Learning strategies in instrumental music practice

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This case study of two organ students aims to identify learning strategies used in preparing a complex piece for performance. The results are based on data gathered from verbal reports given both during and after practice sessions. These sessions were also videotaped. The results show that the students used learning strategies to select and organise information and to integrate it with existing knowledge. In addition, they were systematic in their approaches to sorting the learning material.

Introduction

Recent research (Weinstein and Mayer, 1986) has shown that successful students are methodical in their approaches to learning. They actively plan their study and spontaneously invent increasingly advanced strategies to improve their performance. A focus on the diverse and individual ways in which musicians break tasks down into component processes when practising may contribute to our understanding of how musicians learn. This may lead to improved teaching and assessment of learning and problem solving.

Previous research in instrumental learning has concentrated mainly on revealing relationships between learning activities and learning results. There has been little consideration of students' understanding of what they learn as they practice. Some studies do take the learner's perspective into consideration, however.

Hallam (1992, 1995) categorises students' methods of practising as either 'holistic' or 'serialist'. Beyond this, however, Hallam does not focus on learning strategies. Chaffin and Imreh (1994, 1997) study a pianist's use of separate hands and segmentation of the piece as possible learning strategies during practice. However, they emphasise how pianists define the task as expressive or interpretative, and explore basic musical features attended to during practice periods. Miklaszewski (1989) and Gruson (1981) emphasise learning strategies to some extent by focusing on several aspects of student's actions during practice. Both researchers emphasise division of the material into shorter or longer fragments, playing hands separately, and variation of tempo. In Gruson's study of the way pianists practice, there is an additional emphasis on uninterrupted play, self-guiding statements, reading notes aloud, counting aloud, playing other than the designated piece and intervention by another. However, there is little emphasis on students' understanding of how they themselves learn. This research offers only limited information about how a learning activity aims to achieve a particular goal.

The present study, which investigated the work of two organ students as they prepared a piece for performance, viewed learning through methodical practising as *cognitive problem solving* (Mayer, 1994; Van Lehn, 1989).

There seems to be some variation in the ways learning strategies are defined during practice. This may be due to an absence of theoretical frameworks guiding this kind of research. Recently, Jorgensen (1995) developed a useful rationale for classifying learning strategies in this area. Jorgensen sees practising as 'self-teaching' and has used a didactic theory as a model of practice. However this rationale for classifying learning strategies is not appropriate to the present study. It seemed more appropriate to consider models involving strategic learning developed in areas other than music.

What students do as they learn is a prime determinant of efficiency (Brown *et al.*, 1983). Some systematic activities that students use are referred to as strategies, although the literature has not always made it clear what is strategic and what is not. According to Schneider and Weinert (1990), recent research conceives systematic learning as a deliberate or purposeful process, originally consciously applied, but normally undergoing automatisation as a result of development and practice. Learning strategies are defined as intended or goal-directed processes distinct from those that either are not intended to accomplish goals or that accomplish goals other than the ones intended. An activity is only defined as a strategy in so far as it can relate to the intended goals. This definition explicitly does not stipulate that a strategy must be consciously formulated or the product of a conscious or rational choice.

In this article the terms 'strategy' and 'learning strategy' are used according to the following definition:

> Behaviors and thoughts that a learner engages in during learning and that are intended to influence the learner's encoding process. Thus, the goal of any learning strategy may be to affect the learner's motivational or affective state, or the way in which the learner selects, acquires, organises, or integrates new knowledge. (Weinstein and Mayer 1986: 315)

According to this interpretation, a strategy involves both thought and behaviour. It is not just a 'pure' cognitive information process, but consists also of different forms of action directed towards learning material. Bråten (1991: 17) defines cognitive strategies during learning or problem solving as including both linguistic (verbal) actions and the processing of information. As studying an instrument involves physical manipulation, it seems reasonable to amplify learning strategies during practice in the direction of external actions. This article seeks to integrate an understanding of learning strategies during practice as both action and cognition, but with action primarily in focus. This seems to be to accord with the more general definition given above (Weinstein and Mayer, 1986) that conveys methodological implications that I discuss later.

Weinstein and Mayer (1986) define two 'objects' that learning strategies are intended to influence: (a) the learner's motivational or affective state, and (b) the way the learner selects, acquires, organises, or integrates new knowledge. Dansereau defines strategies intended to operate on these two 'objects' as:

> Primary strategies, which are used to operate on the text material directly (e.g. comprehension and memory strategies) and support strategies, which are used to maintain a suitable state of mind for learning (e.g. concentration strategies). (Dansereau 1985: 209)

The primary strategies are intended to influence *directly* the learner's acquisition of new knowledge by being concerned with the cognitive processing of textual material. Support strategies are intended to influence *indirectly* the learner's acquisition of new knowledge by focusing on the learner's state of mind. The learning strategies in this

category represent ways of maintaining concentration, mastering anxiety, establishing motivation and securing the efficient use of time. Examples are relaxation exercises, constructive self-talk and pausing to rest. This article focuses only on primary strategies during practice.

Three cognitive processes may serve to categorise the students' primary learning strategies during practice (Mayer, 1994): what methods do students use to select relevant information to master tasks, to select and organise information, and to integrate these with existing knowledge?

Garcia and Pintrich (1994) see more general processes such as planning, monitoring and revising of procedures as part of the student's repertoire of primary learning strategies. Other researchers see these as part of self-regulation or as higher level metacognitive skills (Brown, 1987; Nisbet and Shuchsmith, 1986; Sternberg, 1983). The present study sees processes related to directing the strategy as part of the learner's metacognitive competence, not as part of the repertoire of learning strategies. It is not clear whether it is possible, beyond the theoretical, to distinguish between strategies on different levels.

By focusing on two organists, this study explored *the repertoires of learning strategies* within practice sessions. It looked both at the initial stage of learning a particular work, and at later practice sessions. The study also explored similarities and differences in the working methods that can be found between these periods. This article also explores techniques for gathering information developed in other disciplines to fit the purpose of the present study and the naturalistic situation of practising.

Method

The subjects and the music

The subjects were two third-year organ students at the Norwegian State Academy of Music in Oslo. Their teacher described them as gifted and possessing a high level of technical skill. The works practised were the *Prélude* from 'Prélude et Fugue' in B major (Opus 7) by Dupré (Student no. 1), and the *Salve Regina* movement from Widor's Second Symphony (Opus 13). Both pieces represent some of their most important works from the organ repertoire of the French Romantic period.

Before recording the initial practice sessions the students knew their pieces from other live and recorded performances. However, no special auditory or analytic pre-study work had taken place. The pieces were part of the students' preparation for final examinations at the Academy. The students and their teachers selected the pieces as exemplars of moderate difficulty.

Procedure

The results are based on data gathered during the first practice session and during or immediately after the second (lasting one hour) in the first and second learning periods. The students practised on a familiar instrument in one of their usual practice rooms.

The first learning period lasted for one week for Student no. 1, who practised the Dupré piece for two to three hours per day, before playing it to his teacher. During the following weeks he worked with other pieces. For Student no. 2 the first learning period lasted for two weeks, during which she practised the Widor for about one hour per day. During this period she presented the piece several times to her teacher. The following weeks she focused on other movements of the same *Symphonie*.

277

The second learning period started about three weeks after the end of the first, and both students prepared their pieces for concert performance. For Student no. 1 the second period lasted four weeks and for Student no. 2, three. Both students worked concurrently on other pieces during the second learning period. In each period, the information was gathered in three sequences (Nielsen, 1997; 1998):

- *The first sequence* consisted of observation of practice behaviour (*OBehav*) conducted on the first day of each learning period. The student's practice behaviour was defined as the student's performance during practice and the distribution of the musical material in time. The observation lasted for about an hour.
- *The second sequence* consisted of the student's concurrent verbal reports of problem-solving activities during a session (*VRDuring*). The student was instructed to focus on cognitive processes involved in problem solving during practice and continuously to give reports of them as if answering the following questions: 'What am I thinking?' and 'What am I focusing on?' In this session, the student continued working with the same piece as in the first sequence, but on the following day. The *VRDuring*-sequence was recorded on video and lasted for about an hour.
- *The third sequence* consisted of the student's retrospective debriefing reports of problem-solving activities after practice (*RRAfter*). These give accounts of the actions and thoughts remembered from the problem-solving activity during practice verbalised following the taped *VRDuring*-session. They were supposed to expose further the student's knowledge of strategies. In addition, questions about the procedure were asked during the *RRAfter*-sequence following the student's reports. The *RRAfter*-sequence was performed immediately after the finishing of the *VRDuring*-sequence, and lasted about ninety minutes. To help them recall their original problem-solving activities, the students watched the video recording from the *VRDuring*-sequence. (This showed both the student's verbal reports and practice behaviour during the *RRAfter*-sequence.) The cues offered from this helped to structure the researcher's questions during *RRAfter*. The *RRAfter*-sequence was also recorded on video, including the video recording from the *VRDuring*-sequence, making it possible to co-ordinate the student's verbalisations from *VRDuring* and *RRAfter*.

The three sequences were organised as the following:

Table 1. *The organisation of the three sequences within each phase in which information was gathered*

Day 1	Observation of practice behaviour (*OBehav*)	About 1 hour
Day 2	Concurrent verbal reports during practising (*VRDuring*)	About 1 hour
Day 2	Pause	About 15 minutes
Day 2	Retrospective debriefing reports after practice (*RRAfter*)	About 90 minutes

The present focus was seen as appropriate since learning strategies in this context were conceived as originally consciously applied, but undergoing automatisation through practice. The students' overt practice behaviour was seen as evidence of how they learnt.

The verbal techniques for gathering information were adopted from comparable research on learning and problem solving in areas such as reading, mathematics, physics and secondary-language learning. (Garner & Alexander, 1982; Marfo &

Ryan, 1990; McDaniel & Kearney, 1984; Olshavsky, 1976–7; Siegler & Campbell, 1989.) During pilot studies, the verbal reporting techniques were adjusted to fit the purpose of the study and the natural practice situation. These procedures followed guidelines offered by Ericsson and Simon (1993) and Taylor and Dionne (1994), and included conducting a training session and prompting.

Considering this, the data for this study consist of a detailed listing of the students' behavioural and verbal activities made from the videotapes from the two phases (learning period 1 and 2).

Analysis

The observational sequences of practice behaviour

A detailed observational scheme of the students' performance during practice was developed. Earlier studies have focused on categories such as tempo, the size of segments played without interruption and the separation of hands (Gruson, 1981; Chaffin & Imreh, 1994; 1997; Miklaszewski, 1989). However, Gruson's study indicated that the categories were not mutually exclusive, and frequency and interval scoring of categories defined as distinct and continuous were mixed.

To describe the distribution of the musical material in time, earlier studies (e.g. Miklaszewski, 1989) have focused on the number of bars worked on during a particular time. The same procedure was used in the present study. The data give a detailed account of the total time spent per bar during the entire session and bars worked on consecutively.

A videotape of the students' concert performances was compared to the students' performance during practice. The differences were described using four categories of learning strategy: segmentation, change of tempo, playing with hands separately and hands together (uni-/ bilateral play), and *Change of rhythmical structure*. Differences relating to the interpretative and expressive aspects of the performance were not considered. Apart from the category '*Change of rhythmical structure*', each category was further divided into sub-categories (see Table 2). These were devised as work with the videotape progressed.

Table 2. *The detailed observational scheme*

Category	Sub-categories	Definition
Segmentation	*Shorter-than-measure*	Plays a segment of a length that is shorter than that of a measure.
	One-measure-long	Plays a segment of a length of a measure.
	Longer-than-measure	Plays a segment of a length that is longer than that of a measure, but shorter than that of the piece.
Tempo	*Tempo I*	*Tempo* is slower than the final concert tempo, but faster than 75 per cent of the final tempo.
	Tempo II	*Tempo* is maximum 75 per cent of the final tempo, but faster than 50 per cent of the final concert tempo.
	Tempo III	*Tempo* is maximum 50 per cent of the final concert tempo or slower.
Uni-/bilateral play	Unilateral	Plays each hand or the pedal separately.
	Bilateral	Plays both hands or one hand and the pedal separately.
Change of rhythmical structure	–	The rhythmical pattern of a segment is altered by changing the whole structure in certain ways (e.g. length of accents changed compared to the written score).

The verbalisation sequences

Both the verbal reports during practice and the retrospective debriefing reports were transcribed verbatim. A coding grid was developed for the verbal reports from the *VRDuring*-sequence. The categories identified were problem recognition, evaluation of performance and choice of strategies. The coded verbalisations from *VRDuring* were organised into a scheme showing both the verbalisations and the following behavioural actions in succession (Nielsen, 1997). The verbalisations from *VRDuring* were also co-ordinated with the verbalisations from the *RRAfter* within each learning period to make explicit the information implicit in the *VRDuring*. Further, a content analysis was conducted of each category in the coding grid, and here I will present the results of the content analysis of the category *strategy choice*.

The results from the first practice session in each learning period were based on the students' behavioural actions. The results from the second were based on verbal actions, which were seen as extending and clarifying behavioural actions.

Though variables, like two persons practising two different musical works at different times, can make the data less comparable, some variables can contribute in the opposite direction.

The common purpose of the practice sessions could be seen as part of both students' preparations for performance. The pieces were assumed to involve representative problems with each student's skills and knowledge as an organist. Both works were from the same stylistic period in the organ repertoire, and this influenced several aspects of the performances, both technically and interpretatively. This implies some external similarities between each student's task, though each piece involved specific challenges for the individual performer. All these variables contribute towards making useful comparisons of the students' methods of working.

Results

It became clear that the students' repertoire of learning strategies varied to some degree between learning periods. There follows a description of the students' strategies *within* each learning period, which also compares the two students' strategies *between* learning periods.

Repertoires of learning strategies within the first learning period

In the first learning period both students worked only with parts of the piece. Student no. 1 practised the first twenty-five bars of the *Prélude* (a total of 103 bars), while Student no. 2 practised the first twenty-six bars of the *Salve Regina* movement (a total of 78 bars). For both students the first learning period included the following strategies:

(a) *to divide the piece into 'working areas' (larger sections) that are focused separately*
(b) *to play the musical material within each working area in different segments*
(c) *to play segments in different tempi*
(d) *to play each hand or the pedal separately (unilateral play) or both hands or one hand and the pedal separately (bilateral play)*
(e) *to systematically alter the rhythmical structure of a segment*
(f) *to use combinations of strategies in sequence*
(g) *to change the possible solution to a problem*

280

(h) to keep to only one fingering of a segment
(i) to do markings in the score
(j) to take pauses where the score is studied further

In addition, Student no. 1 isolated part movements as figurations based on chords, while Student no. 2 used the metronome to help playing segments in different tempi. Considering this, the students' repertoires of learning strategies seemed to be almost consistent within this first learning period.

If we focus on the use of time in the two *OBehav*-sessions, the students emphasised the playing of segments *Longer-than-measure* in a slow tempo (*Tempo III*) (see Figure 1). In addition, Student no. 2 tended to play segments where the rhythmical pattern of the segment was altered by changing the whole structure in certain ways (e.g. length of accents changed compared to the written score).
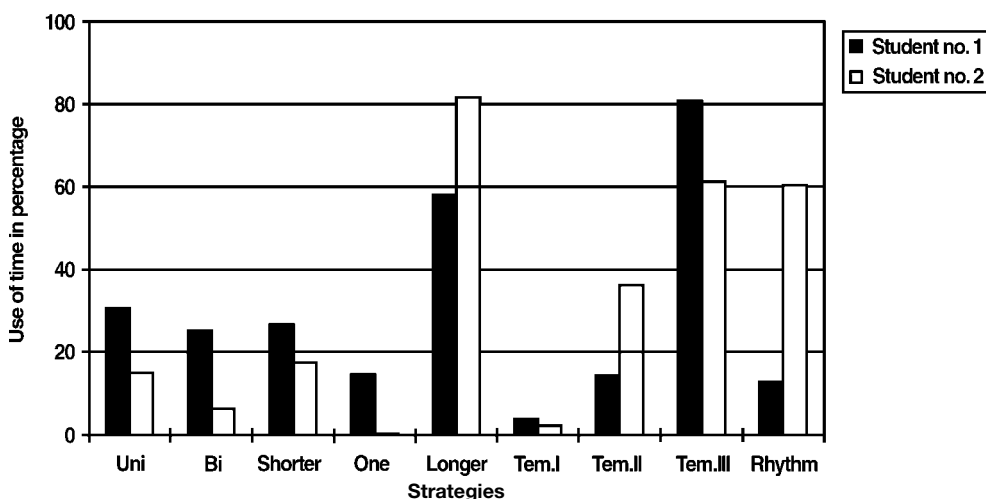

Fig. 1. Use of time to strategies in the *OBehav*-sessions in the first learning period

Repertoires of learning strategies within the second learning period

In the second learning period both students worked with the whole piece (Student no. 1 with the whole *Prélude* and Student no. 2 with the whole *Salve Regina* movement). For both students the second learning period included the same strategies as the first, except for the method of keeping to only one fingering within a segment. Instead they both tested out different solutions to a problem. Beyond this, the repertoire for Student no. 1 also included minimising patterns of movements to chords, overdoing movements, and developing exercises based on parts of the piece. The repertoire for Student no. 2 also included playing segments along with a vocal expression. Considering this, the students' repertoires of learning strategies seemed to be almost consistent within this second learning period.

If we focus on their use of time to some of the common strategies in this learning period (as studied in the two *OBehav*-sessions), the students emphasised the playing of segments *Longer-than-measure* in a fast *Tempo I* (see Figure 2).

Comparing the repertoires within the two learning periods

Considering the presented results, the learning strategies were mostly consistent within the two learning periods. This also was the case for each individual student's
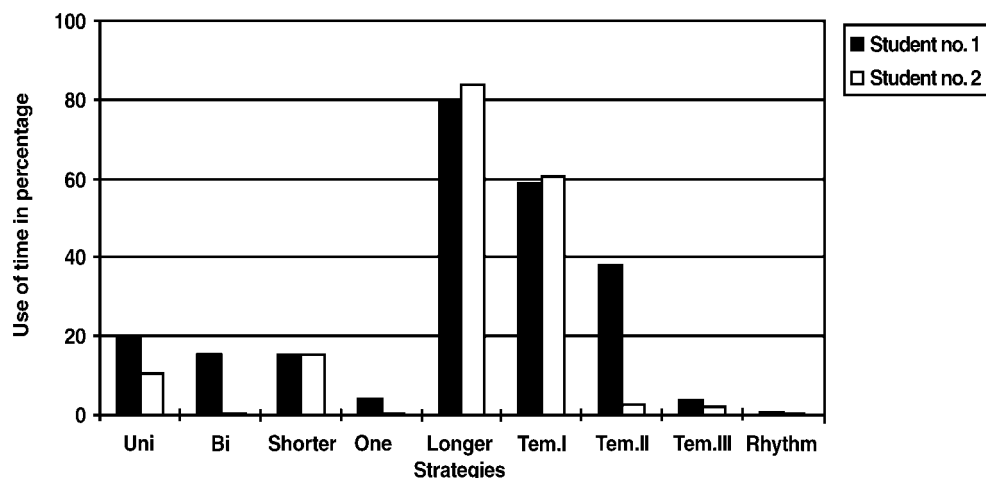
Fig. 2. Use of time to strategies in the *OBehav*-sessions in the second learning period

repertoire. However, there were some inconsistencies as both students kept to only one fingering within the first learning period, while they tried out fingerings in the second.

In the case of the students' different learning strategies in the two learning periods, there were some similar features in the first period. Both students reduced the quantity of information to be processed; though the strategies differed. Student #1 isolated part movements while Student no. 2 used a metronome to assist in steady playing. In the second learning period the strategies took on different features. Student no. 1 tried to reduce the quantity of information processed by overdoing movements and developing exercises based on parts of the piece. Student no. 2 tried to increase the quantity of information to be processed by playing segments combined with a vocal expression.

If we study to what extent they used some of the same approaches in the two learning periods (as studied in the *OBehav*-sessions), the students employed their time differently between strategies. However, as shown in Figure 3, both students were relatively consistent in their use of time to play hands separately and hands together and to play segments *Shorter-than-measure* or *One-measure-long*. (The differences are no more than that of about 10 per cent between the *OBehav*-sessions in the first and second learning periods.) In other words, there were slight variations of method between the students.

The students' use of time showed differences both in quantity and direction. The students were most alike in their use of time to *Tempo I*. In the second learning period both students increased their use of time to play segments in *Tempo I* expressed in percentages (Student no. 1 increased by about 55 per cent and Student no. 2 increased by about 58 per cent). The students were most unlike in relation to the differences in quantity and direction in their use of time to play segments in *Tempo II*. Student no. 1 increased his use of time to *Tempo II* in the second learning period while Student no. 2 reduced her time expressed in percentage.

Further, the students were most unlike in relation to the quantity of the differences in their use of time to *Change of rhythmical structure*. Student no. 1 reduced his use of time by about 13 per cent in the second learning period, while Student no. 2 reduced her use of time by about 60 per cent in the same learning period. Student no. 2 was consistent in her use of time to play segments *Longer-than-measure* between the
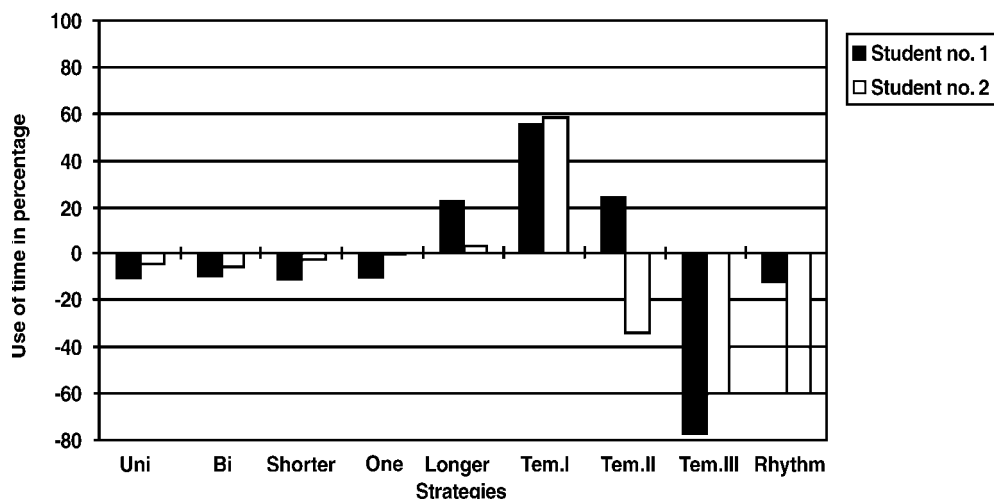
282

Fig. 3. Differences in use of time to strategies between *OBehav*-sessions in the first and second learning periods

learning periods, while Student no. 1 increased his use of time by about 22 per cent. Both students also reduced their use of time to play segments in *Tempo III* in the second learning period, but not to the same extent (Student no. 1 reduced by about 78 per cent and Student no. 2 by about 60 per cent). This implies that Student no. 2 was more consistent in her use of these strategies in the two learning periods than Student no. 1. On the other hand, Student no. 1 was more consistent in using *Change of rhythmical structure* than Student no. 2.

Considering the finished product of their rehearsal as being able to play the piece as a whole in a relatively fast tempo, the students' use of time within the different strategies seems reasonable. Both students increased their use of time to play segments in a fast tempo. Their use of time to play segments *Longer-than-measure* was either consistent (Student no. 2) or had increased (Student no. 1). Simultaneously, both reduced their use of time to *Tempo III* and *Change of rhythmical structure*.

However, their consistencies in use of time to play with one or both hands or to playing segments *Shorter-than-measure* and *One-measure-long* are surprising. With their use of time to employ these strategies in the first learning period, I expected them to use relatively less time in the second. However, the differences are minor.

Theoretical discussion

The students' learning strategies within the two learning periods investigated may be categorised as *primary* strategies intended directly to influence the learner's acquisition of knowledge. In the following, I first discuss to what extent the students' learning strategies may divide into strategies to *select* relevant information to master the task, to *organise* the selected information, and to *integrate* the presented information with existing knowledge. Second, I compare the results with earlier research on learning strategies. Considering this, I finally present a classification of learning strategies during practice.

283

Categorisation

Considering the students expressed goals of their use of strategies during practice, some of the presented strategies can be viewed *as strategies to select relevant information*. For example, both students took pauses where the score was studied further. Considering this visual examination of the score, they selected current problem areas that had to be put in focus to master the piece. This strategy can be classified as a method of selecting relevant information. With memorising parts of the piece, Student no. 2 reported that it would have been better to:

> study the actual part of the piece to know 'that's the way', and then try to play it from memory. Then I could have identified the errors more precisely instead of trying to play the part from its beginning stopping at the same place repeatedly. I did it eventually, but then I had been trying to identify the problem for a while.

The students also used a combination of playing segments *Longer-than-measure* and *Tempo I* to diagnose their skills in performing parts of the piece during practice. Compared to the other segment and tempo activities, these two activities imply the performance of parts of the piece closer to the finished product of their rehearsal. This combination may represent an opportunity to play through longer sections and to identify problem areas. Student no. 1 reported that: 'you have to test it – maybe play it through more – to identify the problem'. This combination may be classified as a strategy to select relevant information.

In learning to master a musical work the following two strategies may affect which parts of the piece the learner focus during practice:

SELECTION STRATEGIES: Strategies to select relevant problem areas:

(a) a visual examination of the score
(b) playing through larger sections in a tempo close to the final tempo

Considering that the students expressed the goals of their strategies used during practice, some can be viewed as *strategies to organise the selected information*. For example, both students worked with the aim of joining parts of the piece as a whole. They played the parts in different segments and played segments in different tempi. They played each hand or the pedal separately. They played both hands or one hand and the pedal separately. They systematically altered the rhythmical structure of a segment, used combinations of strategies in sequence, kept to only one fingering of a segment and changed the possible solution to a problem when it did not work as a whole. To a varying extent, they also used the metronome to assist in playing segments in different tempi, developed exercises based on parts of the piece and tested out different solutions to a problem when the chosen solution no longer worked as a whole.

In learning to master a musical work the following strategies may affect the way the learner organises relevant information during practice:

ORGANISING STRATEGIES: Strategies to join parts of the piece as a whole:

(a) to play parts in different segments
(b) to play segments in different tempi

(c) *to play each hand or the pedal separately, or both hands or one hand and the pedal separately*
(d) *to systematically alter the rhythmical structure of a segment*
(e) *to use combinations of strategies in sequence*
(f) *to keep to only one fingering of a segment*
(g) *to change the possible solution to a problem*
(h) *to use the metronome to assist in playing segments in different tempi*
(i) *to develop exercises based on parts of the piece*
(j) *to test out different solutions to a problem*

Though these strategies mainly affect the way the learner organises the information, it is difficult to see how such organisation can be done without the student selecting relevant parts beforehand. Some of these strategies involve *elements of rehearsal* where information is being repeated to be remembered.

Hallam (1997: 95) considers it useful to distinguish between strategies as 'repetitious' (repeating larger parts of the material as the whole piece or phrases to gradually increase speed, often using a metronome to assist in this process) and 'analytic' (such as changing rhythms, varying slurs, inventing relevant exercises, gaining an overview, whole-part, identifying difficulties, monitoring and evaluation) in the learning of new music. Some 'analytic strategies' may be defined as part of the learners' metacognitive competence (monitoring and evaluation). Several others (such as changing rhythms and varying slurs) may be considered as organisational strategies. Instead of separating rehearsal strategies from organisation strategies, I chose to consider the repetition of parts of the material where some aspects of the performance such as length of segments, tempo, rhythmical structure and uni- and bilateral playing may vary, as *integrated* in the organisational strategies to join parts of the piece as a whole. This decision was based on the results of the present study. This caused a change in the before-mentioned organisation strategies (a)–(d) and (h), to:

(a) *to repeat parts in different segments*
(b) *to repeat segments in different tempi*
(c) *to repeat each hand or the pedal separately, or both hands or one hand and the pedal separately*
(d) *to repeat segments with systematically altered rhythmical structure*
(h) *to repeat segments in different tempi using the metronome to assist*

Considering the students expressed goals of their use of strategies during practice, one of the presented strategies can be viewed *as a strategy to integrate the presented information with existing knowledge*. One student used associations made between an auditive representation of a vocal expression and the phrasing performed on the organ. She played segments of the piece along with a vocal expression, and the phrasing of the melody was related to what she felt sounded 'natural or organic' (Student no. 2), when it was sung. This strategy relates auditive 'pictures' beyond the score to performance and may affect the way the learner integrates relevant information with existing knowledge. Though this strategy mainly may affect the way the learner integrates the information, it is difficult to see how such integration can take place without the learner selecting relevant parts beforehand.

To conclude, the chosen theoretical types of strategy contribute to categorise the students' learning strategies in ways that appear to accord with students' verbalised goals. The strategies are not mutually exclusive. Thus, an important theoretical contribution of this study is that learning strategies in instrumental practice are

related to learning strategies in other learning areas than the musical one, through common theoretical categories.

However, this categorisation does not include all the strategies as presented. The remaining strategies have in common that they *sort* the learning material. For example, both students divided the piece into 'working areas'. This implies that the material is sorted into larger sections that were focused separately. This division reflected the basic formal units of the pieces. For example, in the first learning period for Student no. 1 the basic musical material within each working area consisted of only one pattern. For Student no. 2 the basic material consisted of a phrase of the original Gregorian melody on which the piece was based. This involves both splitting a whole into parts according to the basic formal units of the composition and grouping the musical material. In this way a common pattern or a phrase of a melody may serve as a link. If elements of splitting wholes into parts may be included as a purpose of the selecting strategies, then the strategy in the first-mentioned case may be considered as a selection strategy. Otherwise, it may constitute a supplement to the outlined theoretical categories of learning strategies. Similar considerations may be made for the remaining strategies.

Strategies to sort the learning material

(a) to divide the piece into 'working areas' (larger sections) that are focused separately
(b) to do markings in the score
(c) to minimise patterns of movements to chords
(d) to overdo movements
(e) to isolate part movements in movements patterns as figurations based on chords

As we see, these 'sorting' strategies involve elements of both selecting and organising.

Comparison with earlier research on learning activities during practice

The present study does yield some common results with the earlier research that I summarised in the introduction. These mainly concern activities as segmentation, separation of hands, and varying tempi. In addition, Gruson (1981) focused on activities directed towards the score such as pausing.

Other results of the present study concern students' increased use of time to play segments in *Tempo I*. They either were consistent (Student no. 2) or increased (Student no. 1) their use of time to play segments *Longer-than-measure*, as practice progressed. They also reduced their use of time to play segments in *Tempo III* and were relatively consistent in their use of time to play hands separately and together and to play segments *Shorter-than-measure* or *One-measure-long* between the observed learning periods. Some of these results were expected from the findings of earlier research. This applies to the relation between increasing length of segments as practice progresses (Student no. 1), which is consistent with the results by Miklaszewski (1989) and Chaffin and Imreh (1994, 1997). Miklaszewski (1989) suggested, besides some divisions of the more difficult material into very short fragments, a systematic lengthening of fragments taken for elaboration through sessions the more the piece is practised. Chaffin and Imreh (1994, 1997) suggested that as the pianist (Imreh) learned the piece, she was able to work with larger segments in the more difficult section, so that the segments focused on in this section in later practice sessions looked

286

much more like the segments in the easier section. These results indicate a systematic lengthening of segments taken into elaboration with practice, but that depended on the texture of the musical material. In the case of playing segments in different tempi and uni- and bilateral play, there exist no comparable results.

To conclude, the present study confirms some of the presumed learning strategies that earlier research has suggested. Earlier studies have concentrated mainly on the learner's behavioural actions. However, their results may be seen as conjectures according to the present definition of learning strategies as goal-directed actions. Further, the methodological approach of the present study allows its results to convey a larger abundance of learning strategies.

Finally, based on this comparison, I present a classification of learning strategies during practice founded on the present study's theoretical perspective, where both results from the mentioned earlier research and from the present study fit in.

A classification of learning strategies during practice

The individual strategies in this classification (see Table 3) are drawn from the main results of the present study, from the mentioned earlier empirical research, and from the philosophical research by Jorgensen (1995). The comparable results from the earlier empirical studies were largely similar to the main findings presented here. Thus, beyond the results from the present study, the individual strategies in the classification are drawn from Jorgensen (1995). This mainly concerns strategies that may be categorised as support strategies (Dansereau, 1985). As the placing of strategies from Jorgensen (1995) in the following classification suggests relations between learning activities and purposes, and as his categorisation is not empirically founded, the strategies drawn from his work must be considered as conjectures, and as such as suggested learning strategies in practice.

Table 3. *A preliminary scheme for classifying learning strategies in practice*

PRIMARY STRATEGIES

1. Strategies to select relevant parts of learning material (Selection strategies)	1.1 Strategies to select relevant problem areas	• A visual examination of the score • Playing through larger sections in a tempo close to the final tempo • Playing prima vista
2. Strategies to organise and to form relations in the learning material (Organising strategies)	2.1 Strategies to join parts of the piece together as a whole	• To repeat parts in different segments • To repeat segments in different tempi • To repeat each hand or the pedal separately, or both hands or one hand and the pedal separately • To repeat segments with systematically altered rhythmical structure • To repeat segments in different tempi using the metronome as assistance

287

	2.2 Strategies to sort the learning material	• To use combinations of strategies in sequence • To keep to only one fingering of a segment To change the possible solution to a problem • To develop exercises based on parts of the piece • To test out different solutions to a problem • To divide the piece into 'working areas' (larger sections) that are focused separately • To do markings in the score • To minimise patterns of movements to chords • To overdo movements • To isolate part-movements in movement patterns as figurations based on chords
3. Strategies to relate the learning material to existing knowledge (Integration strategies)	3.1 Strategies to relate kinaesthetic 'pictures' to the performing of the material	• Mental rehearsal
	3.2 Strategies to relate auditive 'pictures' beyond the score to the performing of the material	• To play segments along with a vocal expression • Listening to others' performances/recording
	3.3 Strategies to relate visual 'pictures' beyond the score to the performing of the piece	• –
	3.4 Strategies to ensure positive and to avoid negative transfer	• To identify similarities and dissimilarities

SUPPORT STRATEGIES

4. Strategies to direct attention to the task at hand	4.1 Strategies to activate and maintain concentration	• Pausing/ resting • Prepare body and muscles for the practice activity
	4.2 Strategies to activate and maintain motivation	• Constructive self-talk • Help from others
5. Strategies to master achievement anxiety	5.1 Strategies for mental preparation for a public performance	• Mental exercises • Relaxation exercises
6. Strategies to secure efficient use of time	6.1 Strategies that utilise the distribution of practice over time (massed vs. distributed practice)	• –
	6.2 Strategies concerned with the formulation of general objectives and short-term goals	• –

The classification does not aim to generalise from the results of my study, but to see strategies in the existing 'literature' that relate to the results of the present study. The classification is preliminary. Considering the present study's results where the two subjects in focus also used *different* strategies, it appears reasonable to expect both *elaborations* of the existing categories, and new categories besides the presented ones as results from further research. For example, I have placed the category of 'sorting strategies' as constituting part of the organisation strategies. As these strategies may involve both elements of selecting and organising, this placing must be considered as preliminary and as a hypothesis which further research may demonstrate the probability of or reject.

Conclusion and educational implications

This study shows able students' use of learning strategies to select relevant problem areas, to join parts of the piece as a whole, and to relate auditive 'pictures' beyond the score to the performing of the piece. In addition, they used strategies to sort the learning material. An important contribution to this study is that the theory of learning strategies developed in reading, mathematics and similar learning areas where the cognitive aspects predominate, can be used in a learning area where motor performance is crucial.

One educational implication would be that teachers instruct their students to develop their strategic competence in the suggested categories. Borkowski and Turner (1990) assume that efficient learning depends on the co-ordination between different components as strategies, metacognition, motivation, and a non-strategic knowledge base. This implies that good learners have to know a large number of strategies and to understand when, where, and why these are important (Borkowski & Muthukrishna, 1992). This applies to expanding the students' specific, relational, and general metacognitive knowledge.

Specific strategy knowledge includes an understanding of a goal, the strategy's appropriate applications and range of applicability It also needs to include the learning gains expected from consistent use of the strategy, the amount of effort associated with its deployment and also whether the strategy is enjoyable or burdensome to use (Borkowski, Johnston & Reid, 1987). Considering this knowledge, Borkowski and Turner (1990) also assume that emerging knowledge of the similarity and differences of multiple strategies in a domain allows for a structuring of strategies. Relational strategy knowledge highlights the attributes of each strategy, faced with the changing demands of different tasks. Lastly, teachers should encourage students to recognise the general utility and importance of adopting a strategic approach. General awareness of strategy reflects the student's understanding that effort is required to apply strategies and that effort often produces success (Borkowski, Johnston & Reid, 1987).

Finally, the results could be seen as demonstrating students' need to reflect on their use of strategies during practice as a prerequisite for being able to use a range of skills systematically.

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289

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