The development of expertise in young musicians: strategy use, knowledge acquisition and individual diversity

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Introduction

There is considerable evidence that the length of time an individual spends practising plays an important role in the level of expertise attained on a musical instrument. Indeed, some have suggested that time spent practising may be the sole determinant of the level of expertise attained (Ericsson, Tesch-Romer & Krampe, 1990; Sloboda, Davidson, Howe and Moore 1996; Sosniak, 1990), although not all the evidence supports this. While practice is clearly important in relation to musical achievement other factors, for instance, prior musical knowledge or the quality of the practice may act as mediating factors (Hallam, 1998a; 1998b).

In an attempt to elucidate the ways in which the quality of practice may mediate learning, several studies have explored the strategies that professional musicians adopt in relation to their practising (Wicinski, 1950; Miklaszewski, 1989; 1995; Hallam, 1995a), the development of interpretation (Hallam, 1995b), memorising (Chaffin and Imreh, 1997; Hallam, 1997) and planning for performance (Hallam, 2000). Overall, the evidence suggests that professional musicians develop approaches to practising and performance which satisfy their individual needs and reflect the necessity to maintain high standards of performance. Nielson, (1999) studying advanced conservatoire organ students as they prepared a piece for performance, similarly identified a range of strategies, primary and support, which assisted the learning process.

Gruson (1988) studying novice musicians considered changes in practice as expertise developed. Four behaviours increased in frequency with increasing skill: (i) repeating a section larger than a bar (r=0.72), (ii) playing hands separately (r=0.49), (iii) verbalizations (r=0.37) and, (iv) actual time spent practising as opposed to unrelated behaviour. Three behaviours decreased with increasing skill: (i) making errors (r=-0.31), (ii) repeating single notes (r=-0.31) and, (iii) pausing for more than two seconds (r=-.31). Recordings of a subset of musicians, over a longer period of time, demonstrated consistency in their rehearsal behaviour. The musicians were also interviewed revealing four levels of cognitive complexity in relation to their practice behaviours, simple undifferentiated, concrete behavioural, general strategies and higher order strategies. As skill level increased the higher level strategies were more in evidence. What this research did not consider was the issue of individual differences in strategy use.

Addressing this issue, Cantwell and Millard (1994), working within the approaches to learning paradigm, studied the practice of six 14 year old students, who were of Grade 2 standard. They were selected on the basis of their extreme scores on the Learning Process Questionnaire (Biggs, 1987) which identifies whether students tend to adopt a deep or surface approach in relation to their learning. The findings indicated that students adopting a deep approach defined practising problems in musical rather than technical terms, although they were aware of the need to achieve automaticity in technical matters. Surface approach students had a restricted conception of the nature of the task. They adopted rote learning strategies and sought external support. Differences in motivation and concentration in practice have also been identified in recent work with students learning to play an instrument for only 6 months (Pitts, Davidson and McPherson, 1999).

The aim of this research is to consider the relationships between strategy use and the

development of expertise taking into account individual differences. This will enable the exploration of differential patterns of practising and development and their relationship to performance.

The study

The sample consisted of 55 string players, with standards ranging from beginner to music college entrants, aged 6 - 18. They were recorded for a period of ten minutes practising a short piece of appropriate standard, which they then performed. The task was part of normal examination procedure for the students. The taped performance was assessed by two independent judges, marks being awarded out of ten for overall impression, rhythmical accuracy, steadiness of pulse, notational accuracy, intonation, sense of tonality and observation of marks of expression. Inter-rater reliability ranged from .82 to .96 ($p=.0001$). The students were also interviewed regarding their approaches to interpretation, practice, memorisation, and performance and external influences on their practice, e.g. parents attitudes.

Each interview was transcribed in full as was the content of the tapes from the recordings providing a detailed account of activities while the novices were practising. This included information about errors, their correction, stops, starts, poor intonation, inaccurate rhythm, faltering, repetitions, etc.

Objectivity was established by insisting on agreement between three independent judges on the categorisation of statements. Only where complete consensus was reached that a statement supported a particular categorisation was it included in the analysis. Initial analysis of the data

from the interviews and tapes of the novices indicated qualitative changes in the nature of expertise as it developed. This was particularly marked at advanced levels, i.e. Grade 8 and above. The findings regarding the advanced students are reported in detail elsewhere. Data is included here only where it makes an important contribution to the research questions being addressed.

Findings

Use of practising strategies

The novices ranged in standard from beginners to Grade 7 standard. Initial analysis revealed that only 1 (2%) of the 49 novices reported any activity which could be construed as considering interpretation. In the recorded practice session only 4 (8%) made an identifiable attempt to observe the dynamic markings. The aim of practice appeared to be to play the music correctly.

The data from the recorded practice revealed that 67% of the students consistently repeated the music, starting at the beginning and playing through to the end several times. A smaller number, 20%, played through stopping to practise larger sections en route, while 5% adopted a "line at a time" strategy. 22% of students spent some time in their practise sessions engaged in non-playing analysis. They could be heard speaking letter names of notes or clapping rhythms. This was confirmed in the interviews when 36% claimed to adopt some kind of non-playing analysis.

'I usually look through for a minute or two…. Well I'm seeing if there are any difficult parts in it.'

‘Sometimes I look at it first’

‘First of all I read it in my head’.

Some of the silences on the tape were accompanied by audible sighs which may have indicated difficulties in carrying out the task, boredom or simply a wish for the ten minutes allowed for the practice to end.

There was evidence of differential processing strategies being adopted during practice. Some students relied more on aural processing, others cognitive. In the interviews, one advanced student reported playing by ear even when reading the music. In the recorded practice, a 12 year old novice totally ignored the notation on a repeated phrase playing the same ending twice, although the notation indicated otherwise. This suggested an over reliance on aural strategies. In contrast another demonstrated extreme reliance on cognitive strategies. When a 4 appeared over another en E string indicating the use of a 4^{th} finger, she played the 4^{th} finger on the wrong string producing a clearly wrong note. She continued to make this mistake throughout the practice session. Cognitive information rather than aural was being used to monitor performance.

When the data from the recorded practice was compared with that obtained from the interviews large discrepancies emerged. Sixty nine percent reported practising in small sections, 55% were able to describe aspects of playing which they found difficult, and 20% reported playing sections slowly. Only 26% reported that their practice consisted entirely of playing through, while 35% reported examining the music to "work things out". Correlations between the data obtained from the interviews and that from the recordings confirmed these discrepancies. The correlation between reporting practising in sections and actually doing so was .36 ($p= .007$), while that

between practising sections slowly and doing so was .41 (p=.002). This phenomenon is found in other domains and is known as a production deficit (Flavell et al. 1966). Children often have knowledge of available strategies that they can adopt but do not always use them spontaneously.

Changes in practice were also observed in relation to developing expertise. The interview data revealed that all of the students of Grade 5 and above felt able to identify difficult passages. This fell to 57% for preliminary to Grade 4, and nil for the beginners. A similar pattern emerged in relation to slow practice. Post Grade 5, 70% of the students reported carrying out slow practice. Prior to Grade 5 this fell to 5.2%. The strategy of practising a line at a time also disappeared by Grade 2. This suggests that considerable musical knowledge is necessary for practising strategies to be adopted effectively.

Error recognition and correction

The recordings also revealed that 60% of the students left errors uncorrected in their practice session. Further, errors, once made, tended to be practised in. When errors were detected different correction strategies were adopted. Correcting the single wrong note was adopted by 63% of the sample. A more advanced strategy involved repeating small sections of perhaps half a bar. Changes in strategy use in relation to error correction and practice appeared to be related to developing expertise. For instance at preliminary grade none of the students repeated small sections, while by Grade 1, 85% did so. Similarly the repetition and rehearsal of longer sections was only exhibited by 21% at Grade 1, but by Grade 5 this had risen to 83% and by Grade 8 100%.

Relationship between strategy use and developing expertise

A scheme was drawn up indicating the error correction and practising behaviours exhibited in relation to their occurrence within the differing levels of expertise during the recorded practice. This is illustrated in Table 1. It includes data from the Advanced Students.

Table 1 about here

Correlations were carried out between strategy use, grade and overall performance scores to indicate whether strategy use was more closely related to expertise or to actual performance. The correlation between strategy level and Grade was .69 (p=.001), while that with overall performance score was .44 (p=.01). This suggests a closer relationship between developing expertise and strategy use than specific performance outcomes. The correlation between age and strategy use was .56 (p=.001) suggesting that level of expertise rather than general development is more important in the practising behaviour adopted.

Further evidence for the relative importance of expertise development as opposed to strategy use in performance was the evidence of a concentration on differential aspects of the task at different Grade levels. For instance, in the early grades, there was a particular preoccupation with pitch at the expense of rhythm. This was particularly marked at preliminary grade. Comparison of mean performance scores for rhythmical accuracy and notational accuracy at Preliminary to Grade 5 are illustrated in Table 2. Perhaps limited processing capacity restricted attention and pitch was selected as the priority. Similarly attention to dynamics did not appear until approximately grade 5 when presumably performance in relation to pitch, rhythm and tonality was sufficiently

automated.

Table 2 about here

Overall, developing expertise rather than strategy use per se seems to account for improvement in performance. This is supported by high positive correlations between recorded performance scores and Grade ranging from .64 to .86 as illustrated in table 3. However notational accuracy and intonation have considerably smaller correlations, both .39, indicating possible differences in the nature of their development. Examination of the correlations between performance indicators and time learning indicates similar differences (see Table 3). Perhaps notational accuracy, i.e. the possibility of playing wrong notes is equally likely at any level given the increasing difficulty of the music to be played. With regard to intonation equally low correlations were reported with practising strategy level, .17 (NS); age .13 (NS); and time learning .29 (NS). Perhaps the processes underlying playing in tune are less susceptible to the effects of practising than other aspects of performance.

Table 3 about here

Time spent practising and task requirements

There was an increase in the practice undertaken by advanced students and novices as examinations approached. 92% reported an increase in practice in the weeks preceding examinations, with greater organisation of practice and more concentration on the technical

aspects, e.g. scales. A typical comment is given below:

I don't really do my scales….. only when I'm desperate…. About a week before the examination.

At other times the amount of time spent practising tended to depend on task requirements. For example:

'I just play what I've got to play…..I play it straight through two times.'
'I practise what I've got to practice.'
I practise what needs playing.'

Not even those students contemplating a career in music felt that daily practice was necessary to maintain standards. The number of days spent practising was correlated with Grade .12 and age -.02, both non-significant. However, the total amount of practice did increase, the correlations with age .56 (p=.0001) and with grade .51 (p=.0001). The length of the individual practice sessions therefore must have increased. This may partly be explained in terms of the increasing length and amount of materials to be learned. Seemingly, the amount of practice is determined, in part, by external factors, although the evidence also indicated complex and interacting motives.

Motivation to practice

The motivation of the novices mirrored that found in previous research in professional musicians, intrinsic, extrinsic or a combination of the two (see Hallam, 1995a). However, only one student above Grade 2 reported unreservedly enjoying practice. Below Grade 2 this rose to 41%. This

may be because of fewer scale and technical requirements in the early stages. However, 76% above Grade 2 enjoyed practice sometimes, while 48% below Grade 2 fell into this category. Typical comments included:

'Some days I can't get in the mood and I don't like practising.'
'I like practising quite a lot.'
Do you like practising? 'Not particularly.'

Surprisingly, 10% of pre-grade 2 students exhibited totally negative attitudes to practice, e.g. It's boring.'

The explanation for them continuing to play when so doing was voluntary appeared to be related to parental pressure. One indicated:

> "I didn't want to play the violin, but now she's (Mum) told me that I won't have to bother at the weekend".

Parental interference in practice was viewed negatively:-

> "My Dad often nags at me....when he nags I don't really enjoy it much because I have to do it. If I do it of my own accord I enjoy it more."

Reminding offspring to practise tended to create resentment and annoyance. 16% of the novice sample were made to practise.

Concentration

Lack of concentration in practice was not reported by the novices or the advanced students. Perhaps young people are generally unaware of their own internal states except in the case of nervousness, which because of its severe physical symptoms, is difficult to ignore. Perhaps lack of concentration in practice is perceived as boredom, a reason for terminating practice rather than a study problem.

Planning of practice

Planning was assessed in two ways: by reference to reported planning in practice and planning undertaken in relation to the recorded practice. Criteria were set out which would distinguish high, moderate and low levels of planning in the prepared practice and in normal practice. High levels of planning in the prepared practice were identified by evidence of the completion of task requirements; speedy identification of difficulties; concentration of effort on difficult sections; and integration of the sections practised into the whole for performance. Moderate levels of planning were identified by completion of task requirements; evidence of on task behaviour but repetition of large sections of the work rather than a focus on difficulties; and no integration specifically towards performance. Low levels of planning were ascribed when the task was not completed; the first part of the music was practised but not the remainder; and considerable amounts of time were spent off task. All of the advanced students exhibited high levels of planning in their recorded practice, while 5 (12.5%) of the novices did so. 28 novices (70%) showed moderate levels and 7 (17.5%) low levels.

In relation to daily practice the criteria and proportions of students adopting behaviours at the differing levels are outlined in table 4. The nine beginners were excluded from this analysis as they did not take part in the prepared practice in the same way as the more advanced students. This left forty novices and six advanced students. The advanced students demonstrated considerable task planning in their prepared sight reading regardless of their normal planning of practice. This level of planning may therefore be a feature of increased expertise and is perhaps a characteristic necessary for becoming expert at playing a musical instrument. Table 5 sets out the relationships between planning in recorded practice and organisation of daily practice. The novices exhibited different levels of each kind of planning.

Table 4 about here

Table 5 about here

Performance

90% of the novices reported being nervous on the day of the examination.

'I did get nervous for the first one (exam) but the second one I wasn't really nervous. I was a bit.'

'I was a bit nervous.'

A minority (38%) of these reported nervousness occurring for several days in advance, some experiencing extreme headaches.

'I get really nervous….. I sometimes get really bad headaches.'

Others (10%) reported no nerves at prospective performance, some were excited.

'I was nearly laughing'.

69% of the novices adopted some kind of strategy (or more than one) to overcome nerves. These are reported in Table 6. 38 students (69%) adopted some kind of strategy. Some adopted more than one.

For the novices examinations were considered more important than public performances. Although strategies were adopted in relation to stage fright the strategies tended to be focussed on reducing the fear rather than as a positive means of alleviating any detrimental effects on performance.

Table 6 about here

Patterns of learning, practice and performance

The evidence described above indicates that the effective use of practising strategies depends to

some extent on the development of expertise. If students do not have sufficient musical knowledge, having knowledge of effective practising strategies will be of limited use. Effective practice seems to depend on the learner having metacognitive and musical knowledge. In the next section this will be explored further through the examination of students at similar levels of attainment who exhibit different learning histories.

The beginners

Nine beginners who had been learning to play the violin for only six weeks took part in the study. All were recorded performing two pieces previously practised at home. Six felt sufficiently confident to also perform a piece attempted for the first time in their lesson immediately prior to the recording. This was viewed as equivalent to the sight reading task set for the other students.

The recordings revealed that for some beginners the multiple processing involved in playing was very demanding even after several weeks of practice. Although reading only a finger pattern, not actual notation, turning this into motor 'action' posed enormous problems, even though the unprepared task had been simplified by requiring the children to pluck rather than play with the bow. The three pupils who felt unable to attempt the new piece unaided scored 2.5, 3 and 3.5 on the piece that they had practised at home. These low scores, for two of them seemed to be related to lack of practice. One never practised at home.

I don't…. I always forget…. I have once.'

The other practised only once a week

‘Sometimes I practise, mainly I practise on Saturday’.

Both experienced difficulty in following the finger pattern, tended to lose their place, showed inadequate motor co-ordination and played slowly with many hesitations. The third exhibited a different pattern of behaviour. He enjoyed playing: ‘I like music.’ And practised regularly about 4 times a week. He also read the finger pattern fluently but motor co-ordination problems, particularly in bowing marred his performance. Although the achievement level was similar for these three students the patterns of behaviour underlying the performance outcomes were quite distinctive.

Differential patterns of behaviour underlying attainment also emerged in the six beginners attempting the ‘new piece’ unaided. The highest score, 9, was obtained by a 9 year old girl who demonstrated considerable musical expertise. Before beginning to play the violin she was already learning to play three instruments. Her aural schemata were sufficiently developed for her to be able to correct bad intonation, she could read music fluently and described identifying errors and attempting to eliminate them in her practice at home:

‘First I play it plucking, then I play it with my bow. If I go a little bit wrong then I go back to that little bit, play it, then play it all the way through to make sure I’ve got it right. I do about twice through each song that we do.’

The musical expertise acquired from playing other instruments had enabled her to adopt effective strategies in playing the violin.

The students clustered towards the middle of the attainment scores gaining marks between 5 and 6.5 also exhibited contrasting patterns of learning and expertise. One, aged 8, played slowly and accurately, but with poor intonation and a scratchy sound. She was well motivated and received considerable parental encouragement:

'I practice about once a day for about half an hour, because I do one piece for about 3 times and then my Mum comes up and listens to me and then I do another piece for three times and she comes again.'

From her performance, aural, motor and cognitive skills seemed to be progressing at a similar rate, but her level of expertise was considerably lower than the student described above presumably because she had not previously developed musical expertise through playing other instruments.

The second, student in this middle attainment band, a boy, aged 6, played fast, fluently and in tune. He also played by ear. When required to perform the new piece his deficiency in reading skills, even a simple finger pattern, was immediately apparent. He played slowly and very hesitantly. Well motivated, he practised every day and reported enjoying it 'a lot'. He also reported remembering to practice without his mother reminding him. His description of his practice does not reveal high level strategy use.

'I just play what I've got to play… I play it straight through two times.'

This student appeared to have good aural and motor skills which compensated for his less well developed reading skills. He was also well motivated.

The third student, similarly confident about notation in the well practised pieces was also hesitant in the unprepared piece, finding playing on different strings particularly complex. He demonstrated motor co-ordination and intonation difficulties and in his interview revealed that his mother constantly had to remind him to practice. The three students described above all had similar performance marks but these were achieved in very different ways.

Of the other beginners, one expressed strong negative attitudes towards playing, reporting doing little practice:

'I didn't want to play the violin'

His performance was nevertheless superior (4 marks) to the non-practiser described earlier. Intrinsic reinforcement for playing was weak because he disliked playing with the bow saying 'It doesn't seem good'. This reduced time spent practising with the bow provided less opportunity for improvement and a consequent lack of progress in comparison with the rest of the group.

This detailed examination of the attainment of beginners demonstrates that within a few weeks of commencing playing substantial differences in performance had emerged based on the differential development of a number of skills: motor, cognitive and aural. Prior learning is clearly implicated here. The student with expertise in three instruments demonstrated marked superiority in all areas. Also critical was the level of interest of the students, affecting time spent

practising.

Students at preliminary and grade 1 standards

Similar attainment levels were also arrived at in different ways at higher grade levels. At preliminary grade, the best mark in the study (7.5), was obtained by a nine year old with three years experience who also played a keyboard and had recently obtained a distinction in her preliminary grade violin examination. In the recorded practice she demonstrated accuracy in reading pitch notation, although her rhythm was insecure. Errors were immediately corrected indicating not only adequately developed aural schemata, but monitoring of performance. A cognitive strategy, going over note names, was adopted to assist in understanding notation. The process of reading music was not yet sufficiently automated for fluent sight-reading.

'First of all I read it, in my head. Then I play it.'

She described practising 'once a week…. twice a week for the exam.' Extensive practice would not seem to underlie her high examination mark although playing a keyboard as well as the violin would have assisted in the development of general musical expertise.

In contrast, the lowest mark (2) was awarded to a girl who had also recently achieved a distinction at Preliminary grade. Her recorded practice revealed that she was experiencing considerable difficulties in reading music which were exacerbated by her adoption of the strategy of learning a line at a time. Unaided she could not replicate her excellent examination result. This might be explained by a reliance on playing by ear and support during her lessons enabling her

aural skills to be utilised to best advantage.

The other low scorer in the prepared sight-reading, a partially sighted boy of 8, also demonstrated weak sight-reading skills although he too had passed his preliminary grade examination. In addition, the recording revealed poor aural ability and undeveloped motor co-ordination. His examination success seemed to have been supported by his parents.

'Mum helps me when I can't get them (the notes) quite right.'

He reported difficulties when learning new music:

'I really get annoyed. I like playing the bits I know. I don't want to go on to a new piece. Those pieces were easy and I don't want any hard pieces…because it means I have to work hard.'

Without assistance in his recorded practice he achieved and attempted little. There was almost no playing and he performed only a small segment of the music. This suggests that multiple difficulties can be overcome by intense adult support but the effects are task specific with limited generalisation to other tasks. This student, despite his examination success did not enjoy practising (It's boring), and despite the total commitment of his parents, ultimately gave up playing.

A comparison of 2 students at Grade 1 level reveals further different patterns of attainment. Both scored 6.5 in the prepared sight-reading. One male, aged 8, had been learning for only a year, the other female, aged 11 had been learning for 4 years. The girl exhibited difficulties with reading

skills and adopted cognitive strategies to assist in this process, note naming and task simplification (plucking instead of bowing). Adequate aural schemata and monitoring were demonstrated by the correction of single notes and repetition of small segments. This, given her poor reading skills suggests that the chunking of notation may not underlie the observed repetition of small sections of music when mistakes are made. In contrast, the boy corrected mistakes in larger whole bar sections and demonstrated a great awareness of tonality. He reported practising 5 times weekly usually enjoying it, although:

'Sometimes I kind of can't play it so well as normally…. But then I'm feeling alright to play it….'

The implication here was that he enjoyed practising more when it was successful. The girl reported practising once weekly:

'Sometimes I practice on Sundays…sometimes I don't practice at all.' When asked how much she did on Sundays she replied 'Not much…about ten minutes.'

She reported not enjoying practise. Even when examinations were imminent she only increased practice to twice a week for ten minutes. Previous experience for both of these students was recorder playing. What is striking about these two students is the great difference in the time that they had taken to achieve the same level of attainment. From the available evidence motivation would seen to be implicated. While deficiencies in cognitive processing may explain the girl's poor reading strategies her use of strategies in practice suggests considerable metacognitive skills. Perhaps it is the lack of practice which has precluded the development of automaticity in

reading music. In contrast, the boy seems to have well developed skills in relation to a range of musical skills which have been attained in a much shorter time frame.

Another student at this grade, aged 12, who had been playing for 2 years scored only 3.5 in her prepared sight-reading with poor scores for rhythm, tonality and intonation. This was despite having gained a merit in her Grade 1 examination. Her use of strategies was similar to those achieving higher marks, i.e. repetition, plucking and simple cognitive analysis of the music. She also played the recorder and reported regular practice which she enjoyed. Error detection depended on recognition of it 'sounding funny'. Her poor performance may have been because of anxiety. She reported being anxious 'for a few days before the examination'. Once embarked on the examination 'I felt a bit better, I still felt nervous… I was all shaky.' Subsequent to the research being undertaken she suffered from debilitating nervousness for a considerable time prior to her next examination. The prepared sight-reading task, a normal part of the examination procedure may have induced considerable anxiety which may have interfered with aural monitoring and or the ability to respond to feedback in terms of an action plan.

The other low scorer, aged 10 (2 marks) had also passed Grade 1 taking three years to attain that level. He accurately processed pitch notation but rhythm and intonation were very poor. Regular practice of 20 minutes 4 times each week was reported increasing to 30 minutes daily prior to examinations. He also reported enjoying practice, although his description indicated considerable emphasis on preparation. When asked what he did when practising he replied:

'I put rosin on the bow, get the music stand out and start practising.'

He reported appropriate strategy use.

'I play it through, and then I do the bits that I can't do again, then I play it through again'. He was able to identify things that he found difficult, i.e. fast sections, high notes and slurs. He also played the piano but no examinations had been taken. His difficulties seemed to stem not from inadequate strategy use but inadequate automated reading skills and possibly insufficient time on task.

Grade 2 standards pupils

A comparison of two students of Grade 5 standard illustrates other patterns of attainment and learning, One, aged 11, with a pass at grade 2 attained an overall performance mark of 7. Her initial play through was good, although there were rhythmic errors, intonation was carefully checked, corrections were made immediately suggesting careful monitoring of performance and there was evidence of attention to detail in her observation of staccato notes. Her motivation was not high neither was there evidence of extensive strategy use. 'I play it though. If it goes wrong I play it through again. ' However, her home environment proved supportive, music being widely listened to in her family.

In contrast, another girl, aged 12, who had passed grade 2, scored only 3.5 on the prepared sight-reading although she had been learning to play for almost 5 years. In the recorded practice session she spent most time playing through the music, although some repetition of sections was evident. Her performance was poor. She reported practice in general as 'boring and hard work' with her mother 'nagging' her to do it. However in normal practice she reported adopting numerous strategies, e.g. dividing the piece into sections, working on a section, putting the whole

together again, utilising the recorder to check pitch. This reported extensive use of strategies, if it indeed reflected what she did in her normal practice, did not improve her performance in the recorded practice session or her examination. From the available evidence this student might well have been viewed as unlikely to continue playing an instrument, whereas the student described above, doing well, seemed more likely to continue. In fact, the reverse applied. The student with the lower marks continued, the one with the higher marks gave up. The reasons for this were related to friendships suggesting that motivation is multi-faceted and dynamic. These cases also illustrate that effective strategy use alone does not lead to a high standard of performance.

Higher Grade students

Further insights are gained in a comparison between two female grade 5 students. The first aged 14 took 8 years to reach Grade 5 standard. She scored 4.5 on her prepared sight-reading. The other, aged 13, took only 6 years to gain a distinction in Grade 6 and scored 9 in her prepared practice giving an almost flawless performance. Both adopted similar practising strategies, playing through the piece and repeating short phrases. For the first student, tonality and rhythm were inaccurate from the start and were not corrected. The second student immediately corrected mistakes, seemed to focus on what needed practising and attempted to speed up the performance to match musical requirements. She reported enjoying practice. 'I like practising pieces but not scales'. She received support at home and listened to a great deal of classical music. For these students, overt strategy use was similar but the intensity of concentration, monitoring of performance, development of appropriate schemata, effort, and enthusiasm were very different and it seems played a more important part in learning outcomes than strategic activity.

The issue of concentration and subsequent monitoring of performance is further highlighted by a 12 year old student who had taken 4 years to reach Grade 4 scoring 6.5 in his recorded practice session. Describing scale practice he stated: 'There is an element of playing it a couple of times and then saying, I've done it'. He admitted to finding it difficult to identify errors so that his practice consisted of 'playing the thing through.' This surface level of processing would be unlikely to lead to improvement in performance. To adopt a deeper approach would require the development of adequate aural schemata to enable monitoring of the outcome.

Discussion

The findings of this exploratory study cast light on a number of important issues which have important implications for education. They also serve to raise a number of issues which require further study.

Firstly, the study indicates the sequence of development of practising strategies. This development is closely related to the recognition of errors and knowledge about what will be difficult. The key strategy for those with no musical expertise is simply to play the music through. At the next stage, errors are identified and corrected, later errors are responded to by the repetition of small sections which include the error. Finally, the types of strategy that professional musicians use are adopted, i.e. identifying difficult sections and concentrating practice on those sections. The sequence of development is similar to that identified by Gruson (1988). Some students also reported adopting cognitive strategies to assist in their practice.

The development of practising strategies appears to be more closely related to the development of

expertise than chronological age. In addition, knowledge of appropriate strategies and their implementation is not useful in increasing the effectiveness of practice unless appropriate aural schemata have been developed to enable the monitoring of errors. In other words, metacognitive skills alone are inadequate. To learn and progress in playing a musical instrument requires the development of extensive domain knowledge to assist the monitoring and evaluation of learning outcomes. One of the roles of the teachers is to ensure that pupils have acquired the relevant aural schemata for the particular music that they are required to learn. In addition they must provide opportunities for pupils to develop more generalised aural schemata which can be utilised when the student is sight-reading and learning new music unaided. We know very little about how particular aural representations are developed. The process of enculturation into particular musical genres largely occurs through listening to music in the environment. Much of this learning occurs without conscious cognitive awareness, the sounds are simply absorbed. Currently, because music is easily available in the environment through radio, TV and recordings, most children, when they begin instrumental lessons, will have well developed musical schemata for the particular types of music to which they have been exposed. The nature of these schemata will vary enormously from child to child, presenting the teacher with the task of ensuring that each child quickly becomes familiar with music from the genre within which they are teaching and also what is to be learned in particular lessons. Shared knowledge of the sounds of particular musical genres and particular pieces of music e.g. nursery rhymes, the sound of the major scale can no longer be assumed.

The evidence indicates that students may report the use of strategies while not actually implementing them consistently. This is known as a 'production deficit' (Flavell et al, 1966) and is not restricted to strategy use in music. It means that teachers cannot assume that their pupils are

actually using the strategies in their practise at home that they have learnt about in their lessons. It may be possible to speed up the implementation process by modelling and using effective strategies in the lesson itself so that they become part of the 'routine' of practise and do not have to be consciously adopted.

The evidence reported indicated that there was only a moderate relationship between strategy use and the marks awarded for particular aspects of performance. Some of the relationships were closer than others. Non-significant relationships were reported with playing the correct notation, which might be explained by the increasing difficulty of the pieces presented at each grade level and intonation. Intonation in string players seems to be less susceptible to the development of expertise than other learning outcomes, e.g. playing rhythmically, maintaining pulse. Playing in tune on a stringed instrument is clearly related to aural skills and co-ordinating these with hand movements. We know very little about the mechanisms underlying the development of good intonation but the evidence presented hear suggests that they tend not to improve substantially as expertise develops compared with other musical skills. This is clearly an area for further research.

Comparison of examination results with recorded performance scores suggests that what most students can achieve unaided is considerably less than what they can achieve when learning is supported by the teacher. This seems to be particularly true in the early stages of learning. As expertise increases the extent to which pupils can sustain learning unaided increases. Some caution is required in interpreting this effect as it may be mediated by drop out. Those pupils with higher levels of expertise are self-selecting, some have dropped out. Those dropping out could have found it difficult to sustain learning unaided. The apparent improvement may not therefore

be development but the effects of those making less progress giving up. However, it is likely that as expertise increases there is a genuine improvement in unaided learning. The teacher can promote this further through modelling the process of learning to play a new piece in the lesson and encouraging the students to think through the decisions that need to be made and the necessary strategies to be adopted.

In the early stages of learning a piece unaided, in the violinists and violists studied, there was a tendency to concentrate on playing at the right pitch. As accuracy of pitch became more fluent, attention moved to rhythm and then tonality. Issues concerning interpretation and the observation of dynamics were not attended to until the student had attained a quite high level of expertise. This finding regarding pitch decoding may not generalise to other instruments but it is likely that learners in the early stages of skill development will concentrate on one facet of decoding notation at the expense of others. The actual element concentrated on may vary between instruments and in relation to the emphasis given in teaching. This being the case teachers need to allow for it when setting work, particularly where the pupil is to work independently.

The case studies indicate the extent to which examination and specific test marks are made up in very different ways for individual students and obscure very marked differences in specific skill development. They strongly reinforce the notion that making progress on a musical instrument requires the development of a very wide range of skills which do not always develop evenly. The differences observed at all grade levels depended on a wide range of factors; extensive prior knowledge of music; well developed physical co-ordination; well developed aural skills; differences in skills relating to reading music; motivational factors; planning in practice; concentration in practice; the impact of stage fright; the extent of parental support. There was

some evidence that weaknesses in some areas could be compensated for by strengths or additional support in others.

Even after only a few weeks of tuition there were wide differences in the attainment of the pupils. Educationally this is clearly an important issue. The teacher needs to identify the underlying reasons for differential progress and attempt to devise ways of remediation. This is particularly acute where pupils are learning in groups. As mastery of basic skills on an instrument is a prerequisite for the further development of expertise attempts at remediation in music need to be undertaken early to avoid the child falling behind. The problem is exacerbated because playing which is inaccurate, out of tune, and of poor tone quality distorts aural feedback providing less opportunity to build adequate schemata while also providing little positive reinforcement. A downward spiral may then begin.

In the longer term, there were also substantial differences in the length of time taken by different pupils to reach the same standard. Such differences in speed of progress can create problems when teachers are teaching large groups of pupils together. The most often adopted solution to this difficulty is to be flexible in the composition of groupings so that it is possible to move pupils between them, taking account of the possible damaging effects this may have on confidence and self-esteem and attempting to mediate them through negotiation with the pupil.

Overall, this research reflects the complexity of the factors which affect progress and the outcomes of learning to play a musical instrument. Many skills need to be developed. Individual pupils do not start equitably in relation to these skills when they begin formal tuition. Progress depends on the ways in which each particular skill develops and also the interactions between

them. Lack of progress in any particular skill can hinder overall progress. Strengths in some skills may compensate for weaknesses in others but this can sometimes limit future opportunities, e.g. an over reliance on aural skills at the expense of learning to read music may limit the playing opportunities which are available. Parental support and supervision of practice may facilitate learning but cannot in the long term compensate for the lack of pupil motivation. Effective practising strategies can be taught and acquired but unless they are underpinned by a considerable body of musical knowledge their implementation will not be effective.

References

BIGGS, J. (1987). *Study Process Questionnaire: User's Manual. Hawthorne,* Victoria: Australian Council for Educational Research.

CANTWELL, R.H. & MILLARD, Y. (1994). The relationship between approach to learning and learning strategies in learning music, *British Journal of Educational Psychology, 64*, 45-63.

CHAFFIN, R. & IMREH, G. (1997) Pulling teeth and torture: Musical memory and problem solving, *Thinking and Reasoning, 3-4* 315-36.

ERICSSON, K.A., TESCH-ROMER, C., & KRAMPE, R. (1990). The role of practice and motivation in the acquisition of expert-level performance in real life. In M.J.A. Howe (Ed.), *Encouraging the development of exceptional skills and talents.* Leicester: BPS Books.

FLAVELL, J.H., BEACH, D.R., & CHINSKY, J.M. (1966). Spontaneous verbal rehearsal in a

memory task as a function of age. *Child Development, 37,* 283-299.

GRUSON, L.M. (1988). Rehearsal skill and musical competence: Does practice make perfect? In J.A. Sloboda (Ed), *Generative processes in music: The psychology of performance,* improvisation and composition. Oxford: Clarendon Press.

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. (1997) The development of memorisation strategies in musicians: Implications for instrumental teaching, *British Journal of Music Education, 14(1),* 87-97.

HALLAM, S. (1998a) *Instrumental teaching: A practical guide to better teaching and learning*. Oxford: Heinemann

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

HALLAM, S. (2000) *The development of performance planning strategies in musicians* Conference proceedings of the 6th International conference Music perception and Cognition August 5-10, 2000, Keele University, UK.

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

MIKLASZEWSKI, K. (1995). Individual differences in preparing a musical composition for public performance, In Manturzewska, M., Miklaszewski, K. & Biatkowski, A. (Eds) *Psychology of Music Today*. Warsaw: Fryderyk Chopin Academy of Music.

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

PITTS, S., DAVIDSON, J. & MCPHERSON, G. (2000) Developing effective practise strategies: case studies of three young instrumentalists, *Music Education Research, 2(1),* 45- 56.

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. (1990). The tortoise, the hare and the development of talent. In M.J.A. Howe, (ed) *Encouraging the development of exceptional skills and talents*. Leicester: BPS Books.

WICINSKI, A.A. (1950). Psichologiceskii analiz processa raboty pianista-ispolnitiela nad muzykalnym proizviedieniem (Psychological analysis of piano performer's process of work on musical composition). *Izviestia Akademii Piedagogiceskich Anuk Vyp., 24*, 171-215.

Table 1

Levels of task oriented strategy use as expertise develops

Strategy Level	Task oriented strategy	% of students
1	Task requirements incomplete	6%
2	Material played through no corrections	2%
3	Material played through single notes corrected	9%
4	Material played through, short sections repeated	51%
5	Material played through, large sections practised en route.	21%
6	Material initially played through, difficult passages identified and practised in isolation.	10%

Table 2

Comparison of performance on pitch and rhythm from Preliminary to Grade 5

Grade	Rhythmical accuracy	Notational accuracy	Number of subjects	Probability
Preliminary	2.58	6.92	6	.01
Grade 1	4.25	6.86	14	.01
Grade 2	5.63	7.5	4	.025
Grade 3/4	4.5	7.2	5	.025
Grade 5	6.42	6.92	6	NS

Table 3

Correlations between performance indicators, task strategy level, grade and time learning

Performance indicators	Task strategy level	Significance level	Grade	Significance level	Time learning	Significance level
Overall impression	.44	.01	.74	.001	.55	.001
Rhythmical accuracy	.6	.001	.79	.001	.57	.001
Steadiness of pulse	.49	.001	.78	.001	.61	.001
Notational accuracy	.19	NS	.39	.05	.29	NS
Intonation	.19	NS	.39	.05	.29	NS
Tonality	.46	.001	.64	.001	.39	.05
Expression	.58	.001	.86	.001	.72	.001

Table 4

Levels of planning in daily practice

Organisation of practice criteria	Novices	Advanced students
High planning Specified aims of practice Consistent order of practice Self-imposed organisation of when practice occurs Tends to mark things on the part Evidence of systematic work	4 (10%)	2 (33%)
Moderate planning Some organisation of when practice occurs Planned order of practice when taking examinations Evidence of some time organisation	26 (65%)	4 (66%)
Low planning Practises when has time Constantly has to be reminded to practice Wastes time practising unnecessary material Practice is disorganised	10 (25%)	

Table 5

Comparison of novices and advanced students overall approaches to planning

	Planning in recorded practice		
Organisation in daily practice	High	Moderate	Low
High	2 (4%)	3 (7%)	1 (2%)
Moderate	7 (15%)	18 (39%)	5 (11%)
Low	2 (15%)	7 (15%)	1 (2%)

Table 6

Student strategies adopted to reduce nervousness

Strategy	Number of students
Arranging to be tested	6
Playing to parents or others	21
Doing a mock exam	7
Avoiding thought of the exam	3
Treating an examination like a lesson	3
Playing immediately before the examination for reassurance	9
Actively concentrating on the music	1
Practised to alleviate feelings of nervousness	8