Developing the ability to perform: a context of relevant research and psychological theories with examples on practicing the doublebass

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Abstract: This paper is about the urgent need expressed by students to receive more specific instructions concerning structured and effective practice. Empirical studies focus on the students' time invested in practice and how it might influence their performance level . Research on the quantity and quality of practice assemble some of the principal guidelines in terms of 'deliberate practice', put into relevance for the doublebass student. A three-stage model of skill acquisition is introduced and examples are given on how the student might use this knowledge by choosing a menu of concepts necessary to prepare a convincing performance.
Keywords: doublebass, deliberate practice, expert performance, stage theory, skill acquisition, declarative-procedural memory

Desenvolvendo a habilidade de performance: um contexto de pesquisa relevante e de teorias psicológicas com exemplos para praticar o contrabaixo

Resumo: Este artigo considera a necessidade urgente manifestada pelos estudantes em receber informações mais específicas relacionadas com a prática estruturada e efetiva. Estudos empíricos abordam o tempo que o aluno investe no estudo e como, eventualmente, poderá influenciar o seu nível de performance. Uma investigação sobre a qualidade e quantidade de estudo reúne os principais pontos prática deliberada adaptadas ao aluno de contrabaixo. Introduz-se uma teoria sobre a aquisição de habilidades dividida em três fases. São dados exemplos sobre como o estudante pode transformar estes conhecimentos em termos práticos, utilizando um menu de conceitos que lhe são necessários na preparação de uma performance convincente.
Palavras-chave: contrabaixo, prática deliberada, performance excelente, teoria de fases, aquisição de habilidades, memória declarativa - processual

Introduction

In the first part of my investigation, published in ***Per Musi*** Vol 5/6, 2002, p.120–130, I pointed out some of the multiple processes that are involved when learning the doublebass. In the second part, presented in this volume, further investigation links to a musical context. Previously established guidelines to posture and motion will be connected to the process of skill acquisition, confidently leading to a way of more effective practice. Considering the students' time invested in practice, I will first give a brief overview on studies undertaken in this field.

As will be seen, the current investigation concentrates mainly on the acquisition of some technical elements as indispensable tools for developing the ability to perform. While it is not intended not include the whole complexity of performing the doublebass, the purpose is to give an alternative approach to traditional doublebass education which may open new horizons for the learner.

1. Studies featuring time invested in practice

Instrumental music students have expressed their need to receive more specific instructions concerning structured and effective practice (BASTIAN, 1990), and an increasing number of

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studies have given empirical information focused on practice behaviour and how it might be related to the performance level as the out- coming product. ERICSSON's *et al.* (1993) study of the role of deliberate practice in the acquisition of expert performance (ERICSSON, KRAMPE and TESCH-RÖMER, 1993, cited in JØRGENSEN, 1997 and KLÖPPEL, 1997) related the accumulated amount of practice time of a selected group of thirty violin students from a major German conservatory to their expected professional career either as a soloist (awarded as the "best"), orchestra player (awarded as "good") or music teacher (awarded with a considerably lower evaluation than the orchestra players). Data were collected using retrospective estimates of the overall time the students had spent in practice activities since they started to practice seriously. Ericsson's data showed that the accumulated practice amounts correlated positively with the performance level: The amount of practice reached at the age of twenty for the "best" violinists exceeded 10.000 hours, that for the "good" accumulated 8.000 hours and the future violin teachers reached 4.500 hours. While this study demonstrates an evident relationship between practice amount and the level of performance attained, some critical observations are appropriate: This study does not show why some student practised less than the others and why this phenomenon appeared so early in their study career. It could be argued that the selection of violinists represented only a limited population, having been chosen as an elite of already confirmed students that already had established sophisticated practice habits (NIELSON, 1997; JØRGENSEN, 1997) investigated the quantity of practising time of students between different degree programs and different instruments of the Norwegian State Academy. His study was based on his expressed need for elaborating a theoretical framework that will enable analysis of students' use of practice time. While Jørgensen's results mainly confirm those of Ericsson et. al., he added that time spent practising is strongly related to the students level and the instrument. All musical instruments have different norms for practice time, e.g. the physiological capacity to practice a wind or string instrument. Doublebass students in this context showed a high score of weekly-spent time on individual practice equivalent to other string instruments.

2. Suggestions on practice for the double bassists

Empirical investigation in general and that specific to music has so far underlined the importance of the amount of time invested in practice is a key mediator to expert performance. In general, a time frame of 10 to 15 years is considered to become a domain expert in a complex skill, and it might take at least 10.000 hours of practice to become an expert violin player (ERICSSON, 1993). Doublebass students of a Norwegian Music Conservatory practice 27 hours a week (JØRGENSEN,1997). While the empirical investigation on the quantity of invested practice time has been related to the outcome product (like discussed in the introduction of *Per Musi*, Vol. 5/6, p. 120), it is felt that other components have been excluded that might be relevant. Indeed, only a few studies have focused on behaviours that occur in the practice room; factors like quality of practice (e.g. the usage of strategies or organisation). Differences might also be related to the instrument.

In absence of any empirical evidence to backup the theory, some comments from doublebass performers rank the contents and quality of practice above quantity, although quantity is also of confirmed importance in this view. For example, STREICHER (1977) bemoaned the existence of unthinking study in the practice studio: "I have known doublebassists who went over the same passages up to eight hours a day like unthinking automatons…and the passages in question were still full of mistakes…" (p.2)

Instead, Streicher assures that

> … if you experiment in a rational way, however, approaching the problem with logic, understanding and thought, success should not be long coming…and as for the many problems that face the doublebass soloist, I have learned to cope with them not within a practice studio but on the concert platform (p.2).

WOLF (1991) has also warned against the danger of mindless repetition and promotes the act of making decision in what direction practice should proceed:

> "Everything done twice becomes better"- the inescapable consequence of repetition is that something has, as a result, been improved or become secure. This applies not only to the desired technical improvements but also to mistakes (p.163)…just because something is technically difficult doesn't necessarily mean that it is worth practicing. Decide first on the appropriate musical effect, and then proceed to the simplest technical means to achieve it…(p.164)

McTIER (1999) acknowledges the physical demands when performing the doublebass and advises to use the amount of practice time effectively:

> Playing the bass is physically very demanding and even the most dedicated of bassist probably find four hours of practice a day pretty exhausting…. it is therefore imperative to utilise the available time to best advantage…(p. 4) …regular practice time is vital, not for only keeping fit the instrument, but also for consolidating results previously established.

So far, empirical investigation has provided evidence that relates the invested practice time to its qualitative outcome (e.g. ERICSSON, 1993). Doublebass teachers have outlined some points focusing more on the quality and efficiency of practice rather than on the accumulation of hours. The method of McTIER (1999) seems to encapsulate best the importance of both quality and quantity as the key elements to practice: Recognizing the physical demands of practising the doublebass, he points out clearly the imperative of qualitatively-efficient and quantitatively-regular practice. Research into practice might complete a proposal that assembles some of the principal guidelines for practicing the doublebass.

3. Components influential in the process of practice

Practice activity has been considered as an essential element in any motor skill acquisition (e.g. ANDERSON, 1981; NEWELL & ROSENBLOOM, 1981, SCHMIDT, 1975) and as one of the topics in the acquisition of skill in music. Practice can be the most time consuming activity necessary to learn the instrument and an urgent need has been expressed to form guidelines in order to promote practice as a comprehensive curricular discipline (KAPLAN, 1993). This concern has also been expressed by HALLAM (1997). She points out that practice strategies "… tend not to be addressed within existing instrumental curricula" (p.105). While the description on the precise nature of practice has been almost excluded or only briefly sketched in most of the doublebass method books in the past, investigation towards processes that shape instrumental performance has become one of the centre points of interest in research. The more recently published methods by WOLF (1991) and McTIER (1999) show evidence that research has in methodical frameworks have been very significant. Thus, it is important to discuss some of this research and how it may affect the production of a method for playing the doublebass.

Early empirical investigation on practice in the field of music was undertaken by BROWN (1928), focusing on a study of learning the piano practicing sections as a whole, partly or in combining methods. RUBIN-RABSON's study (1941a) investigated massed versus distributed practice,

the whole versus part learning, mental rehearsal and over-learning. ROSENTHAL (1984) discovered that different practice conditions are influential on the performance accuracy: practice might become more effective when organised in sequential and logical ways (BARRY, 1992). Novices might not be as capable of establishing a practice concept as effective as an expert or experienced teacher (GRUSON, 1988). Mental practice is mentioned as one of the most influential strategies in effective practice. A study with trombonists revealed that mental practice prior to instrumental practice revealed a higher performance outcome (ROSS, 1985) in comparison to the learner who only practised physically. A study of pianists revealed that those who analysed the music memorized it faster than those who did not (NUKI, 1984). Length and time distribution has been considered as another factor of structuring practice. Studies made in the field of motor learning indicated that relatively short practice sessions can be more effective than longer practice sessions (e.g. OXENDINE, 1968). Increasing the length of practice time does not necessarily result in improved musical performance (WAGNER, 1975). Practice results might be significantly increased when goal orientated and especially when the goals are directly related to the task being practiced (KLÖPPEL,1997). Model supportive practice, such as using audiotapes with model performances and practice advice, has been beneficial in some cases (ROSENTHAL, 1984). HALLAM (1998) has outlined some of the principal observations forming a model of variables influential to the practice process: Characteristics of the learner like personality, motivation, ability to concentrate etc. interact with the learning environment formed by the characteristics of teacher, support of the school and parents. Another point is the development of the tasks related to the instrument and the development of its multiple skills are necessary to assure control it in performance.

Thus in summary, skill acquisition in a general context and to music in particular has assembled a number of ways that may give a more or less complete picture of items that govern effectively the practice process:

- *Distributed practice:* evenly over time is more efficient than the massive practice putting large amounts into short periods (RUBIN-RABSON, 1940a). Motor skills generally improve more quickly with spaced rather than massive practice (LEE & GENOVESE, 1988);
- *Mental practice:* Learning away from the instrument (BARRETT, 1978). It is recommended o start a new piece with maximum preparation away from the instrument (McTIER,1999);
- *Goal practice:* Create goals that, if carefully practised, will guarantee a convincing performance. These will provide a focus for attention and facilitate motivation. Goals can be set in the short medium or long term (Hallam, 1997);
- The usage of a *"game-plan"* can structure practice (Mc TIER,1999);
- *Variable practice* can promote a long term establishment of musical motor skills (OWEN, 1988);
- *Transfer between the tasks:* Learning is more effectively transferred between tasks when conditions are similar, e.g. tempo, when tasks interact (WINHOLD, THELEN & ULRICH, 1994);
- *Practice as problem solving:* Elimination of errors before they arise or establish themselves. Providing proper analytical skills needed to respond adequately to musical materials or to pursue a course of self-correction (BARRETT, 1978);

- *Constructing and de-constructing:* into component tasks can be beneficial to musical memorization and to the transfer of general motor tasks (ADAMS, 1987). Passages can be broken down into their component parts to discover and address fundamental technical weakness (WOLF, 1991);
- *Assuring consistency:* The rate of "first time success" continues to improve until it occurs with great reliability. Deficient motor programs will only be eliminated when new ones have established in a continuously rate of correct performance (WOLF, 1991, PERTZBORN, 1997b);
- *Awareness:* the ability to observe and evaluate the consequences of the act of practice (BARRETT, 1978). Proficient players are able to articulate their behaviours more precisely and outline further practice strategies that are more complex (GRUSON, 1988; ERICSSON, 1996).

The amount of time necessary to learn a complex skill has been largely confirmed as one of the key factors in practising. Several studies have investigated this component in the process of skill acquisition (JORGENSEN, 1997). In this context, time management, a concept widely used in business, has been suggested to be adapted to organise practice time in order to improve and supervise efficiency and improvement. Professional musicians are more and more recommended to organise formal practice in a business-like approach in order to face competition and performance anxiety and to guarantee the highest possible performance level (KAPLAN, 1992). A step towards improving practice strategies might be in designing them according the learning capacity of each individual, e.g. by considering the stages of skill acquisition.

4. Stage theories of skill acquisition

Describing the stages of skill learning, HALLAM (1998) points out that any skill takes time to learn and it can only be learned gradually (p.119). The two stage theories of Fitts (FITTS, 1964; FITTS & POSNER, 1967) and ANDERSON (1982) have been particular influential in this field. Both divide the process of motor skill acquisition in three major stages and assume that the acquisition of skill is a continuously evolving process in which behaviour is progressively organized into larger and larger units (ROSE, 1997). FITTS (1964) designated his theory in the early-cognitive, the intermediate-associative and the autonomous stage. In the early-cognitive stage, the learners first attempt to understand the nature of a task and how it is performed. This information might be derived from receiving verbal instruction and/or observing the teacher demonstrating the skill. A first attempt by the learner performing the skill provides own sensory feedback. The teachers' comments and suggestions about these trials performance create a verbal feedback. Information received in this stage is stored in a memory system named 'declarative memory', characterized as "knowing that" (KLÖPPEL, 1997). Klöppel describes this state as explicit, conscious and controlled (p.251). Because movement skills have to be consciously controlled and verbal instruction is predominant, the cognitive component of this stage is distinctive. It is crucial that the teacher ensures that the student understands what is required. Once the learner understands the nature of the task in developing an internal template, he/she reaches the next stage (HALLAM, 1998). Learning a new skill one has to cope with previous established abilities and habits that might be applied in first attempts of performing the new skill. Novice skill that the learner tries to perform in conscious control might interfere with a long-term established motor plan that is controlled on a different memory level.

In the intermediate- associative stage, the learner starts being able to undertake the task and performance becomes more fluent. The need for verbal instruction becomes less important and the learner starts to be able to modify and /or adapt movement pattern as needed during this stage. Habits are more advantageously integrated in this stage and are accessed from within a different store labelled as the procedural memory, describing the “knowing how” state. Errors are subsequently eliminated. KLÖPPEL (1997) likewise defines this state as the implicit and knowing-how stage. Single movements become automated and unconscious. The length of the declarative and procedural stages varies in accordance to the type and complexity of the skill. Neuroscientist have revealed that the declarative and procedural memory is located each in different parts of the brain (PASCUAL-LEONE,1996; KLÖPPEL, 1997). The final and autonomous stage of learning, the focus is on automatizing the task so that attention might be directed to other aspects of performance. It can be said that this state has been achieved when the task can be performed with little conscious control (SCHIFFRIN & DUMAIS, 1981). Errors become much less frequent during this stage, learning begins to slow down and small changes necessary to improve performance become more difficult to master. It is also argued that the cognitive aspects are no longer accessible to the learner, who has largely given over control of the task to other subsystems at a lower level within the central nervous system. Although it remains difficult to verify and know exactly when a learner is entering each of these stages, Fitts’ description illustrates how motor behaviour changes as a consequence of instruction and/or practice. According to KLÖPPEL (1997), a particular interest for designing practice activities might be driven out of the distinct properties concerning declarative and the procedural level of stage acquisition: Each of them is stored in different part of the memory (PASCUAL-LEONE, 1996). Procedural activities are related to motor-mechanical activities established through long-term and often repeated practice sessions. The necessary knowledge concerning these skills is often disconnected from conscious reflection, labelled as the knowing- that stage. As an example, students that perform a piece flawlessly from the beginning to the end often are surprisingly not able to name the notes they play or give a distinct technical or analytical description. Further characteristics might enter into the comprehension of different practice methods. Procedural - implicit learning occurs slowly and demands numerous repetitions, while declarative-explicit learning might proceed much faster. Procedural knowledge is difficult to recall and therefore represents a critical point for the teacher in explaining complex task to a student (MENUHIN, 1976). Here, the development of stages that lead to the domination of a complex skill should be established carefully, because it represents a considerable disadvantage for the learner, when his/her teacher, although a performance-expert, is not able to explain all stages. This has been mentioned as a phenomenon that appears up the highest level of expertise (KLÖPPEL, 1997).

Anderson’s model is largely based on that of Fitts and has been developed as a computer program that operates according to the basic ideas of *the production system theory* (see SLOBODA, 1985 for a musical application). Anderson states that skill learning passes from factual knowledge (knowing-that or declarative stage. to procedural knowledge (knowing-how or procedural knowledge). Both stages are connected by a transitional stage. Anderson claims that retrieving the declarative knowledge can be a time consuming process due to the yet missing fluency in skilled performance. He calls this stage *proceduralization*, that means the conversion of declarative knowledge into action. His theory accounts for this by means of production rules, each defined by conditions and associating functions that are inherent to

perform if the condition is met. For instance, if condition X is met, then perform action Y. When practising in this concept, processes become more and better known while the declarative representations to direct them diminish. After completing this stage, which Anderson defined as *knowledge compilation*, performance only might improve when practice strategies fulfil effectiveness towards a process that he defines the process of *tuning.* It should be understood, that although the learning of simple skills might pass rapidly through the stages of declarative-cognitive to procedural stage, complex skills might take many years to master. For learning the doublebass, they might build up with the development and knowledge of the positions of the left hand as the declarative-cognitive stage and the basics of technique and with the procedural and automatic control of some aspects of performance.

5. A three-staged model of skill acquisition applied to the left hand

A three-staged motor plan featuring organized finger permutations in thumb position has been developed by the author within the context of the previous theories of section 4. In its practical use, it serves to most of the finger combinations imposed by the repertoire, reducing them to just three positions. A terminology defines type of finger permutation and register. All examples consider the G-string and might be applied likewise to the other strings.

In traditional doublebass method books, left hand positions have been organized in a numeric system (_ to 7^{th}. for the lower and middle neck-positions. This system ends when the thumb is placed on the fingerboard, forming the thumb positions. While expert doublebass soloists have found each different approaches to perform successfully in thumb positions, the subsequent digit system follows the guidelines of the three-staged model by FITTS (1964).

The most notable difference between fingerings of the thumb position and lower neck positions is the more frequent use of extensions. To take advantage of this greater flexibility, the development of a small repertoire of practical and easily reproducible hand positions is suggested to accommodate both the physical limitations of the fingers and the technical requirements of the music (BAILY & DRIVER 1992). Three positions in the target of a tetrachord form the diatonic intervals that are mostly requested in the literature, leaving the extended positions for exceptional passages like e.g. arpeggio playing. In the following section, the acquisition of this digit system follows the guidelines of the three-staged model by FITTS (1964).

1st stage: Understanding the task: In Fig. 1a-c, three parameters and their codes (in brackets. are proposed to encircle the predominantly used positions: The chromatic *(chr)*, the semi-chromatic *(schr)* and the diatonic *(diat)* (see PETRACCHI, 1980) are revealed in Fig. 1 a, b, c, referring to the notes, codification and finger permutation placed underneath the photos :

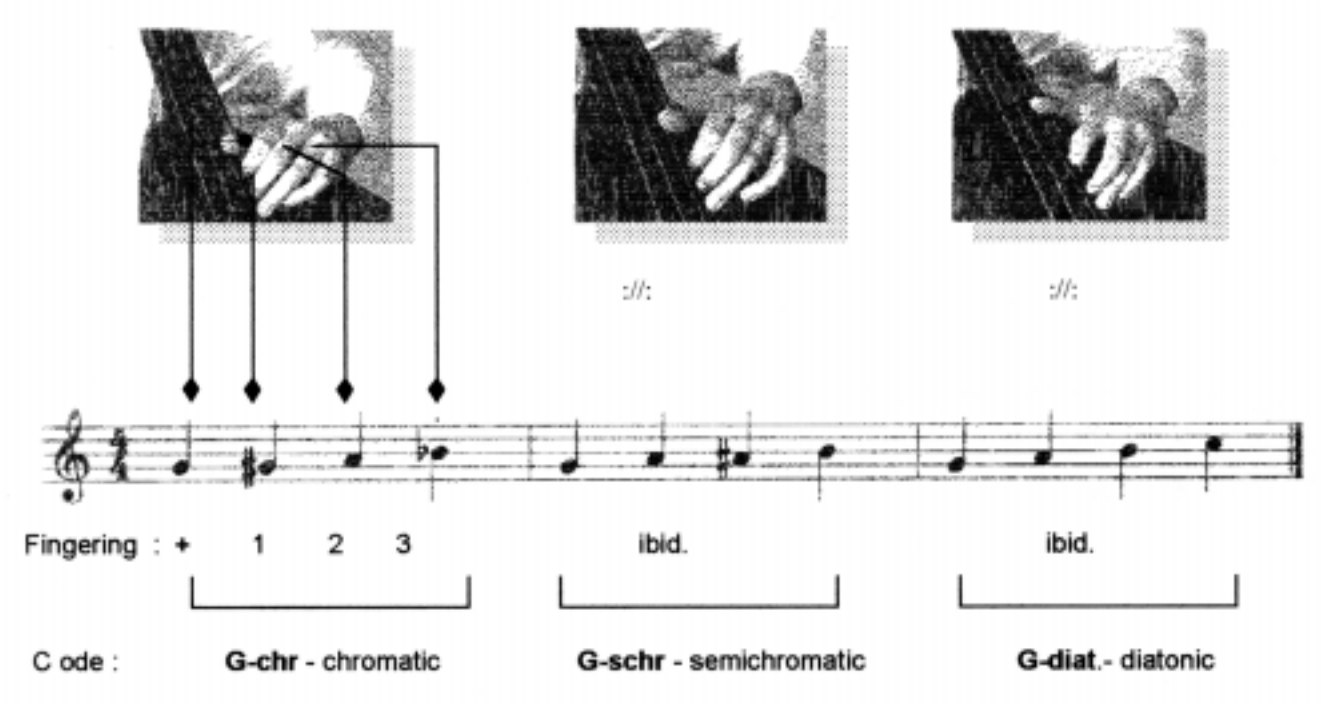

Fig. 1 a, b, c, : 1st stage :The three different hand positions cr-scr-diat in G

This terminology reduces finger permutations to codes by defining the spatial and tonal position of the fingers. The thumb (indicated always with a **+**. signals the exact location on the fingerboard, e.g **G-chr** means that the thumb is placed on the G, organizing the 1st 2nd and 3rd finger in a chromatic hierarchy (PETRACCHI, 1980). In the first stage, all information towards the three different hand positions have to be demonstrated, explained and learned. Information is stored in the declarative memory (KLÖPPEL, 1997). The learner needs to develop a mental template for further application (HALLAM, 1998). While practice starts, first sensory experience will be achieved through aural feedback (COHEN & SQUIRE, 1980). All this information and its practical application have to be learned as a first stage (FITTS, 1964; BERNSTEIN, 1967; KLÖPPEL, 1997) forming a 'template' (HALLAM, 1998) or 'operative fingering system' for further practical application (GELLRICH, 1998).

2nd stage: The second stage is a refined application of the first stage. The learner transfers the position to a higher register and thus to a different tonality

(Fig. 2 a-c). A qualitative modification of the finger permutation is not required: G-chr moves to D-chr, Gs-schr moves to D-schr, G-diat moves to D-diat. Instead, a clear spatial representation of reduced spacing due to the higher register has to be established:

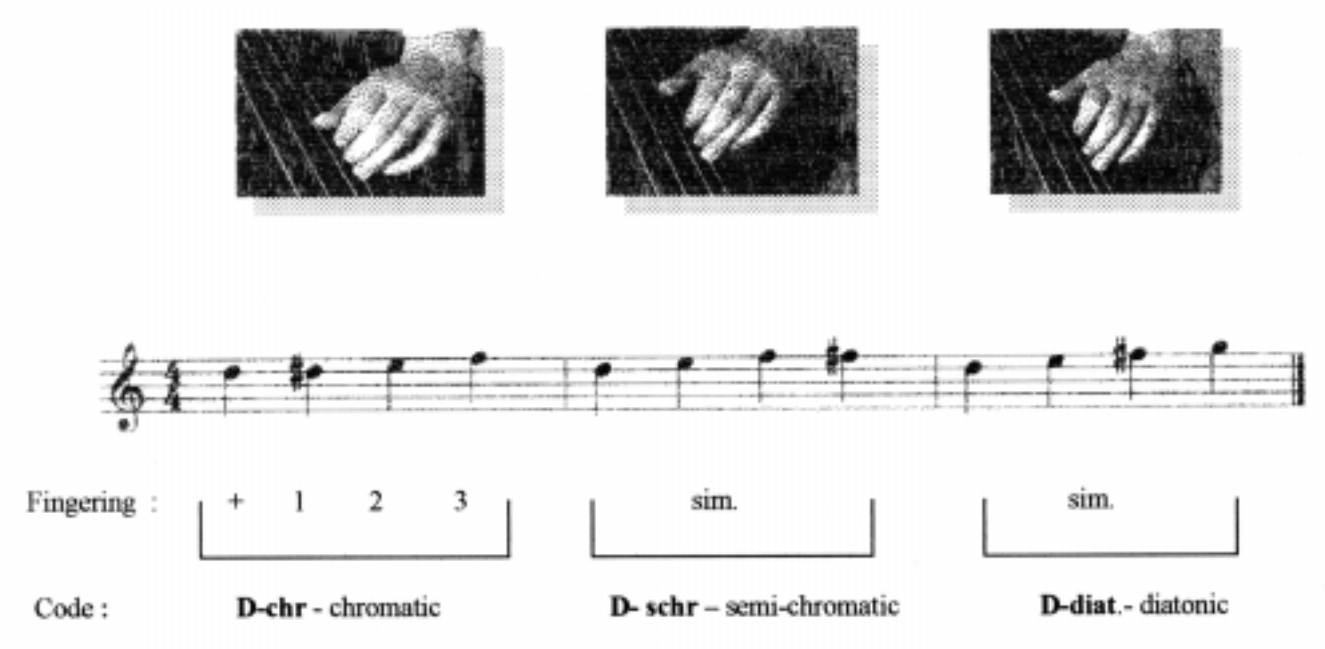

Fig. 2 a, b, c : 2nd stage : Transfer of positions to D- chr; D-schr. and D-diat.

3rd stage: The third stage might be defined as the 'performance' stage. The learner has to pass successively through all positions defined in the previously established ones in performing scale patterns in the form of successive thirds by transposing them:

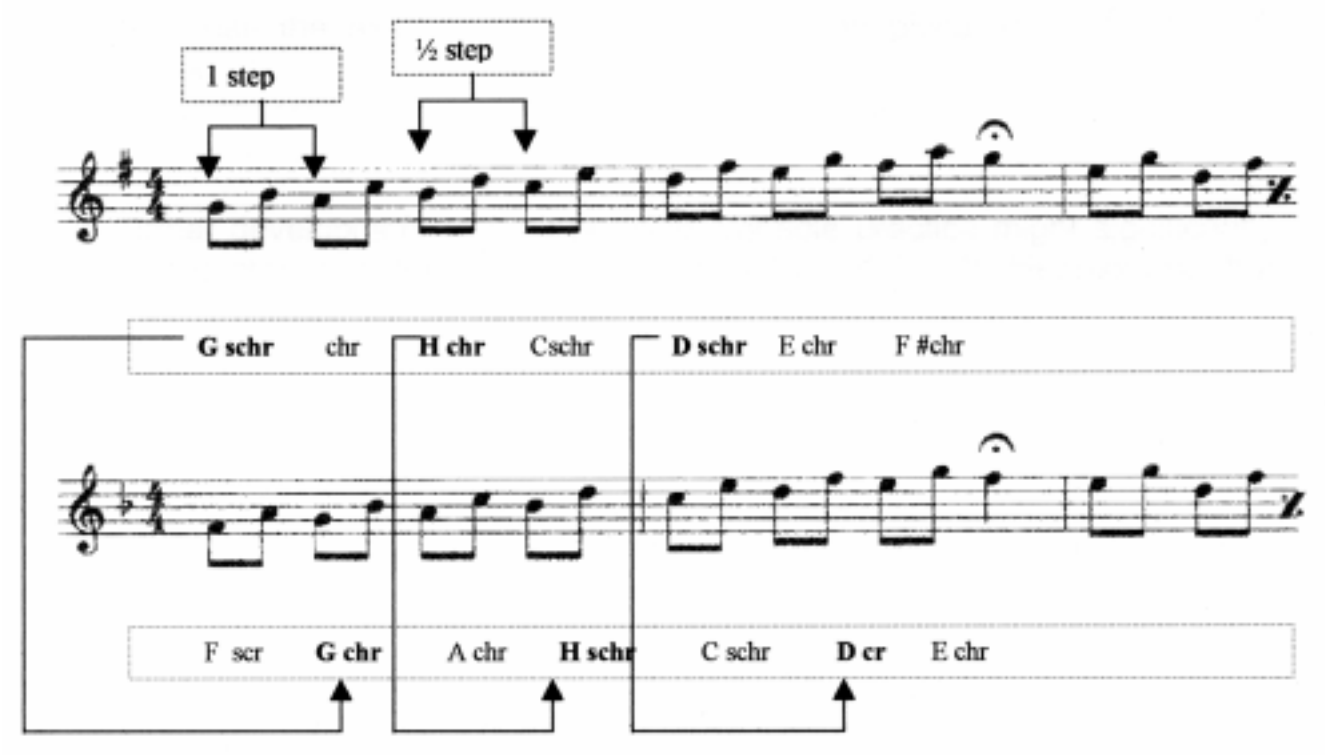

Fig. 3 : 3rd stage : Quantitative modification of (G,H and D)

The positions G,H,D in Fig. 3 appear each in the chromatic and semi chromatic forms and need to be distinguished sequentially between both positions based on the same tone. In this stage, the learner is required to combine two skills: shifting and spacing.

In Fig. 3, several positions appear in different permutations: G- schr changes to G- chr., H- chr. changes to H- schr., E- chr changes to E- schr. Every two notes, two decisions before proceeding have to be made about :

- **i.** Does the thumb moves 1/2 step or 1 step?
- **ii.** What is the next position: *chr, schr,* or *diat.*?

In order to have more time to organize the following position and to promote a mental preparation, the learner should be allowed to take as much time as needed to make the two decisions, e.g. a fermata could be placed on each second note. It is important to stop the sound and remain the bow on its spot while shifting the left hand. No motion should be produced during the process of decision making and placing the left hand in the following position with the correct spacing (PERTZBORN, 1999).

Practice indication referring Fig. 3 could be given as following:

- **i.** Shifting: Declare what distance the thumb will shift in advance:1 or 1/2 step?
- **ii.** Find out with what regularity hand position changes. Define generic rules.
- **iii.** Pronounce verbally each task before performing it, using the terminology *chr schr diat*
- **iv.** Transpose the exercise to the tonalities of the piece you are currently working on.
- **v.** If in doubt, write them down in order to promote aural awareness.
- **vi.** Invent own variations according to your needs (e.g. Fig. 4)

As a further development to slow practice, variable practice might significantly promote the storing of this system for all registers of the doublebass and that might be included as a template to the exercise developed in Fig. 4 (HALLAM,1998).

In the exercise given in Fig. 4, the time of making the two decisions on shifting and spacing (G-schr to A-chr. has been prolonged from two notes to three bars). The learner has more time to practice one position in different forms and speed, chreating additional aural and sensory feedback to improve awareness of correct intonation. Opportunities to repeat and to compare are provided (BARRETT, 1978).

It is essential that every repetition of the variation will be taken as opportunity to compare intonation in order to conform or correct it in the next variation. The following Practice indications should be given according to Fig. 4:

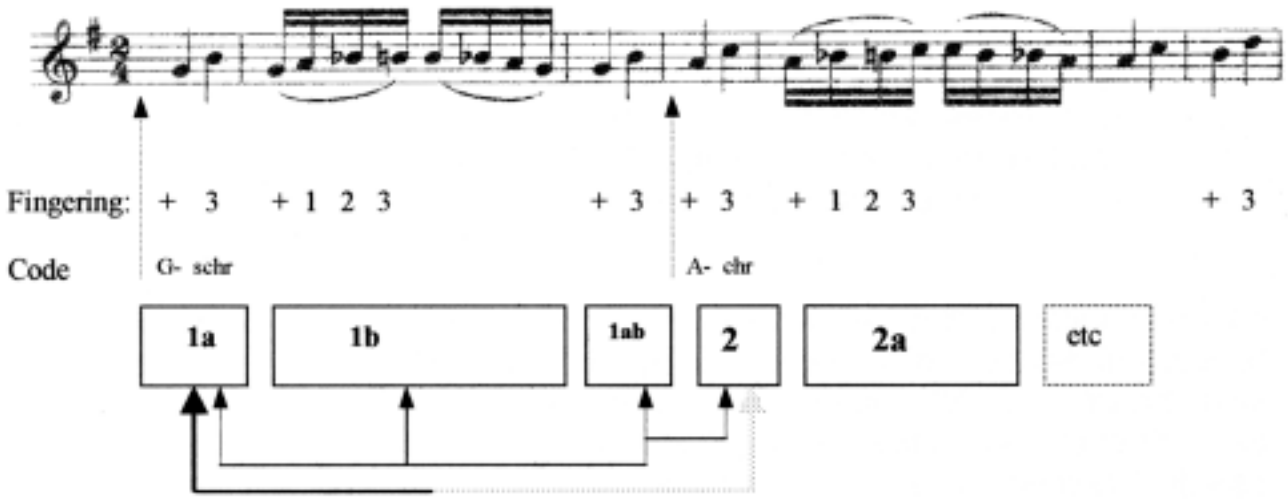

Fig. 4. Variable practice: The creation of sub- goals

1a Performance of G- schr
1b All notes of G- schr are played successively to balance intonation
1a/b Repetition with feedback related to 1 and 1var.
Control and cognitive preparation to the following position 2
2 Performance of A-chr based on the experience gained from the previous versions

For further application, Ex. 5 has been taken from the 1st movement of Hindemith's Double Bass *Sonata* (1949). It demonstrates how problematic finger permutations and shifting might be reduced and thus save practice time in a very significant way:

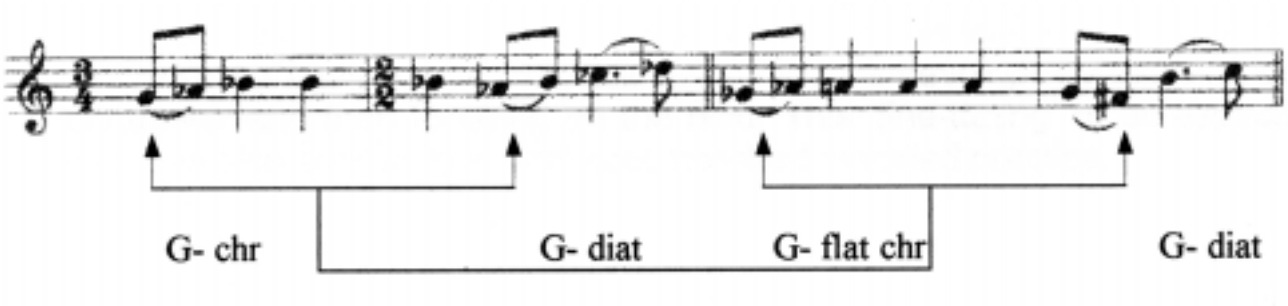

Fig. 5: Paul Hindemith: Double Bass *Sonata* 1949 **C**, bars 32 and 35

The above positions are coded with the necessary information for the performance permutation and register. Fingerings are incorporated and thus it is not necessary to indicate them as it would normally happen in a traditional approach.

In summary, the development of the digit system earlier in this section might be considered as an example how to design comprehensive modules in order to organize and facilitate the left hand technique for the doublebass. This proposal was built on the knowledge gained out of the investigation on stage theories that emerged out of a general investigation on practice. In section 3 it was pointed out that a number of components are influential to the effectiveness of practice and some of them have formed the six practice guidelines given in Fig. 3 (i- vi).

In order to improve effectiveness of practice, learners should be encouraged to develop their own exercises (e.g. Fig. 3 and 4) in order improve the ability to face and locate problems and to avoid monotonous repetition. Here, it is equally important to include multiple skills to access aural, tactile, visual and kinaesthetic senses in the practice process: feeling of motion of the arms, tactile senses for the strings, aural awareness of sound and intonation and create a mental representation to picture how the task should sound and to prepare the next action.

While the course of learning the basic skills of doublebass technique might best occur in a closed environment of a music studio, practice has to lead into performance as the ultimate goal. This might be accomplished by choosing a menu of concepts that assure the development of tools that are necessary to prepare a convincing performance.

6. Developing the ability to perform

The development of technique should always be considered as the development of musical tools that lead to improve the ability to reach expressive and thus convincing performance. When separating technique from its musical setting, the danger that this concept is not accomplished exists. Musical concepts have to be integrated at every stage of practice. While aspects like intonation, rhythm, and dynamics are the basis of “musical correctness”, they have to form the basics to expressive performance, but practice time has to be invested in good phrasing conception, style, tone colour, volume etc. Multiple parameters might be best integrated and developed in a circle of rotative practice as shown in Fig. 6 : by focusing on only one parameter at a time, the learner develops the capacity to select and compare multiple skills. Practice develops by focusing on one parameter and then focusing on the next. This ‘fine-tuning’ of all aspects involved (see also section 4) is best accomplished in varied practice.

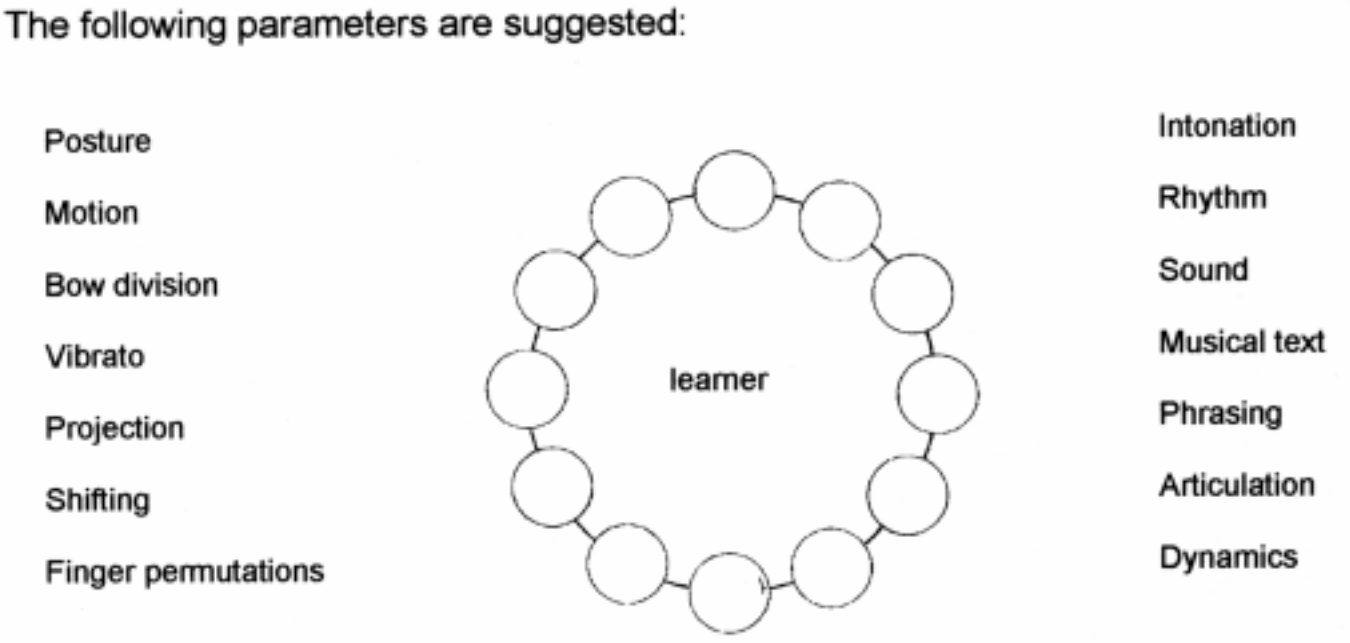

Fig. 6 : Selection of parameters for rotative practice

The selection of parameters undertaken in Fig. 6 might be reduced or completed by others adding to this type of investigation. While the left side assembles more technical aspects, the right side assembles the musical goals. It becomes clear, that all these parameters have to be developed in order to reach expressive ability to perform. The learner therefore should try to develop a wide range of dynamics and tone colours. The broader a range of expressive tools a player is able to produce the greater the variety will be perceived by the audience.

7. Further practical recommendations for the advanced student

For the advanced student, the concepts introduced (see also *Per Musi* Vol. 5/6 p.120-130. might help to improve the tasks already accomplished and to replace, if necessary, 'dead- end' strategies or poorly established motor plans with new strategies to overcome self-imposed limits. Here, the development of aural, sensory and tactile senses under the proposed practice rules might provide an alternative to conventional practice. The aim of the student should be to improve the effectiveness and quality of practice as well as being aware of the negative consequences of wrong practice, e.g. repeating mistakes. Even a single repetition of the same mistake should be treated with caution and as something that should be avoided through intense concentration and carefully chosen goals.

7.1. The risk of repetition

Repertoire that has been practised over several years, e.g. the classical audition repertoire and orchestra excerpts underlie the hazard of repetition. After years of endless repetition of the first ten seconds of an audition test piece like e.g. the Dittersdorf or Koussevitzky concerto or orchestra excerpts e.g. the opening of the recitative of Beethoven's *Symphony no.9*, the performer can become incapable of assessing its impact on the listener hearing it for the first time. Practice activities, therefore, have to be addressed and to assist the freshest possible musical perspective when preparing them for performance.

7.2. The elimination of non - random mistakes

Mistakes are 'normal' behaviours and are a part of any learning process, but should be treated with caution in order to get rid of them at the beginning of the learning process. But, if a note is always too flat, too late or too far from the bridge and never too sharp, too early or too close to the bridge, then this might not be considered any longer as a mistake but ironically as a newly composed, but not intended version of the piece. In order to eliminate an established error, it is important to investigate where the mistake occurred and in what direction. Practice should be undertaken to eliminate the error and to replace the deficient version with the correct one. The error might only be considered eliminated when the correct version has dominated the wrong one in at least three consecutive performance attempts. Practice techniques should approach the goal from various sides in order to avoid establishing errors.

8. Further considerations for this investigation

The purpose of this paper has been to provide an updated approach to more effective practice for the learning doublebass performer. The aim was to develop a broader theoretical background to traditional method books and everyday work for the student. While most of the studio instruction is undertaken verbally and thus relatively inaccessible for further discussion, recent investigation on the musicians performance and its preparation proposes some new perspectives into

doublebass education. In this context , new research methods, especially in the field of music psychology, challenge for a more appropriate and updated study of the processes involved in professional instrumental practice, performance and teaching (KENNEL, 2001). Obviously, the current project does not present a complete 'theory and practice' of doublebass playing, however it shows that much more can be achieved and it is the author's hope that discoveries and developments will result as a product of the current endeavour.

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