Music — where cognition and emotion meet

JOHN SLOBODA *gave the Presidents' Award Lecture at the Society's Annual Conference in Belfast, April 1999. He argued that millions of people could discover the joys of music making if we created modern equivalents of the village brass band and stopped focusing on the need to be best.*

MUSIC presents a puzzle. On the one hand, people love music and devote much time and effort to putting themselves in the way of it. On the other hand, the levels of musical skill achieved by the vast majority of people in contemporary Western society are surprisingly low.

On the face of it, music has all the characteristics which would lead one to predict that many people should be highly skilled at it. A long tradition of research into skill and its acquisition (cf. Ericsson & Smith, 1991; Ericsson, 1996) suggests that *structure* plus *motivation* plus *practice* leads to *skill*.

In reviewing these four aspects, I will first provide evidence that most music has the kind of structure that is easily learned and understood by the human mind. Second, I will examine evidence relating to motivation, and the very high value that many individuals place on their engagement with music. Third, I will review evidence of the intimate link between level and nature of practice activities and achievement in music.

Fourthly, and more speculatively, I will outline some potential inhibitors to musical achievement, in an attempt to formulate hypotheses about why, given such an apparently propitious set of circumstances, population outcomes in the area of music achievement are so dire. These inhibitors,

Requests for reprints of this article should be addressed to:
Professor John Sloboda
Department of Psychology
University of Keele
Keele, Staffordshire ST5 5BG
Tel: 01782 5833381
E-mail: j.a.sloboda@psy.keele.ac.uk

MARGARETE KLOPFLEISCH/SONJA GROSSNER

Music can have mood-altering powers

whilst having individual psychological consequences, are rooted in wider social and cultural phenomena.

'Naturally' detected structure

The parallels between music and language are very great. Just as it has been shown that very young infants have already picked up certain structural regularities of spoken language, so similar research shows they know something about the structure of music.

Sloboda (1985) has showed that children as young as seven can consciously choose between well-formed and ill-formed musical sequences. Asked which of two teddies played the 'right' tune, and which 'made a mistake', children demonstrated knowledge of both simultaneous and sequential constraints that exist within Western tonal music.

Structural sensitivity has also been demonstrated by untrained adults in a wide variety of tasks. For example, Sloboda and Parker (1985) asked psychology students to listen repeatedly to a short folk melody and attempt to reproduce it after each trial by singing it. Although almost no participant gave note-perfect recall, recalls showed structural sensitivity. For instance, recalls tended to preserve the metre and phrase structure of the original.

These and many other studies have established that music is represented in the mind in terms of the structures and regularities that it contains. When such structures cannot be detected, it is impossible for people to process and store the information efficiently. The music of a culture has a familiar syntax, and when this is missing, as for example in some forms of atonal music, processing is severely disrupted.

Music is just like chess and the many other cognitive skills that psychology has studied. If people cannot discover the structure, they cannot become experts. The research literature on music shows that almost everyone in our culture has 'found the structure of music' through exposure to music irrespective of formal training. Therefore, a prime condition for the acquisition of expertise has been fulfilled by most people in our population.

How and why do people value music?

The proportion of people who can gain material advantage from being skilled at music must be small. Why is music

TABLE 1 Factor analysis of bipolar mood scales in pager study

POSITIVITY	(36 per cent)	
	distressed	comforted
	sad	happy
	irritable	generous
	insecure	secure
	tense	relaxed
PRESENT -MINDEDNESS	(14 per cent)	
	bored	interested
	detached	involved
	lonely	connected
	nostalgic	in-the-present
AROUSAL	(12 per cent)	
	drowsy	alert
	tired	energetic

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attractive to people? Why are they motivated to listen to it, perform it, create it? Does it serve any useful purpose?

Many types of research have demonstrated that music can and does have important psychological benefits. Not only does engagement with music seem inherently pleasurable, but it is often used for essentially therapeutic purposes. Strong and valued emotions seem to be at the core of such engagement (Sloboda, 1992).

There are a number of laboratory and clinical demonstrations of the mood-altering powers of music. More recently, an interest has developed in real-life uses of music, outside the laboratory or the clinic. For instance, Sloboda (1990) obtained 113 accounts of musical life events from 70 adults of varying musical background and experience. The question asked was: 'Do you have memories of any specific incident from the first 10 years of life which involved music in any way?'

Many of the memories so elicited were deeply memorable, and often motivated lifelong enthusiasm for, and involvement with, music. The contexts in which these highly-valued experiences occurred were somewhat restricted, and this provides a very important clue for framing an answer to the puzzle with which this article opened. Hardly any of these experiences occurred during music lessons or in the presence of a teacher. They occurred in time 'off task'— alone or with friends, at home or at school (see Example 1).

Currently, a research team at Keele is gathering data on music use rather closer to the coal face (Sloboda *et al.*, in preparation). Adults without musical training have been carrying around pagers with them for an entire week. The pager calls them at random intervals throughout the day.

Every time they are paged they are asked to stop what they are doing as soon as they can safely do so, and complete a brief questionnaire in a booklet of identical sheets that they are also asked to keep with them at all times. They are asked to focus on any music that was occurring as the pager sounded, or, if there was none, to recall the most recent occurrence of music since the previous paging.

What we have found so far is that music is experienced in an incredibly wide variety of circumstances. Hardly any of these have music as the main focus. The music is accompanying some other activity (such as washing up, socialising, exercising, working, travelling). Two sets of data are particularly pertinent to the current discussion.

First, participants were asked to estimate their mood on a number of bipolar scales both before and after the music. These scales factored into three major mood dimensions. We have labelled these, in order of contribution to the variance, positivity, present-mindedness and arousal (see Table 1).

In general, music increased emotional state towards greater positivity (e.g. more happy), greater arousal (e.g. more alert), and greater present-mindedness (e.g. less bored). But what seemed of particular significance to us is that mood change was greatest when participants exercised choice over the music they were hearing. Music maximally enhances well-being when participants exercise some degree of autonomy and self-determination in the type of music they hear (see Table 2).

EXAMPLE 1 Excerpt from the response of a participant in the Sloboda (1990) study

'I was sitting in morning assembly at school. The music formed part of the assembly service. The music was a clarinet duet, classical, probably by Mozart. I was astounded at the beauty of the sound. It was liquid, resonant, vibrant. It seemed to send tingles through me. I felt as if it was a significant moment. Listening to this music led me to learning to play first the recorder and then to achieve my ambition of playing the clarinet …'

The second result of interest is the dissociation of emotional factors in some music-listening cases. While it is true overall that music makes people more positive, more aroused and more present-minded, a more differentiated pattern was evident in about 12 per cent of the episodes.

In some episodes, for example, positivity increased, while the other two dimensions decreased. In others, arousal increased, while nothing else did, and so on. Each of these patterns was associated with a particular set of circumstances and psychological purposes. People deliberately use music for different intended outcomes.

TABLE 2 Chang e in mood as a function of degree of musical choice in pager study

	DEGREE OF CHOICE		
	low choice	medium choice	high choice
Change in			
POSITIVITY	0.8	0.3	2.3
PRESENT	0.6	3.0	3.2
AROUSAL	0.8	1.2	1.8
Av era ge change	0.8	1.5	2.4

Some examples of these episodes are given in Table 3.

From results such as these, a quite detailed picture is beginning to build up of what music does for people. But a much more intriguing scientific puzzle is to explain how music can 'mean so much' to people.

How are emotions mediated through music?

A range of research studies suggests that emotions are mediated through music in at least three quite distinct ways: episodic associations, iconic associations and structural expectancies.

Episodic associations are the type of effects that can be explained by what John Booth Davies (Davies, 1978) has memorably described as the 'Darling, they're playing our tune' theory of emotion. Music can provide a powerful reminder of earlier events or periods in our lives, and the significant people or places that figured in them, particularly when these life events were strongly emotional.

Strong and real as these associations are, they are not particularly interesting from a theoretical point of view, because they are entirely driven by idiosyncratic autobiographical contingencies.

Iconic associations are brought about by physical characteristics of the music that mimic or resemble the sound effects that could be created by non-musical events. Crude examples would be the mimicking of bird-song or of natural phenomena such as thunderstorms.

More interesting are the ways in which music can suggest a particular kind of emotional character, by creating sounds typical of that emotion. Watt and Ash (1998), for instance, have recently developed the analogy, previously advanced for visual materials by Michotte (1963), of musical objects as 'virtual persons'.

Research at Keele has been more concerned with the third source of emotional engagement, that seems to come about by tracking the unfolding structures of a piece of music, and reacting to the confirmations and violations of expectancy that are created within those structures. Waterman (1996) showed that there are particular 'hot spots' in many pieces of music where people are prone to experience emotions particularly intensely. These can be tracked by asking people to report on 'thrills' (Sloboda, 1991). Thrills are reliable physical concomitants of emotional response, which include shivers down the spine, tears, or a lump in the throat.

It has been found that music hot spots usually involve particular structural events which tease structural expectancies. They do this by repeatedly creating and resolving tensions, or by manipulating timing parameters that cause expected events to happen earlier or later than expected. Emotional response to music is thus an integral outcome of the intuitive structural analysis that goes on while listening.

This is an important finding for a long-

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TABLE 3 Examples of mood change dissociation in pager study

Mood change pattern:	Positivity up, present-mindedness down, arousal down.
Everyday descriptor:	'Chilling out'.
Example:	At home, relaxing with six friends and acquaintances. Wanted to do it. Ambient music on CD. Little choice over music. 'The music was very tranquil and relaxing. I was very, very tired.'
Mood change pattern:	Positivity down, present-mindedness down, arousal up.
Everyday descriptor:	'Nostalgic wallowing'.
Example:	At home, alone, washing up. Rock on radio. High choice over music. 'Favourite song I had not heard for some time. It brought back certain memories.'

running debate in musicology. Some musicologists have tried to argue that 'pure' music listening means stripping away all mundane associations from music and hearing it as pure sound. Even if that were possible and desirable, our findings suggest that music would still be an intensely emotional experience.

It is interesting and pertinent to note that in many traditional academic music contexts, the official discourse is such that emotions don't get a look in. Everything is to do with form, content, history and analysis. Perhaps this is the price that musicians felt they had to pay to have music accepted as a 'proper' discipline.

This could be one more clue to the puzzle that motivated my lecture. You can't get fully inside music without becoming emotionally involved, yet such emotional involvement is exactly what many of the traditional institutions of music education have tended to inhibit and discount.

In sum, there is good evidence that people are strongly motivated to engage with music because of the valued psychological outcomes. These outcomes can be traced in part to the powerful emotions engendered when we listen to music, emotions which are enhanced by the structural expectations that we acquire within a musical genre or culture.

Acquiring musical expertise

Some recent research has been concerned with the processes by which a transition is made from the basic level of receptive competence, which is shared by all listeners within a culture, to the status of expert. There are, of course, many types of expertise, but much recent research has focused on a particular and relatively widespread form of expertise: the ability to perform notated music on a traditional acoustic instrument, such as a piano or violin.

This is a form of expertise which has been particularly widely promoted within the education system. Almost every school has a recorder or wind band, or an orchestra; and most qualified music teachers, whether private or public, work within this tradition. Much of the research in this area is concerned to show the intimate link between achievement and focused deliberate cognitive engagement of the sort that is generally called practice.

Sloboda *et al.* (1985) made an extensive single-case study of an autistic musical savant, who was reported to be able to memorise long piano pieces just by hearing them over a few times. His quite phenomenal ability turned out not only to be specific to music (his verbal memory span was subnormal), but also specific to tonal music. Given a piece of mildly atonal music to memorise, his ability fell apart.

We found biographical documentation which suggested that his ability to memorise grew gradually over 15 years of obsessive and repetitive work at this single task, to which he devoted almost all his waking hours.

Sloboda *et al.* (1996) probed systematically into the musical histories of 250 young people learning musical instruments. The data showed a strong relationship between objectively measured level of skill and the amount of practice undertaken, both in any given year and cumulatively over the lifespan.

Members of the highest achieving group were undertaking on average 800 per cent more daily practice than those in the lowest achieving group at the age of 12. Because differences in practice time were evident at considerably younger ages, we found similarly large disparities in total hours of accumulated practice time by early adolescence (see Table 4).

More recently, O'Neill (1997) tracked beginning instrumental learners over the first year of music lessons. This allowed her to administer a battery of measures prior to any exposure to the instrument at all. These included measures of IQ, standardised musical aptitude tests, and a motivational measure of resistance to failure (an adapted version of the Wisconsin Card Sorting Task). This is a

particularly pertinent measure for early musical leaming, where failure to be able to reproduce the fluent musical products they hear all around them is a constant experience of beginners.

After nine months, all children were given the same piece to learn for two weeks, and their performance on this piece was video-recorded for evaluation by expert music examiners. There were large disparities between the children in the standard of these performances. Neither starting IQ nor musical aptitude predicted outcomes, but both the pre-instruction motivational variable and amount of practice on the piece were strong predictors.

There is a considerable amount yet to be discovered about what types of practice lead to better and faster learning outcomes. It is naive to suppose that an hour of one type of engagement is as good as any other, and some preliminary evidence on the efficiency of different practice strategies is now being collected. But none of this negates the main conclusion of this body of work, which is that to attain high levels of performance expertise within the classical performance tradition, large amounts of deliberate practice are required.

Where have all the musicians gone?

This more speculative section attempts to describe and explain some of the barriers to the achievement of musical expertise that appear to exist in our society.

The first barrier to achievement is a significant reduction (in comparison to many earlier periods) of the societal scaffolding that allowed people to progressively occupy intermediate rungs on a ladder of skill progression. There are decreasing numbers of widespread social institutions where moderate levels of performance skill are encouraged and celebrated.

In an earlier age, one could expect to hear and join in music sung and played in the home. There would be sing-songs at the local pub, or at village festivals, where all and sundry could join in at their own level. Playing along on a tin whistle or a violin would be tolerated, even encouraged.

At a slightly more formal level, people might receive a structured learning environment within a church choir or a brass band. Here, there would be a level of discipline and correction of blatant errors, together with a regular cycle of rehearsals and concerts.

These institutions could allow a gradual progression in skill and accomplishment, so that someone might move from the back desk to a soloist position. From this backdrop, the few might indeed move on to professional activity. But opportunities were there for many to reach a significant intermediate level of achievement.

In times of mass conscription, even the armed forces provided important opportunities for regular formal and informal music making.

The present society has seen the rungs in this ladder of progression gradually rot and fall out. The decline in church attendance and in the cohesion of local communities has caused these institutions to wither, and they are not being replaced. Thus there is a widening gap between everyday contexts in which people operate as novices and those in which they can come to operate as experts.

In general, what Simon Frith (Frith, 1996) has called 'the academy' has come to appropriate the gateways that provide cultural scaffolding for moving up the ladder of achievement. The academy is constituted by 'the music departments, conservatories, and the whole panoply of formal arrangements and practices in which classical music in its various forms is taught and handed down the generations'(p.36).

It is significant that in our large-scale study of young people's musical achievement (Davidson *et al.*, 1996), the family environment of high achievers was quite unusual. Parents devoted great amounts of time and energy to the practical support of their children's learning. They often engaged private tutors, they supervised daily practice sessions, they encouraged, cajoled, and sometimes even fought with their children when the children felt like watching TV rather than practising. They have fought for their children's access to the academy.

I suggest that such unusual family environments are necessary these days to replace the scaffolding that local communities no longer provide. Most

TABLE 4 Key practice indicators from Sloboda **et al.** (1996)

Average minutes of daily musical instrument practice at age 12 as a function of skill level.

Lowest achievement				Highest achievement
1	2	3	4	5
15	30	60	60	120

Average hours of accumulated practice at age 13 as a function of skill level.

Lowest achievement				Highest achievement
1	2	3	4	5
450	800	1400	1400	2500

families are neither able to make, nor see the point in making, these arrangements for their children. Arguably, the ubiquity of recorded music also inhibits practical music making in the home and elsewhere.

The second barrier to achievement is the increasing framing of official discourse about music performance in terms of talent, achievement and success, rather than community, fulfilment, or transcendence. The National Curriculum for music is only the most recent manifestation of this, where attainment targets are more salient than any notion of why it might be interesting or personally relevant to achieve these targets. This reflects the very ambivalent attitude towards art that typifies many modern consumer societies.

Art is often seen as of no value except as a commodity to be purchased by consumers for 'entertainment' in exchange for hard cash. Therefore musical expertise is only valued to the extent that it can earn money for the purveyors of entertainment, be they popular music recording companies or opera houses.

What then matters most is to be better, more skilful, more innovative, more 'professional' than one's peers. Hard work is taken for granted, but on top of that, only those with that special indefinable extra quality — 'talent' — are, at the end of the day, going to be able to command the attention that will earn their sponsors the kinds of profits that they seek. And so, the impossibly polished outputs of musical superstars are rubbed in the faces (or more precisely, the ears) of young people through constant media exposure.

Young music learners are pitted against each other, in exams, competitions and festivals, with the aim of weeding out all but the 'really talented'. Even at the highest levels of training, in the conservatories and music colleges, where everyone is way above the average level of achievement, to come second in a competition is seen by many as having failed. In this context, it is unsurprising that young people are discouraged from participating in an activity where there are so few winners and so many losers.

The notion that music could be engaged in purely for personal fulfilment, for the building up of community and friendship, for the sheer joy of making beautiful sounds together, is a strange, almost reprehensible, concept in many people's minds.

Music is the poor relation in many schools — what has it got to do, after all, with the real business of equipping people to contribute to wealth creation? The message is that if you haven't got talent, you should stop wasting your time messing about with music, and concentrate on your maths or business studies.

The third and final barrier I want to postulate is the barrier of elitism or high art. The academy in most of its manifestations promotes the classical performance tradition as the paradigm and paragon of what music *really* is and what it is to be a musician. Limited nods in the direction of jazz and an assortment of exotica labelled as 'world musics' hardly modify the message that the academy sends to most people.

The traditions and forms of the academy are, despite what some apologists claim, inaccessible to most people. Their inaccessibility is of two sorts. First, they do not reflect to most people the values and identities that they bring to music. Music of the academy is seen to be about class privilege and maintenance of a cultural *status quo* in which an elite minority dictate to the majority what constitutes good music.

Second, the core exemplars of the forms of the academy (such as concertos and symphonies) demand such a level of individual and corporate proficiency and resource to execute that they have almost no points of contact with the levels of music making that still survive in our culture (e.g. the karaoke bar). If elite music neither has resonances with one's own cultural identity, nor appears to be potentially learnable, then it hardly encourages mass participation.

It is, of course, encouraging when symphony orchestras go into schools, or when sympathetic school music teachers take an interest in students' love of pop. But if the academy, whether represented in schools or symphony orchestras, carries within its very structures and discourses the seeds of the problems I have identified, then the solution will not lie in minimal reforms within the academy but in the creation of new cultural and folk institutions.

We need living and socially relevant forms to replace the church choir and the village brass band. Recent pleas by major figures in classical music for the government to reverse cuts in school instrumental provision may have come too late, if the social institutions that support music making outside the academy are no longer there.

I have no idea what these social institutions might be, what they might build on, or how they can be encouraged. Psychology cannot provide the answer to such questions. All it can do is indicate some of the conditions that must be met if these institutions are to enable the flourishing of individual development.

The evidence reviewed above indicates to me that performance potential could be unlocked in millions of people if we could recreate social institutions that focused on musical enjoyment, and personal and communal fulfilment, rather than on the need to be best, or to meet the taxing performance requirements of a professional elite.

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