environment that seeks to advance already competent musical skill levels in young people who normally exhibit (or report) little or no disability (though see, for example, Lerner and Straus, 2006).

Within the spectrum of HE in music, there are observable similarities and differences in the way that the activity of music learning is processed. These are particularly related to context, such as the age and gender of performers, their principal musical genre and the particular HE location. For example, a recent study of advanced music learning and teaching in four UK Higher Education Institutions (HEIs) investigated how classical, popular, jazz, and Scottish traditional musicians deepened and developed their learning about performance in undergraduate, postgraduate, and wider music community contexts (Papageorgi and Welch, 2015; Welch, Duffy, Whyton and Potter, 2008). In the first year of the study, a specially designed, web-based questionnaire was used to survey 244 musicians across the four participant HEIs. In addition to demographic information, participants provided self-reports about their earliest engagement with music (including first instrumental or vocal lessons), secondary and tertiary education, as well as significant musical experiences and influences. The participants were questioned about the perceived relevance of a range of musical skills and activities, experience of performance and general life anxiety, how they spent their time in an average week, the pleasure that they derived from engagement in musical activities, various self-views (musical self-efficacy, self-esteem, self-regulation), group membership and their beliefs about the nature of expertise in musical performance and teaching.

The resultant data analyses suggest that all musicians attached great importance to achieving a high overall standard of performance, although they had different perspectives on the processes by which this might be achieved (Creech et al., 2008). For example, in terms of the performance expectations of their particular musical "community" and its requisite "tools" and "rules" (*pace* Engeström), classical musicians ranked the ability to improvise as the least important musical skill, but perceived sight-reading to be very important. In contrast, in relation to the performance expectations of *their* particular communities, the other-than-classical musicians (jazz, popular, Scottish traditional) tended to assign the least importance to the ability to sight-read, but placed greater emphasis on playing from memory and improvisation. Although all musicians recognized the value of practice, the community of classical musicians tended to place greater emphasis on practicing alone, whereas other-than-classical musicians attached greater relevance to making music for fun, networking, and extracurricular activities such as listening to a diverse range of musics and engaging in professional conversations with peers (see Figure 32.5). Nevertheless, both classical and other-than-classical groups considered musical expertise to involve the possession of global musical skills that could be transferred to other musical genres (Papageorgi et al., 2010).

An exploration of underlying processes that might explain the similarities and differences between these two groups implicated both institutions (whether home, school, or elsewhere) and teachers (including parents, private tutors, and teachers in educational institutions). Other-than-classical musicians reported that they typically began to engage with music of

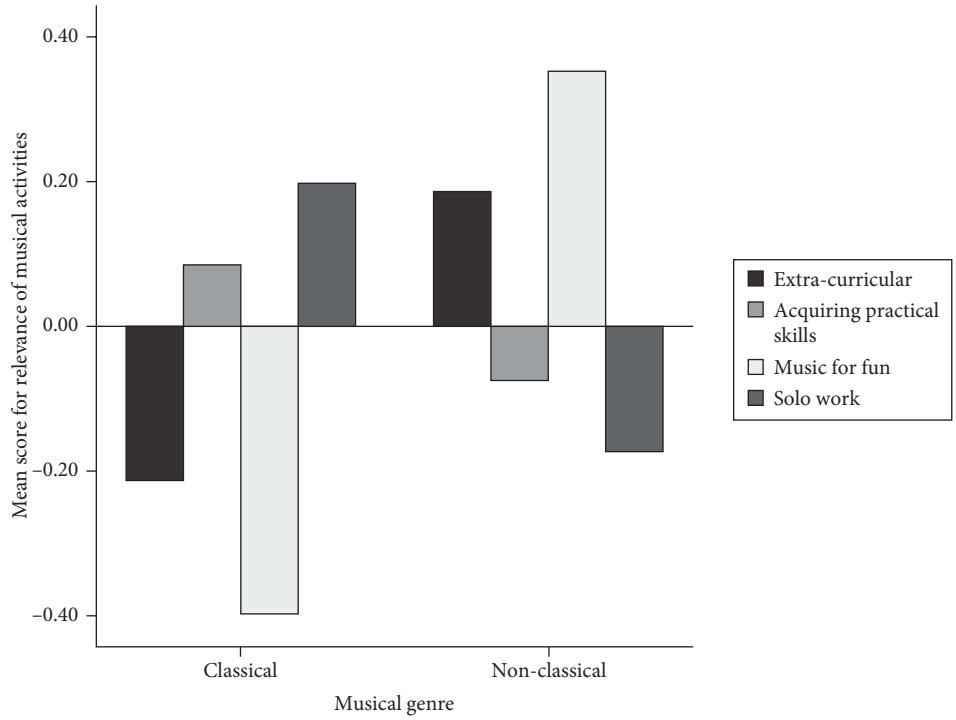

FIGURE 32.5 Classical and other-than-classical-musicians' mean scores for categories of musical activities (*extra-curricular*: listening to music from own and outside of own genre, acquiring general musical knowledge, engaging in professional conversations, networking; *acquiring practical skills*: practicing alone, practicing with others, taking lessons, solo and group performance, listening to music from own genre; *music for fun*: playing for fun alone or with other; *solo work*: mental rehearsal, giving lessons, solo performance).

any kind at a later age than their classical musician peers (other-than-classical: $M = 8.4$ years, classical: $M = 6.6$ years). Similarly, they began formal learning on their first instrument at a later age (other-than-classical: $M = 12$ years, classical: $M = 8.8$ years). Notwithstanding the nature of their early musical experiences, all the participant musicians, irrespective of genre, were able to achieve the requisite baseline skill levels for entry to higher education and beyond. Nevertheless, contexts were not identical. Classical musicians reported that their most important musical influences (past and present) were parents, instrumental/vocal teachers, significant musical events, professional colleagues, and previous membership of county (regional) music ensembles. In contrast, other-than-classical musicians claimed to be particularly influenced by well-known performers, as well as university or college lecturers and informal groups of friends (Creech et al., 2008). Across all musicians, irrespective of genre, higher education tutors (whether lecturers in particular aspects of music or specialist

solo instrumental and vocal teachers) were reported to be significant agents in a communal process of advanced music learning (Creech and Papageorgi, 2015).

Overall, participant classical musicians rated themselves higher in terms of perceived musical expertise. The basis for this difference is likely to relate to (1) the comparative longevity of classical musical cultures in higher education, (2) other aspects of participants' group-based self-views, and (3) differences in participants' cumulative years of study. For example, interviews with senior academics in the participant HEIs revealed that:

1 Classical music had been established for much longer in their academic programs compared to the three selected other-than-classical genres (jazz, popular, and Scottish traditional). Concomitantly, classical music teaching and learning and assessment practices were reported to be more firmly embedded, rehearsed, formalized, and understood within their particular communities.
2 It may be that (as reported earlier) other-than-classical musicians have idealized views of expertise that relate to how they see themselves in comparison to the individual quality of "star" performers in their chosen genre rather than some more generic HE measure of performance.
3 It is also the case that the participant musicians in "other-than-classical" genres typically begin to engage with music at a later age and, as a consequence, were more likely to have expert role models from outside their peers and teachers, having had relatively less time to be immersed in their musical genre.

As an example of differences *within* a musical genre in relation to age and experience, the same data set suggests that portfolio career classical musicians who engage in both performance and teaching are more likely to be able to identify successful teaching strategies than their younger, undergraduate peers. Furthermore, the activity of teaching, allied to extensive solo performance experiences, is likely to reduce levels of performance anxiety (Papageorgi, Creech and Welch, 2013).

Example 3: Supporting Female Music Learning in a UK Cathedral Setting

Male choristers have participated in UK cathedrals since their inception in 597 AD at Canterbury. In comparison, it was not until 1991 that Salisbury became the first old UK cathedral foundation to admit girls on the same basis as boys. The political impact and success of their initiative (although foreshadowed by other religious institutions earlier in the twentieth century but without the same publicity) has led to a growing (and perhaps less grudging) acceptance of female choristers within the previously all-male culture. By 2006, a majority of cathedrals had choristers of both sexes for the first time in their long history, even though it continues to be relatively rare for the two sexes to sing together, other than at special festival events (Welch, 2007, 2011).

One of the cited reasons for the longevity of the all-male cathedral music tradition was that young females were regarded as being unable to sing with the same "pure" quality of vocal timbre as demonstrated by the young male voice in the performance of the cathedral sacred

music repertoire. This belief does have some basis in the physical realities of child voice acoustics, even though research has demonstrated its fallibility. First, there are slight differences in the relative sizes of girls' and boys' vocal anatomy (the male being slightly larger throughout childhood and into adolescence—cf. Welch and Howard, 2002) and these could be expected to generate perceptible disparities in acoustic outputs. Second, with regard to untrained children's voices, there is increasingly perceptible psycho-acoustic differentiation between the sexes as they progress through childhood (Sergeant, Sjölander and Welch, 2005; Sergeant and Welch, 2008, 2009), with observable gender-related differences in their sung spectra. However, the power of the musical activity system in the cathedral is such that formal induction of girls into its performance expectations can generate changes in their basic vocal behavior so that any gender differences are reduced significantly and often become imperceptible. A series of perceptual studies from the mid 1990s onwards has demonstrated that membership of a cathedral choir can allow girls to be trained to produce sounds that are "boy-like" in character in order to match the customary, male-biased, performance expectations of the musical repertoire (Sergeant and Welch, 1997; Howard and Welch, 2002; Welch, 2006c; Welch and Howard, 2002).

Detailed longitudinal case study data from one cathedral suggests that the activity of becoming a female chorister is closely linked to the customary tripartite relationship in music (Small, 1999) between the physical setting, people (performers and listeners), and the way that the musical soundscape constrains the variety of possible musical outcomes. The induction process for both young males and females involves the novice chorister ("probationer") being required to learn, practice, rehearse, and perform music systematically many times each week across the school and ecclesiastical year, whilst standing between and listening to the vocal models of established senior performers ("Head Chorister," "Deputy Head Chorister," "Senior Corner Girls"), supported by group-based (communal) teaching by a highly experienced church musician ("Organist and Choir Director" or "Deputy"), in order to master a ritualized repertoire (such as the *Introit, Psalms, Response Settings*, and *Anthem* for "Evensong") that involves both choral and solo performance (see Figure 32.6 for how this experience can be framed within an activity system—Welch, 2007, 2011).

The acoustic features of the rehearsal and performance spaces within the chancel and choir of the cathedral also shape the learning experience, with features of the choristers' sound amplified by the high stone vaulting of the nave and adjacent spaces and fed back to the performers. The collective and ritual nature of the performance is reinforced by the addition of adult male voices (for most services) and the organ. It is not surprising, therefore, that females are able to perform the established religious repertoire in customary fashion, given the interrelated and situated expectations of the musical learning process and the longevity of the performance practices within the culture that are handed down across generations of cathedral musicians (and where it is extremely rare for a new director of music to be appointed from outside the tradition).

Example 4: Supporting Music Learning in the Lower Secondary School

In contrast to the above, it is possible that institutions and teachers can also hinder as well as support learning in music. For example, notwithstanding a general rise in the reported

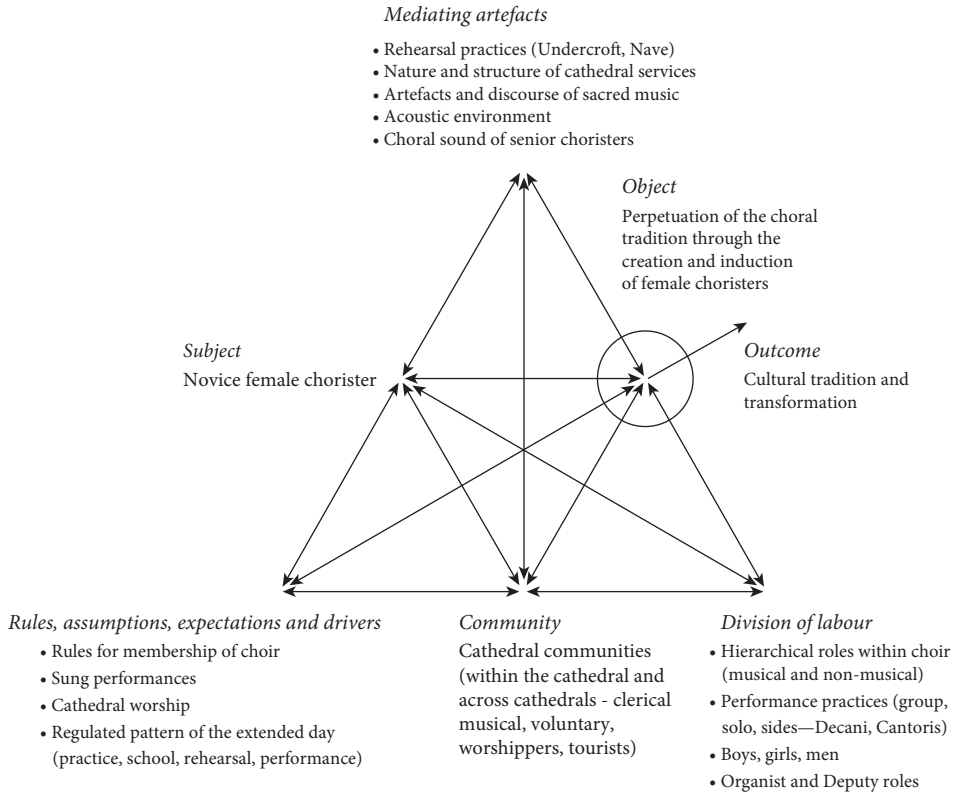

FIGURE 32.6 An example of the activity system that frames the development of the novice (female) cathedral chorister.

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quality of music education in English schools since the turn of the millennium according to Ofsted[1]—the independent schools inspection body (e.g., Ofsted, 2009, 2012)—there is often a notable disparity in the individual experiences of pupils (Welch, 2006b; Zeserson et al., 2014). In particular, music teaching in the lower secondary school classroom (ages 12–14) has often been reported as less successful generally than the overall quality in the other school-age phases (both older and younger). The reasons for these systematic differences are likely to relate to:

1 The organization of the timetable in primary schools where one class teacher tends to take all curriculum subjects and therefore is in a better position to know each individual child across a school year and to match music teaching to individual need.
2 English National Curriculum music learning expectations of primary school children are less (in terms of the complexity of musical behaviors) than in secondary schools;

[1] The Office for Standards in Education (Ofsted) assesses the quality of music teaching on behalf of the government. This is a non-ministerial government department that reports directly to the UK Parliament. Ofsted is headed by a senior civil servant and is required to inspect and report on the quality of education in schools, initial teacher education and, more recently, child minding, child day care, children's centres, and children's social care.