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# Piano Performance: strategies for score memorisation

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Dissertation submitted to City University and the Guildhall School of Music & Drama in  
partial fulfilment of the requirement of the degree of  
Doctor of Music Arts

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## Dedication

This paper is dedicated to the memory of my father

XIAOBIN LI

(1946 – 2002)

A committed researcher for the meaning of life and an extraordinary person, to whom I

have always aspired to be.

Thank you for all your love, support and sharing your wisdom to all of us.

I wish he were here to see it finished.

He is missed.

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## **Abstract**

Accurate live performance demands that player equip him/herself with a secure memorisation of the work. Most professional pianists are familiar with the four aspects of music memory, namely Kinaesthetic, Aural, Visual and Analytical Memories. However, these may not be enough in themselves to ensure freedom from momentary memory lapses on the stage.

After a discussion of issues concerned with psychological memory and music cognitive memory, the dissertation outlines a memory technique, here labelled MM, which draws on the use of music mnemonics. The technique is intended to help pianists retrieve relevant information as quickly and effectively as possible during the performance, therefore avoiding or minimising mistakes. Various types of music mnemonics which the author has herself used are identified. Following this is an account of a project undertaken by the author which involved the examination of the memorisation techniques of five professional pianists while learning two contrasting pieces. The extent to which they applied the MM technique, and the specific mnemonics described in the dissertation thus far, is examined closely. So is the effectiveness of the various mnemonics in dealing with very varied repertoires.

## Preface

Several years ago, I experienced probably the most challenging task I have yet encountered in my 20 years of piano-playing. Due to a frantically busy schedule, I found myself with only seven weeks to learn three complete new works for a concert. Since the concert was going to be broadcasted, I was determined to bring the performance to a high standard. Two out of these three pieces were 20th-century works, and therefore composed in a style with which I was less familiar; they would take longer to learn. Immediately after this important date, I was also going to participate in a prestigious international piano competition, the required repertoire for which was vast and varied. It included one commissioned work to be memorised within a restricted period of time.

This resulted in my having to learn four difficult and entirely new works within seven weeks, as well as preparing huge chunks of repertoire, three hours in length, which had to be performed from memory. This may not seem so extraordinary for high-standard and experienced pianists. I, on the other hand, as a twenty-four-year-old young professional, had never encountered any task on this scale before. I was under a great strain.

Straight away I realised my priority was the memorisation of all these works. To be more precise, I did not worry whether or not could I memorise these works in time; I was more uncertain about how secure my memorisation would be *during* the performance. This is a common feeling amongst pianists. We think we learn a piece well from our practice, but then we discover how wrong we were after the performance has been tested on the stage! This also applies to works which we have performed successfully many times: the question of the reliability of memory always remains an issue for the next performance. Actually, in many cases, memory falters during relatively easy sections or in those passages that we have always taken for granted during practice.

Even the best-known pianists cannot escape memory flaws. At the beginning of a concert in



Prague in 1967, Sviatoslav Richter attempted to perform a Beethoven Sonata seven times.<sup>1</sup> This included several trips backstage to restudy the score before he finally cancelled the concert. A live recording of Arthur Schnabel performing a Mozart Piano Concerto K488 shows him suffering a major memory lapse toward the end of *Rondo*, where he only plays a sequence of chords underlining the main harmony.<sup>2</sup> John Browning said, ‘Memorisation is an issue with everybody because we have to play from memory...I don’t care what anybody says, every performer, no matter how secure, always thinks about the possibility of memory slips.’<sup>3</sup>

Judging from the situation I faced, I decided that it was simply impossible to achieve a satisfying result through following my usual routine of learning, which is more or less practising as much as time allows me and then hoping for the best during the performance. I tried to fashion a strategy of learning that would not only help me to memorise my pieces more quickly, but would also provide a clear vision of mental cues in performance, thus aiding rapid enough retrieval of the information so as to avoid any major memory errors in the performance.

There are many tools that can help a pianist memorise. Most pianists are familiar with harmonic theory and analysis, etc. The notion that such knowledge can support memory in performance is especially emphasised in music-teaching, but it may not necessarily suffice. It is probably most helpful to pianists in the *process* of learning and understanding of a work; but evidence shows that it is not a suitably reliable *aide-memoire* in performance.

In the past I have successfully used other mental cues to assist the memorisation of some particularly difficult passages. This has involved the identification of particularly tricky passages and choosing a *mnemonic* to help me through it.

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<sup>1</sup> Czech pianist Libor Novacék told me this story. His parents were present at this concert.

<sup>2</sup> Wolfgang A. Mazart, Piano Concerto No.23 in A Major, K 488, Cond. Artur Rodzinski, Pianist Arthur Schnabel, New York Philharmonic Orchestra, Urania 22.162, 1946.

<sup>3</sup> Noyle, L.J., *Pianist on Playing: Interviews with Twelve Concert Pianist* (London: Scarecrow Press, 1987), p.32



The mnemonic may take any form: it may be a number, like a pin number, a name, a concise chunk of information, or something else. Whatever it is, this mnemonic comes to be associated in my mind with the correct execution of the passage in question. Indeed, the piece can be divided into a sequence of mnemonics, each referring to a segment which may be as short as a bar or two or as long as a page. But each one points the way forward to the next mnemonic, and thus provides (changing the metaphor) a series of signposts which guide me towards the successful completion of the work.

The surprisingly good results emanating from this approach have encouraged me to investigate further. I am interested to see if this strategy can be equally beneficial to other pianists; thus this project.

To understand how the mnemonic works, it is necessary to begin with a survey of psychological memory, music cognition and performing memory, introducing several categories of the latter. Thus, in the first chapter some studies concerned with memory in the general field of Psychology are outlined as well as some discussion of the main findings to date is presented, and the author's own proposed mnemonic strategy is placed in this context. This study does not attempt to examine psychological issues in depth; rather, they merely provide an arena for subsequent practical study. The second chapter offers a selection of the research into memory and music performance, which is followed by a detailed discussion of the four major types of memory employed in such activity.

The third chapter is dedicated entirely to consideration of the use of mnemonics in piano performance. This chapter is the kernel of the theoretical part of the study. It considers definitions and properties of mnemonics and then lists six types, together with musical examples. It concludes with one short piano work, offering examples of the application of the mnemonic technique during its memorisation.

Chapter Four presents an account of a project which involved five pianists learning two short pieces and replying to a questionnaire. The five subjects are all known personally to the author; they are very competent pianists and are well above average in their lack of memory problems. They were asked to learn two short, contrasting pieces previously unknown to all of them in order to establish how the subjects tackled the problem of memorising these pieces. They were asked to keep a record of their learning procedure, answer a questionnaire and undergo an interview with the author.

In the latter two chapters, the strategies applied by the author in her own concertising, and described in Chapter Three, are examined in light of the practices of the pianists enlisted for the project. Questions to which answers are sought include whether these strategies had already occurred to, or been used by, these other performers, and whether *their* tried and trusted techniques of memorisation included any that could augment those proposed earlier. The study concludes with some clear suggestions concerning memorisation strategies which, it is hoped, will prove helpful to all pianists.



## Chapter 1: An Introduction to Memory

For the solo pianist, as for actors, dancers, and others who rely on memory when they give a performance, stage anxiety and the fear that memory may prove vulnerable are closely-related, but nevertheless different, since stage anxiety may be felt by anyone who appears on the stage. It can happen, for instance, even to the organiser of some event who merely has to read out an announcement.

The two states are closely linked because fear that memory will falter is to many pianists a powerful and only-too-familiar cause of stage anxiety. Equally, slips of memory may be caused, or are made much more threatening, by the performer's knowledge that he/she has chosen a repertoire at the utmost limit of his/her technical ability, or by some non-musical condition, such as a preoccupation with an adverse personal situation or a health problem.

In the European concert tradition, the practice of playing from memory is a relatively recent development, introduced in the second half of the nineteenth century. There seems to have been more investigation of the nature and causes of stage anxiety and techniques for relieving it, than of memorisation as such. Since the topic is one which has mainly engaged the interest of psychologists, the musician may find it hard to evaluate or even understand these findings. Memorisation, however, is an integral part of the equipment of professional solo pianists, which they must all try to improve, if only by learning from their own experience and that of their peers.

The public expectation for pianists has increased enormously in the present musical environment: an outstanding pianist nowadays is not only judged for his/her mastery of technique, musicality, knowledge, and experience, but is also required to offer a lengthy repertoire list, nearly all to be played from memory. The demands placed on memory during a piano performance are remarkable,



sometimes requiring the production of over 1000 notes a minute for period of up fifty minutes.<sup>4</sup> Even some chamber music repertoire should ideally be memorised. Therefore even for those who have little difficulty with memorisation would surely welcome an enhancement of their ability.

Admittedly, research into memorisation techniques is difficult because it is hard to assess what is going on in the mind of the performer when practising. It is particularly difficult to devise experiments which can objectively test the efficacy of alternative strategies, especially over long periods which transgress the practicable limits of an experimental programme. Thus, empirical investigations so far have relied heavily on interviewing subjects after the event, a process which is not too reliable and is usually lacking in detail. Often, such investigations merely studied the manner in which musicians spend their time when practising. Obviously, this does not necessarily help establish the best strategies for a successfully memorised performance on stage.

The rest of this chapter will be devoted to three main topics: memory and its constituent parts, interaction between these and retention in them, and an exploration of mnemonics, those devices which, it is proposed, can aid the process of memorisation, in particular that of the piano repertoire, immensely.

### **1. Psychological Memory and its constituents**

Memory has been of prime importance in historical human development.<sup>5</sup> Though it is regarded as an innate ability, it can be developed further through training and exercises, and the potential of this resource is vast and mysterious. The study of memory goes as far back as ancient Greece (600 BC).

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<sup>4</sup> Roger Chaffin & Gabriela Imreh, 'Pulling Teeth and Torture: Musical Memory and Problem Solving', *Thinking and Reasoning*, 3, 4 (1997), 315.

<sup>5</sup> A good introduction to the subject of psychology is given in N.R. Carlson, G. Neil Martin & William Buskist, *Psychology* (Pearson Education Limited, 2004), Ch. 8, 271-320, and Richard Gross, *Psychology: The Science of Mind and Behaviour*, 3rd Edition (London: Hodder & Stoughton, 1999).



In modern taxonomy, the study of memory has been distributed amongst many disciplines, including neurology, physiology and psychology. However, it is psychological memory that is of greatest importance to the study of the practical issue of piano memorisation, due to the intellectual and rational nature of piano-playing. It is therefore necessary to introduce this research with a brief and concise review of psychological theory and major findings in this area, before moving to a more detailed discussion of memory in music performance.

Memory is the way the past is recorded by the brain and how this information is utilized in order to affect the present.<sup>6</sup> It is closely linked with perception, but whereas this latter alludes to the organisation of space, memory concerns the organisation of time. It is impossible to conceive the human being's capacity to learn without memory; similarly, the use of any skills and the recognition of persons, names or places. Without memory we would be circumscribed to a continuous present.<sup>7</sup>

Memory can be defined as the process of encoding, storing and retrieving information.<sup>8</sup> 'Encoding' represents the method by which we transform the information that is received through a stimulus into a form that can be recognised and used by the memory system. 'Storage' is the process of maintaining this information in the memory, and 'retrieving' refers to locating and using this stored information when it is needed.

The encoding process is related to the acquisition of information. There can be no remembering if there is no previous acquisition. Once this information is acquired, it is transformed or encoded prior to storage, using any of a number of several possible codes. For example, a word may be stored as a sound pattern, as a series of letters, as an association with another word, as a synthesis of other word, etc.

There are four different types of memory that can be associated with the gradual journey of

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<sup>6</sup> The section on psychological memory is particularly indebted to the following: Henry Gleitman, *Basic Psychology* (New York: W.W. Norton & Company, 1992), Carlson, *op. cit.*, and Gross, *op. cit.*

<sup>7</sup> Gleitman, *op. cit.*, 171.

<sup>8</sup> Carlson, *op. cit.*, 272.

the information that is been processed: sensory memory, short-term memory, working memory and long-term memory. Each of these types represents a different stage in memorisation, from the most immediate to the deepest level.

#### **a. Sensory memory**

This is closely related to the act of perception. During this stage the features of a stimulus are stored. Sensory memory holds information very briefly, only long enough for this to be sent to the short-term memory. This span of time is so short that we are not aware of this type of memory. Although there is a different kind of sensory memory for each of our senses, the two most important are the *visual* (iconic) and the *auditory* (echoic).<sup>9</sup>

Visual memory is a type of sensory memory that briefly holds a visual image of a scene that has just been perceived.<sup>10</sup> A display of a series of numbers or a combination of random letters are examples of information absorbed by the iconic memory. Auditory memory is a form of sensory memory that holds sounds that have just been heard for a short period of time. This type of memory is essential in the comprehension and usage of spoken language. In order to understand any word we must first remember all the individual sounds that together create that particular word. These fragments are stored in the auditory memory until the desired word is constructed. It seems to hold information for about four seconds.<sup>11</sup>

**b. Short-term memory (STM).** This is the immediate memory for what we have just perceived. It is of limited capacity, being seven plus or minus two the number of items that can be stored. This

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<sup>9</sup> Carlson, *op. cit.*, 272.

<sup>10</sup> Carlson, *op. cit.*, 273.

<sup>11</sup> C. J. Darwin, M. T. Turvey and R .G. Crowder, 'An auditory analogue of the Sperling partial report procedure: Evidence for brief auditory storage', *Cognitive Psychology*, 3 (1972), 255-267.



quantity is usually referred to as the 'magic number', a term invented by George Miller.<sup>12</sup> According to Miller this number represents the holding capacity of the short-term system, the number of items that will fit into its store at one time. Most of the information stored in the short-term memory is quickly forgotten.

### **c. Working memory**

This memory manipulates the material in the short-term memory, recalling it while engaging in a different but related task. It works on the information that we have just received and allows us to manipulate it in a short period of time. It represents our ability to remember what we have just perceived and to think about it in terms of what we already know.<sup>13</sup>

Although short-term memory and working memory are very closely associated, there is a clear distinction between them. STM involves the storage of information whilst working memory represents the manipulation of these materials.

The functioning of working memory is ruled by three components which allow us to temporally store visual and verbal material: phonological working memory, visuospatial working memory and the central executive.

*Phonological working memory* is the component that allows us to store verbal materials. When we see a printed word we can say it out loud or silently. When we say it to ourselves, our brain sends this word to the circuit of neurones in the auditory system. There it will repeat itself silently in a loop until it is replaced by something else. This phonological loop accounts for the retention of verbal phonetic information and it is an essential component in learning to read.

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<sup>12</sup> C. A. Miller, 'The magical number plus or minus two: Some limits in our capacity for processing information', *Psychological Review*, 63 (1956), 81-96.

<sup>13</sup> R.H. Loggie, 'The seven ages of working memory', in J.T.E. Richardson, R.W. Engle, L. Hasher, R.H. Loggie, E.R. Stoltzfus and R.T. Zacks (eds), *Working on Memory and the Human Condition* (Oxford: Oxford University Press, 1996), 31-65.

*Visuospatial working memory* deals with the recognition of objects, forms and images from the past. Much of the information that we hold or process is not only phonetic, but a great proportion of it is also visually related and can be obtained from the environment through our sensory organs, or retrieved from long-term memory. A good musical example is visual recognition of the keyboard, frequently employed in the memorisation of music.

*The central executive* provides supervision, updating and also coordination of the different elements of the working memory. It allocates resources to working memory tasks and coordinates the phonological and visuospatial working memories within it. The central executive is also responsible for the conscious attentional control needed to regulate behaviour.

Working memory is an efficient cognitive tool that is associated with such functions as reading comprehension, verbal ability, academic ability and mathematics. Efficient management of mental resources can be a clear sign of a well-functioning working memory.<sup>14</sup> When reading music at the piano or any other instrument, the individual with a good reading capacity has more cognitive resources available for executing other related activities, like examining dynamic and expressive markings, having greater awareness of other musical partners when playing chamber music, or even memorising the music that is being played. On the other hand an individual with a poor reading capacity has to concentrate most of his/her cognitive resources on finding the notes.

**d. Long term memory (LTM).** This holds the information that has been stored on a permanent basis. It has no known limits and the information contained in it need not be continuously rehearsed. Once that information is successfully stored it remains relatively stable.<sup>15</sup>

The process of storage is quite varied. Sometimes we make very conscious use of strategies to encode the information into the LTM, such as the internal repetition of names, or the continuous

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<sup>14</sup> Carlson, *op. cit.*, 277.

<sup>15</sup> *Ibid.*, 280.



practising of a passage of music. But at other times the information is stored without much effort, as when we had an interesting meeting, and sometimes we even remember things that have not been learnt consciously like a song heard in the background.

This is not a single pool of information that is fed by a single source. Most scientists studying Memory agree that Long-Term Memory is formed by many different kinds of information stored in different locations through different ways. There are four main types of LTM, usually linked in pairs; these are *episodic* and *semantic* memory, and *explicit* and *implicit* memory.

The distinction between episodic and semantic memory was made by E. Tulving.<sup>16</sup> Episodic memory (EM) is responsible for storing a record of our past experiences, such as events, places and people that we have encountered. Very often, this information includes a spatio-temporal context, which means that we can later remember when or where happened.

Semantic memory (SM) deals with the storage of conceptual knowledge, including rules and language. It mainly processes facts, information and data. One of the features of semantic memory is that it can be used without reference to where and when the knowledge was acquired. For example, we do not remember when we learnt to speak, or when we learnt that the capital of France is Paris, and that lack of knowledge does not affect the quality of the information. Semantic memory can also store information about ourselves that does not need to be linked to specific past experiences, like how many brothers or sisters we have or how much we like folk music.

These two types of memory are strongly linked; semantic memory can be considered to be composed of several episodic memories. Needless to say, they are also in constant cooperation. When we memorise music we make use of Semantic Memory to decode the notes and rhythms printed on the score. At the same time, we tap into Episodic Memory to remember the series of notes that are specific to this piece of music and that we previously have learnt before.

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<sup>16</sup> E. Tulving, 'Episodic and semantic memory', in E. Tulving and W. Donaldson (eds), *Organization of Memory*, (New York: Academic Press, 1972) 381-384.



In a later study it is suggested that Episodic Memory is divided in two: *autobiographical memory* and *experimental memory*.<sup>17</sup> The first one, as its name suggests, stores personal life experiences, whereas experimental memory deals with the storage of information linked to the learning process.

One special kind of episodic memory is ‘flashbulb memory’. It refers to a vivid and strong recollection of events of major public importance, such as the attack on the World Trade Center on the 11 September 2001.<sup>18</sup> Many people can precisely recall where they were, what they were doing, or with whom they were when the news broke out.<sup>19</sup> There are two distinct theories about the reasons why this memories are so strong. According to Brown and Kulik, the emotional relevance of the event leaves an instant, strong print in our memory that is very difficult to erase or forget.<sup>20</sup> On the other hand, Neisser believes that the constant reconsideration and analysis of the events in the days after, creates a rehearsal loop that helps rooting this memories deeply into our system.<sup>21</sup>

The differences between explicit and implicit memory is that explicit memory deals with the information that we are aware of learning, such as memorizing a poem or the names of the different dynasties that ruled China, while implicit memory does not rely on conscious awareness, but rather contains information that was incidentally or unintentionally learnt. Implicit memory has sometimes been described as synonymous with procedural memory, but there is a clear difference between the two. Procedural memory refers to the information from the long-term memory that cannot be inspected consciously, like playing the piano or riding a bike.<sup>22</sup> These two activities are strongly connected to a physical memory that sometimes is called muscle memory. Another example of procedural memory is shown by the native English speaker who is able to talk and write to an

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<sup>17</sup> Theory first mentioned in G. Cohen, G. Kiss and M. Le Voi, *Memory: Current issues* (2<sup>nd</sup> ed.), (Buckingham: Open University Press, 1993), quote taken from Gross, *op. cit.*, 289.

<sup>18</sup> Gross, *op. cit.*, 289.

<sup>19</sup> Carlson, *op. cit.*, 303.

<sup>20</sup> R. Brown, and J. Kulik, ‘Flashbulb memories, *Cognition*, 5 (1977), 73-99.

<sup>21</sup> U. Neisser, *Memory observed* (San Francisco, CA: Freeman, 1982), quote taken from Gross, *op. cit.* 289

<sup>22</sup> Carlson, *op. cit.*, 286.

excellent standard without being able to explain the complex grammatical rules of the language. The fundamental difference between implicit and procedural memory lies in the fact that learning how to play an instrument or to ride a bike requires a conscious effort and practice. Skills related to implicit memory always imply a lack of conscious effort in the learning process.

## 2. Retention and transference

While four types of memory (and their constituents) are identified above, there is of course interaction between them. Below, issues of retention and transference, in particular as they apply to the main consideration of this thesis, the handling of musical information by the pianist, are discussed.

**a. Retention in the STM.** When we examine the ways of retention in the STM, the two main factors affecting it are the ‘primacy effect’ and the ‘recency effect’.<sup>23</sup> Once again these two effects are an example of the close working relation between the STM and working memory. The best way of portraying them is with the following task:

When individuals are asked to write down a series of words that have just been said, most of the participants will remember more clearly the words at the beginning of the list (primacy effect) and at the end (‘recency’).<sup>24</sup> The explanation for the primacy effect is the fact that these first few words had the chance of being rehearsed for a longer period of time, and subsequently would have been stored in the long-term memory. The last words of the series can also be recalled with relative ease because they are still stored in the short-term memory. The performance of the recency effect is diminished if there is a lapse of time before the words are being recalled, during which the rehearsal

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<sup>23</sup> Carlson, *op. cit.*, 277.

<sup>24</sup> *ibid.*, 277.



activity is substituted by another unrelated task, such as counting numbers backwards. A series of experiments examining these effects has been undertaken by Glanzer and Cunitz in 1966.<sup>25</sup>

A study by Lloyd and Margaret Peterson attempted to discover how long information stays in the short-term memory.<sup>26</sup> They briefly presented a series of three random consonants to different individuals and asked them to recall them after a period of time. The subjects of this experiment had no difficulty in remembering after thirty seconds, because they have had the chance of rehearsing the information. In this space of time both their visuospatial working memory and phonological working memory were active, repeating internally these three consonants and thus creating a rehearsal process. By the time the subjects were asked to repeat those letters, these were already stored in the long-term memory and therefore were easy to recall.

When the task was made more challenging, the individuals had much greater difficulty in recalling the consonants correctly. This time, after being shown the items to remember, they were also presented with a three-digit number from which they would have to count backwards by three. In this way, the participants were denied the chance of rehearsing the information because their cognitive resources were kept busy with another activity. In most of the cases, after 18 seconds' delay between presentation of the information and the recall signal, successful recall was near to zero.

Miller established the capacity of the short-term memory as seven, plus or minus two.<sup>27</sup> He demonstrated that, on average, people could remember seven different pieces of information in their short-term memory, such as seven words, seven notes or seven numbers. But in order to make the STM more efficient, the human mind goes through a form of encoding that Miller called 'chunking'. In this process the information is simplified according to a series of rules, grouping the individual

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<sup>25</sup> M. Glanzer and A. Cunitz, 'Two storage mechanisms in free recall', *Journal of Verbal Learning and Verbal Behaviour*, 5 (1966), 531-560.

<sup>26</sup> L.R. Peterson and M.J. Peterson, 'Short-term retention of individual verbal items', *Journal of Experimental Psychology*, 58 (1959), 193-19.

<sup>27</sup> C. A. Miller, *op. cit.*, 81.



items that are needed to be remembered. For example, let's observe the following list of nine letters:

G A B C D E F # G

It will be very difficult to remember them individually, but those people who have had some basic musical training can quickly group them into one scale: G major. In this way we only have one item to remember instead of the previous nine, which simplifies the amount of information to be memorised.

**b. Transference from the STM to the LTM.** For the pianist, the means of transferring information from the STM into the LTM is the rehearsal process. Once a piece has been rehearsed for a while in the STM the information is then stored in the LTM, where it will stay to be later recalled when needed. The longer an item stays in the STM the greater chance for it to transfer successfully to the LTM.<sup>28</sup> In most cases, this is not a straightforward procedure and involves using resources from the LTM in order to help the rehearsal process in the STM. For example, if we need to remember a group of five notes (C, E, G, F, B) printed on a piano score, we will first of all need to retrieve from the LTM the information that allows us to recognise these pitches. Once that they have been identified, the rehearsal procedure is influenced by our previous knowledge in order to facilitate memorisation. We may choose to rehearse the notes in several different ways:

- aural skills;
- iconic memory to recall the notes printed on the page
- our knowledge of harmony
- the physical position of the hand on the keyboard
- verbally repeating the names of the pitches

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<sup>28</sup> Gleitman, *op. cit.*, 175.

This exemplifies the constant feedback and movement of data between the STM and the LTM, as opposed to the presumption of a linear flow from the STM to the LTM.

### 3. The Mnemonic

The mnemonic is an aid that helps working memory to consolidate information into the LTM, and which also helps the LTM retrieve this information with a greater rate of success.<sup>29</sup> It can be related to different aspects of perception and usually organises the material to be remembered. Using a mnemonic system means that not only is more information stored, but that this additional information is easier to retrieve. The mnemonic will also ensure that if we recall only a small part of the information we will be able to access the whole of it.<sup>30</sup>

A good example of mnemonics through verbal organization is the positioning of words in a rhythmical manner and also using metre and rhyme. Hundreds of Buddhist Sutras have been passed on through generations of monks and scholars without being written down. This impressive collection of teachings was more easily remembered with the use of verse. It would have been much harder to preserve this legacy in prose form.<sup>31</sup>

The *method of loci* falls into the category of *mnemonics through visual imagery*, since it involves the deliberate use of mental images.<sup>32</sup> It was originally identified in ancient Greece, before the sixth century BC. It consists in having a mental picture of a place (locus) that we know well, and then adding visual images of the objects, words or ideas that we need to remember.

For example if we need to remember the words, 'kiss', 'rice and' 'strength', we should think

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<sup>29</sup> Carlson, *op. cit.*, 282.

<sup>30</sup> *Ibid.*, 282.

<sup>31</sup> Karen Armstrong, *Buddha* (New York: Viking Penguin, 2001), 18.

<sup>32</sup> Carlson, *op. cit.*, 282-283.



of a familiar place, like our house, then locate each of the words in a specific place using some visual image. ‘Kiss’ could be the image of a couple kissing in the living room; ‘rice’, a bag of rice in the kitchen, and ‘strength’, the image of a heavy-weight boxing champion in the bedroom. If we decide to recall these words in the future, we would only need to have a virtual walk around the house and ‘see’ the words that have been stored in the different rooms as images. With this method the amount of information is much greater than the original three words, but the retrieval is more successful.

Another example of a visually-related mnemonic is the *peg-word method*.<sup>33</sup> It is similar to the method of loci in the way it uses familiar objects to which we attach the items that we want to remember. The difference is that instead of using a recognisable physical space, we will link the material to a series of mental pegs that we already have in our mind. A classical example of those pegs is the series of words rhyming with numbers: one – bun, two – shoe, three – tree, ... In order to recall the previously used series of words, we can now visualise the rice inside a bun, the boxer with a shoe in his hand and the kissing couple sitting under a tree.

*Verbal mnemonics* are also in frequent use. One of the most recurrent ones is the acronym, such as R O Y G B I V, which in this case provides the initials for the colors of the rainbow (Red, Orange, Yellow, Green, Blue, Indigo, Violet). We can also remember the acronym through the phrase, ‘Richard of York gave battle in vain’.<sup>34</sup> Or, more commonly, ‘Read out your green book in verse. In any case both the acronym and the process of decoding it has to be learnt, rehearsed and remembered.

The use of mnemonics has been described as an aid to the memorisation and retrieval of information from the long-term memory. In later chapters, the term, ‘mnemonics’, will be used in relation to certain aids for the memorisation of piano music. Musical mnemonics are strongly linked

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<sup>33</sup> Carlson, *op. cit.*, 283.

<sup>34</sup> Gross, *op. cit.*, 298.

with the mnemonics discussed above, but they nevertheless differ in many aspects. Most of those differences lie in the complex procedure of playing, learning and remembering piano music, which requires a great amount of physical coordination, specialized skill, notwithstanding highly concentrated thought process.

This chapter has recounted some of the major phases and activities of psychological functioning. The following chapter will concentrate on more specific researches in music cognition, including recent theories, views and experiments of memory in music as well as the four main types of memory, which have been recognized as those most frequently employed by musicians.



## **Chapter 2: Research into Musical Memory**

Following the general definitions of memory offered above, it is possible to move to a consideration of the types of memorisation employed specifically in keyboard learning. Since a considerable amount of research has been undertaken in the broad area of musical memory, this section will conclude with just a brief synopsis of modern discoveries concerning musical memory; both in general and in keyboard learning.

### **1. Types of Memorisation employed in Keyboard Learning**

Despite the considerable amount of research concerned with memory itself, there has been relatively little research specifically exploring the ways that instrumental musicians (in particular, pianists) learn music for public performance from memory. Understanding these processes, as Hallam believes, may provide insights into how we can assist performers to memorise music more effectively.<sup>1</sup>

An advanced performer is expected to show dimensions in his/her playing beyond the indications of the score. Music interpretation, concerning expression, style, sound and so forth, is often not marked on the score by composers. Nonetheless, in public performances, memorising the music material (the score) exactly as set down by the composer is regarded as one of the basic performing skills. The level of detail to be retained is great, and even small errors may mar the performance. It is therefore important to understand the nature and the mechanisms of memorisation employed in keyboard learning.

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<sup>1</sup> Susan Hallam, 'The development of memorisation strategies in musicians: implications for education', *British Journal of Music Education*, 14 (1997), 87.

There is considerable diversity and variation in pianists' approach to memorising music, mostly depending on the individual's idiosyncrasy, perceptions of specific strengths and weaknesses, and the level of the demand of the task. Nevertheless it is generally accepted that there are four chief mechanisms by which memorisation may be achieved: motor or kinaesthetic memory,<sup>2</sup> auditory memory; visual memory; and conscious analysis of the structures of the music.

**a. Motor memory** is of course familiar to all instrumentalists. It is the most truly 'automatic' of the four, since once it is embedded one plays automatically without the need to apply the conscious mind at all. In fact, if the conscious mind is active during performance this may adversely interfere with the flow of automatic recall, depending on what it is that the conscious mind is thinking about.

A popular tale exists regarding a concert pianist who, struggling with an unfamiliar hall, a noisy audience, and an extremely bad piano, resignedly and deliberately left the performance to his subconscious mind, consciously thinking about a business problem which had been troubling him. When the work finished he remembered virtually nothing of what and how he had played, but he had resolved his business problems and composed two business letters in his head. The applause of the audience and the review the following morning suggested that in fact he had played very well!<sup>3</sup>

On the other hand, if one follows blindly the saying that 'Consciousness is the centre of practice; subconsciousness the centre of performance', it also could spell

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<sup>2</sup> Dale Reubart prefers the adjective 'haptic', by which he wishes to include the sense of touch of fingers on the keys as well as the transmission of force by the various muscle to the fingers depressing them. *Anxiety and Musical Performance, On Playing the Piano From Memory* (Da Capo Press, New York, 1985), 70-71.

<sup>3</sup> *Ibid.*, 53.



disaster for a performance. As most of us have not mastered total control of either our conscious or subconscious mind, we would not envy the pianist who, for instance, half way through the first moment of Rachmaninov's third concerto, suddenly returns to full consciousness and finds his conscious mind refusing to think of anything but his breakfast. Motor memory alone, therefore, can not provide a safeguard for a performance, just as one of the professional pianists who was interviewed in Hallam's study said, 'Well, I've tried all ways . . . repetition is the only one that really seems to have got me anywhere, and then it's not safe'.<sup>4</sup>

**Aural memory** recalls what a piece sounds like: its melodies, harmonic structure, and rhythm, so that one can play it through, as it were, in the mind, either away from the keyboard or during actual performance. Those people who possess such an ability, either with perfect pitch or good relative pitch, from their natural musical instinct or from their general practice and training, may find this can be powerful aid to the motor memory. In particular, aural memory can assist the pianist to 'hear' ahead, and can help him/her internalize pitches from visual information provided by the music notation.<sup>5</sup> It has been suggested that there is a positive correlation between the development of a good aural memory and playing by ear or improvising at an early age. Such early experience, it is argued, helps to develop the capacity to memorise melodies and sharpen the awareness of relative pitch differences, which in turn assists the understanding of harmonic structures.<sup>6</sup>

Two experiments were performed in 1981-1982 at the University of British Columbia to study the balance between the use of auditory memory and motor memory

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<sup>4</sup> Hallam, *op.cit.*, 90

<sup>5</sup> *Ibid.*, 73.

<sup>6</sup> John Sloboda, Irène Deliège & Deliege, (ed.) *The Musical beginnings: Origins and Development of Musical Competence*, (Cambridge University Press, 1996), 173.

by pianists.<sup>7</sup> The first experiment involved twenty-four pianists (professionals and pre-professionals); twelve of them had absolute pitch and the remainder had good, if not 'perfect' pitch discrimination. Each was asked to perform from memory a rapidly-moving work of five to ten minutes duration which was in his/her current repertoire, without auditory feedback. The equipment used for the experiment was a Baldwin Electropiano. All of the performances were later evaluated for note and rhythm flaws by a panel of knowledgeable musicians using the tape recording. No significant differences could be detected between the two performances by the players with absolute pitch and those without.

In the second part of the experiment the pianists were asked to perform a work from memory, without auditory feedback, which they had not played or practised for over a year. Again, the pianists with absolute pitch experienced no particular difficulty, whereas only one out of the twelve pianists without absolute pitch was able to play more than the first phrase or two of the unpractised work.

According to Reubart, however, the ability to internalise pitches is not necessarily limited to pianists with absolute pitch. With proper training and application the player with good relative pitch can also internalise the pitches through their interrelationships and can eventually automate the process.

**Visual memory** is much less used than the motor and aural memories. A pianist with acute visual memory (possibly, total photographic memory) is capable of storing in the subconscious a picture of a page of music as clear as a photograph. For him/her it would

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<sup>7</sup> Reubart, *op. cit.*, 71.



theoretically be possible to recall the music, page by page, into the conscious mind and play it as though he/she were reading the score on the stand. At lower levels of visual skill, however, even a less-detailed recall of the printed page may be of value in seeing ahead mentally to particularly important places or passages where one's motor memory to be unreliable. Or it may be, as it was to one of Hallam's subjects, 'a comforting presence'; he liked to 'see the bars going along . . . but you can't really sort of see it physically'.<sup>8</sup> Some pianists may find it is an advantage when applied to a performance whereas others may simply find it is merely a distraction.

A stronger case perhaps can be made for the role of the visual system in another capacity. As David Sudnow's analysis suggests, observation of a myriad positions of the hands on the keyboard may be of utmost importance, at least to sighted pianists. The late Lillian Steuber often stressed the importance to memory of the 'mental photographs' taken by the mind.<sup>9</sup>

From my personal experience, visual memory has been proved to be particular useful when large intervals feature in the music, where the hands must leap a great distance from point A to B on the keyboard. The mental 'snapshot' of the leaping movement comes directly to my mind when I have trouble recalling the actual notes or chords during a performance.

As mentioned previously, less experienced pianists often appear to rely almost exclusively on motor memory, perhaps because it can be developed easily and rapidly through simple repetition. This appears to be the source of the classic memory-failure

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<sup>8</sup>Hallam, *op. cit.*, 94.

<sup>9</sup>Reubart *op. cit.*, 75.

scenario of the student recital: the performer falters and cannot continue. As the retrieval cues for motor memory are generated by the preceding actions, once the performance stops, there is no way to resume. The embarrassed performer must go back to the beginning and risk repeating the debacle. For this reason, as well as for aesthetic ones, experienced pianists develop other types of memory representation.<sup>10</sup>

**Analytical memory** is the conscious analysis of the structure of a piece. It is evidently different in that it resides in the conscious, not the subconscious. Hallam's study confirms that of all the participants in the experiment, the professional musicians are much more likely to rely on conscious analysis than are beginners.<sup>11</sup> Her studies observe that changes in memorisation strategies also occur as expertise develops. While novices adopt similar automated processing strategies, they make little use of conscious cognitive analysis. To some extent, this maybe because professionals play pieces of greater length and complexity, and also because they are more concerned with achieving a good understanding of the music so as to give the best realisation of the composer's intentions.

A performer who knows at exactly what point they have arrived at within the formal structure of a piece stands a better chance of recovering from memory failure. He/she may jump forward to a new starting point and continue to play, having acquired acute analytical and structural knowledge necessary for the constructing appropriate retrieval cues. Lack of such conscious recollection presumably explains the fate of a concert artist reputed to have played the exposition section of a classical sonata three

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<sup>10</sup> Chaffin, R. & Imreh, G. 'Pulling Teeth and Torture: music memory', *Thinking and Reasoning*, 3, (1997), 317.

<sup>10</sup> Susan Hallam, *op.cit.*, 91.



times, forgetting that he had already obeyed the repeat sign first time he came to it.<sup>12</sup> A shade less crudely, the conscious memory may be needed if one is to play a set of variations in the correct order in such cases as Bach's Goldberg set, where one variation does not always obviously follow by some musical logic from its predecessor. And there is value, too, in memorising the minor changes which occur in each reappearance of a principal theme, notably in the Rondo form as used by Mozart and Beethoven.

On the other hand, though conscious analytical memory can be done during the process of practice, e.g. slow practice of the piece, it is impossible for pianists actively to recall the utmost details of a work from the conscious mind and apply them immediately during the performance. On the contrary, in my experience, if a player interferes too much with unconscious activities by rationalising each physical or mental movement, the natural coordination between the body and mind is disturbed, and might lead to some disastrous memory lapse, or some kind of uninteresting and unmotivated interpretation.

For this reason, it is vital for a player to find his/her own method of memorisation. Some focal points can keep us concentrated while playing, and can help us instantly recall the unconscious memory we have gradually formed during the process of our conventional study. As Grondahl explored the thinking structures and processes of professional and student keyboard players, she concluded that 'recall processes relied on visual, aural and movement schemata, within which individual musicians exhibit strategy preference utilised simultaneously and interchangeably'.<sup>13</sup> These strategies are not necessarily limited to the language of standard musical theory, e.g. harmony,

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<sup>12</sup> Author's friend John Gould told this story as it was one of his personal experience in a live concert, the pianist's name was forgotten.

<sup>13</sup> D Grondahl, *Thinking Processes and Structures Used by Professional Pianist in Keyboard Learning* (Norges Musikkhogskole, Oslo, 1987), 127.

counterpoint, form, etc. They can be signals derived from notation, and gradually formed during the process of conventional study.

## **2. Major theories and discoveries concerned with memorisation in music**

There have been many attempts to assess the influence of different methods of instrumental practice on memory acquisition. Grace Rubin-Rabson addressed the problem over 70 years ago in a series of experiments which must have been path-breaking at the time. Her subjects were a mixture of professional musicians and advanced students of piano, and the experiments in which they participated were designed to test the efficacy of various practising regimes in achieving memorisation and retention.<sup>14</sup>

Her strongest conclusion was the beneficial effect of analytical study of the score before embarking on keyboard learning, and also on inserting an interval of ‘mental rehearsal’ in the middle of practice at the piano. There were weaker indications in favour of ‘distributed learning’ (separated sessions over a period of time) rather than the same total of practice hours in one massed session, and that much practice time could be wasted in repeatedly playing material which had already been satisfactorily learned. There appeared to be no benefit, as regards long-term retention, from ‘over-learning’ sections which had already been mastered; instead it seemed better to concentrate on shorter passages which still needed more work.

While Rubin-Robinson’s experiments were set up with inventiveness and their

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<sup>14</sup> Grace Rubin-Rabson, ‘The influence of analytic pre-study in memorising piano music’, *Archives of Psychology*, 31, (1937), 1-53. See also G. Rubin-Rabson, ‘Studies in the psychology of memorizing piano music’ I — VII. There are seven articles under this generic title, all from the *Journal of Ed. Psych.* (1939-1941). For full details, please refer to the bibliography.



results are interesting, there are features which cast doubt on the value of the findings to the advanced student or concert pianist. Chief among these is the fact that the measure of successful achievement in each test was simply the number of times needed to repeat an extremely short fragment – usually only eight bars – to get note-perfect reproduction. This fragment was too short to be of realistic, practical use to the concert pianist.

In her recent research, Susan Hallam confirms, as aforementioned, that professional musicians are much more likely to rely somewhat on conscious analysis than are beginners. Her studies observe that changes in memorisation strategies also occur as expertise develops.<sup>15</sup> While novices adopted similar automated processing strategies, they made little use of conscious cognitive analysis. This may be partly because the professionals play much longer and more complicated pieces; and also that they are usually more concerned with ‘understanding’ the music.

Hallam’s study divided memorisation processes into two groups: automatic memory processes (including aural, visual and kinaesthetic memory) and conscious analysis of the music. In her experiment with novices, advanced students and professional musicians, she discovered that automatic programmes set up during practice of a work and based on aural, visual and kinaesthetic codes were sufficient to enable successful recall for performance. However, playing from memory was reported as causing anxiety for most professional musicians. For this reason, and because of the perceived unreliability of automated programmes, 50 per cent of professional musicians reported having adopted conscious cognitive analysis to supplement that which had been

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<sup>15</sup> Susan Hallam, *op. cit.*, 87-97.

learned automatically. In contrast, none of the novices or advanced students reported using cognitive analysis to assist the process of memorisation, although a small number (5%) did report 'looking through the music'.

The nature and context of the task, including its length and complexity, also has a great influence on the nature of the adopted strategies. For example, when they were required to memorise a short, simple piece, some professional musicians felt it was adequate to rely merely on automatic memory processes. However, a more analytical approach was likely to be adopted when they were required to memorise more complex and longer works, e.g. a piano concerto.

Those musicians reporting the greatest confidence in performing from memory appeared to adopt multiple coding, both automated and analytic. This tended to minimise retrieval failure.<sup>16</sup> Where memorisation was not complete after a work had been learned, a strategy of repetition tended to be adopted, with short sections being repeated and then linked together into a whole.

Edgar Ross's article reinforces the argument of Rubin-Rabson, that training in analysis of musical structure helps to make memorisation quicker and easier.<sup>17</sup> It is based on an experiment carried out with selected woodwind players in the Central Michigan University Wind Ensemble or the Symphony Orchestra. The experimental group learned a specified work with the aid of 'guided analysis' (the use of imitation, important intervals, repetition of motives and phrases, and rhythmic patterns in particular), while the control group learned the work without it. According to the statistical results

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<sup>16</sup> *Ibid.*, 95.

<sup>17</sup> E. Ross, 'Improving facility in music memorisation', *Journal of Research in Music Education*, 12 (4), (1964), 269-278.



comparing the pre-test and post-test means of the two groups, the experimental group shown significant improvement by undergoing such guided analysis training whereas the control group made no improvement.

Another and completely different line of thought is put forward by music psychologist John Sloboda. He poses an extreme example of outstanding memorising ability, Mozart's legendary success in writing out the score of Allegri's *Miserere* after hearing it performed just twice.<sup>18</sup> For many people this feat could only be achieved by a genius with musical powers nothing short of miraculous. Sloboda however takes a somewhat different view. In his book, *The Musical Mind*, he observes that a chess grandmaster, after studying for only five seconds pieces set out on boards taken from an actual game, can recall the position of every piece with almost total accuracy.<sup>19</sup> On the other hand, such grandmasters were unable to reproduce random boards which could not have occurred in any rational game. This result shows that chess masters do not have better visual (eidetic) memory than novices. They are superior *only* when the material to be remembered makes some sense, and can be grouped into strategic 'chunks' (e.g. a pawn chain, a fork, a concealed check).<sup>20</sup>

Sloboda argues that music closely resembles chess in its dependence on patterns and relationships, and that music performers as well as grandmasters can rely heavily on this feature to assist memorisation. As Sloboda puts it, 'effective musical memory depends upon the ability to represent music in terms of the grouping of notes which can

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<sup>18</sup> John Sloboda, *The Musical Mind: the Cognitive Psychology of Music*, (Oxford University Press Inc., 1985), 192.

<sup>19</sup> *Ibid.*, 6.

<sup>20</sup> *Ibid.*, 6.

be related to familiar stylistic patterns and structures and also other sequences within the same piece'.<sup>21</sup> He claims that the most important factor in distinguishing the differences between experts and novices is 'probably the *number* and *complexity* of the structured features in terms of which the listener is capable of representing music.'

Chaffin and Imreh have reported a detailed study of the practice undertaken by a concert pianist (Imreh) for a memorised performance of the third movement ('Presto') of J.S. Bach's *Italian Concerto*.<sup>22</sup> Practice sessions were video-recorded and transcribed by noting the location in the score at which each practice segment started and stopped. The pianist's concurrent and retrospective commentary on her practice was also examined. They found that starts and stops occurred more frequently at structural boundaries than in the middle of sections. In addition, features the pianist reported in her comments determined the starting and stopping points of these practice segments and the number of times bars were repeated.

Moreover, accuracy of recall, without forewarning twenty-seven months following the original performance, was significantly better for bars beginning each section than for bars at other locations. What are termed 'performance features' (i.e., features attended to during performance) serve as retrieval cues, eliciting successive passages from long-term memory; they allow the pianist to keep track of progress through the piece and provide points of intervention for recovery from a mistake and for the spontaneous variations that make each performance unique. Both practice data and analysis of the pianist's comments indicated that performance features were being

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<sup>21</sup> Ibid., 95.

<sup>22</sup> Roger Chaffin & Gabriela Imreh, 'Pulling Teeth and Torture: Musical Memory and Problem Solving', *thinking and reasoning*, 3, 4 (1997), 315-336.



attended to right from the start of practice. In fact, they affected practice in all three of the reported learning periods.

It is not always easy to identify the nature of cognitive mechanisms used by skilled musicians to encode and retrieve information. Eric Clark suggests that skilled musicians retrieve and execute compositions using hierarchically organised knowledge structures constructed from information derived from the score and projections from players' stylistic knowledge.<sup>23</sup> He claims that in memorised performance, this generative structure is known to the performer entirely in advance, and thus is 'reproduced' during the performance. This knowledge includes the highest level of understanding of the piece as whole, as well as the lowest level of details such as individual notes. Incidentally, a similar remark was made by Reubart, who used the word 'gestalt' to describe how successful performers usually are able to associate immediately any part of the piece to the rest as a whole.<sup>24</sup> Clarke also points out that it is unlikely that the performer will activate the entire structural internal representation throughout the performance. Instead, he surmises, part of this structure is activated at any one time and the active region shifts as the performer progresses through the music.

One of the key features of any cognitive skill is speed. A successful performance does not only require the performer's expertise in memorising the entire work, but also to execute it within a reasonable speed fitting to its musical context.<sup>25</sup> Psychologists

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<sup>23</sup> Clarke, E.F., 'Generative principles in music performance', In J.A. Sloboda (ed.), *Generative processes in music: The Psychology of Performance, Improvisation, and composition* (Oxford: Clarendon Press, 1988), 1-26.

<sup>24</sup> Reubart, *op. cit.* 75.

<sup>25</sup> John Sloboda, *The Musical Mind: the Cognitive Psychology of Music*, (Oxford University Press Inc., 1985), 7.

therefore think that memory of performance is controlled by the same sort of hierarchical structures as seem to account for performers' input skill. There are highly automatic procedures which control detailed performance while the performer is free to attend to higher-order aspects of performance.

In recent research by Williamon and Valentine, 22 pianists, classified into four groups depending on their level of skill, were asked to learn and memorise an assigned composition by J.S. Bach.<sup>26</sup> The result confirmed some previous findings that pianists at all levels of skill used longer practice segments as practice progressed. Moreover, they increasingly interspersed short and long segments across the practice process, and this phenomenon occurred most often for performers at higher levels of ability. These findings suggest that the strategy of shifting attentional focus between levels of musical structure – by way of isolating and rehearsing specific portions of a composition – is a 'salient characteristic' of the practice of skilled performers and that it develops gradually as skill is acquired. Therefore, the discovery of a practice strategy in which skilled performers focus on both specific parts of a piece of music and the composition as whole as they prepare for performance is unsurprising.<sup>27</sup>

This strategy forms the foundation of the research for the following chapters.

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<sup>26</sup>A. Williamon, E. Valentine, J. Valentine, 'Shifting the focus of attention between levels of musical structure', *European Journal of Cognitive Psychology*, 14 (4), (2002), 493-520.

<sup>27</sup> *Ibid.*, 506.



### Chapter 3: Music Mnemonics: additional memory tools

In order to learn and perform a work from memory experienced pianists use aural, visual, kinaesthetic and cognitive analytical memory. However, once on the stage, these techniques seemed unable to provide a completely secure and reliable defence against memory lapses.

Motor memory, for example (previously discussed in Chapter 2), has long been recognised as the main automatic memory-type used by pianists and other keyboard players. Many simply practise the work as many times as possible, until the physics of the playing comes automatically. But while motor memory is an indispensable tool, it is also unreliable. Typical statements from respected pianists concerning this include:

The fingers memorize things, but it should be a combination. If you rely on your fingers, it's very dangerous.

— Vladimir Ashkenazy

I think probably the least reliable, in terms of public performance, is finger memory, because it's the finger that deserts one first . . .<sup>1</sup>

— Leon Fleisher

Primarily this is because the mental and physical state of a pianist is at a much higher level of instability during a live concert. Stage anxiety and external disturbance from the

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<sup>1</sup> These two quotations are taken from L.J. Noyle, *Pianists on playing: Interviews with Twelve Concert Pianists* (London: Scarecrow Press, 1987), 8 & 97 respectively.

audience as well as the adjustment to the new concert environment can all contribute to an increased chance of ‘accidents’ happening in the performance. A small failure to produce the correct note from the appropriate finger can interrupt the chain of events stored in the pre-rehearsed motor memory, and may result in serious damage to subsequent playing.

Visual and aural memories, similarly, can often ‘back-fire’ on the performer. Pianists who can successfully stimulate memory by using these tools in practice often fail to execute the same procedure in performance.

Cognitive analytical memory is one step further along from the ‘automatic’ memories (visual, aural and motor) aforementioned. As cited in Chapter 2, psychologist Susan Hallam claims that

Performers in general are known to analyse music to establish its structure, including harmonic structure, key changes, the length of rests and difficult exit points, etc. Advanced pianists are more likely to depend on such an analytical approach, especially when facing works which are longer and more complex.<sup>2</sup>

Despite the fact that analytical memory seems to be able to compensate for the flaws in automatic memories to some extent, the information presented by a complex composition often far exceeds the number of analytical memory-cues that can be extracted from such a work. In the internal memory map of a performer, places not governed by cognitive analytical memory are therefore still not, to coin a phrase, ‘safe-belted’. The employment

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<sup>2</sup> Susan Hallam, ‘The development of memorisation strategies in musicians: implications for education’, *British Journal of Music Education*, 14 (1997), 91.



of music mnemonics is an additional safety feature.

In 1982, Chase and Ericsson assert that a remarkable display of memory can be obtained through the efficient use of 'skilled memory', which mechanism, they propose, can increase memory by 1000% after extended training.<sup>3</sup> There are various provisos: the activity must be familiar to the subjects, because only they can accurately decide future demands for retrieval of relevant information; and subjects must be able to associate the encoded information with appropriate retrieval cues organised in a stable structure, namely a *retrieval structure*. Recent research tends to confirm this theory; with regard to music, Aaron Williamon explains that 'access to this, the hierarchical representation, is available through aural, visual, kinaesthetic and analytical cues, depending on the learning preferences of the performer and the piece being learned.'<sup>4</sup>

It seems reasonable to conclude that *mental representation*, used by musicians to recall specific information, is a core component of memorisation.<sup>5</sup> Much recent research has been directed towards identifying those specific characteristics of mental representation that musicians invoke when memorising music for performance. Hallam and Aiello discovered that these are more frequently used by professional pianists and are highly individual depending on pianists' idiosyncrasies.<sup>6</sup> The examination of such features in detail could provide useful insight into the memorisation techniques of professional pianists.

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<sup>3</sup> W.G. Chase, & K.A. Ericsson, 'Skill and working memory', in G.H. Bower, ed., *Psychology of Learning and Motivation*, 16 (New York: Academy Press, 1982), 1-58.

<sup>4</sup> Aaron Williamon, 'Music memory and the Brain', *Piano Professional*, 6 (2004), 10.

<sup>5</sup> *Ibid.*, 12.

<sup>6</sup> Susan Hallam, *op. cit.*, 87-96. Also Aaron Williamon, 'Shifting the focus of attention between levels of musical structure', *European Journal of Cognitive Psychology*, 14(4) (2002), 493-520.

## General properties of mnemonics

‘Mnemonic’ is a word derived from the Greek *Mnemon*, meaning ‘mindful’. As previously mentioned, it is a device consciously used to improve memory storage and retrieval.<sup>7</sup> The mnemonic can be related to different aspects of perception and usually organises the material to be remembered. Using a mnemonic system means that not only is more information stored, but that this additional information is easier to retrieve.<sup>8</sup> The mnemonic will also ensure that if we recall only a small part of the information we will be able to access the whole of it.<sup>9</sup>

Mnemonics have a variety of forms. Often mnemonics are verbal (‘key words’), as with a very short poem or special word. An *acronym*, too, is commonly a key word; for example, the acronym, ‘BRASS’ reminds one how to shoot a rifle: ‘Breath, Relax, Aim, Sight, Squeeze’.<sup>10</sup>

An *acrostic* is another common example of a keyword: an invented sentence where the first letter of each word is a cue to an idea you need to remember. The example of the colours of a rainbow was given previously; most musicians have heard ‘Every Good Boy Does Fine’ (or ‘Deserves Favour’), used for recollecting the notes represented by the lines in the treble clef.<sup>11</sup>

Other types of mnemonics are those associated with images, for instance where relationship is invented between the name and the physical characteristics of the person.

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<sup>7</sup> N.R. Carlson, G. Neil Martin & William Buskist, *Psychology* (Pearson Education Limited, 2004), 282.

<sup>8</sup> See chapter 1, p. 16-17.

<sup>9</sup> Carlson, *op.cit.*, 282.

<sup>10</sup> M. Pressley, J. Levin, & H. Delaney, ‘The mnemonic keyword method’, *Review of Educational Research* 52(1) (1982), 61-91.

<sup>11</sup> *Ibid.* 61-91.



For example, Shirley Temple's name can be remembered by 'her curly (rhymes with 'Shirley') hair around her temples.'<sup>12</sup>

Mnemonics rely not so much on repetition, but also on associations between easy-to-remember constructs and lists of data, based on the principle that the mind more easily remembers insignificant information attached to spatial, personal, or otherwise meaningful information than that occurring in meaningless sequences. This is called the 'Chaining effect', i.e. 'create a story where each word or idea you have to remember will cue the next idea you need to recall'.<sup>13</sup>

Although musical mnemonics are widely employed in the memorising of educational materials (for example, for young children, a song commonly aids the memorisation of the alphabet), the use of mnemonics to learn music is much less acknowledged.<sup>14</sup> Work has, however, been done in this area by a number of researchers, including Chase and Ericsson, Williamon and Hallam.<sup>15</sup> Building on this, there follows a discussion of the possible application of mnemonics to the memorisation of piano music, based on the author's own experience as a pianist.

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<sup>12</sup> *Ibid.* 61-91.

<sup>13</sup> Meg Keeley and the Special Populations Office at Bucks County Community College, website: <http://www.bucks.edu/~specpop/mnemonics.htm>

<sup>14</sup> Kimmel, Karl, L. 'The Development and Evaluation of a Music mnemonic-enhanced Multimedia Computer-Aided Science Instructional Module', Dissertation submitted to the Faculty of the Virginia Polytechnic Institute and State University, 1998, Blacksburg, Virginia, 1-92.

<sup>15</sup> See for instance W.G. Chase, & K.A. Ericsson, op.cit., p.141-187. Also, Aaron Williamon, 'Music memory and the Brain', *Piano Professional*, 6 (2004), and Susan Hallam, op.cit., Vol.14 (1997). Aaron, Williamon, 'Shifting the focus of attention between levels of musical structure', *European Journal of Cognitive Psychology*, 2002, 14 (4), 493-520.

### The properties of music mnemonics (MM)

A music mnemonic – henceforward abbreviated to ‘MM’ – is a memory retrieval cue (not necessarily composed of music) which is stored in the musician’s Short-Term Memory in order to retrieve relevant musical information rapidly from the Long-Term Memory.

For the most efficient use of mnemonics for memorisation, the pianist first needs to identify the passages causing memorising difficulties.<sup>16</sup> But regardless of this, for general memorisation, the work needs to be broken up into sections. The functions of the human brain are so complex that it is almost impossible for anyone to memorise with the same level of clarity and intensity throughout a composition without consciously using tactics. In two separate studies, Williamon examined the practice and performance of twenty-two pianists. These studies showed that the *shifting of the focus of attention* from one passage to the next in a musical work is a common occurrence for pianists at higher levels of ability during both practice sessions and performance.<sup>17</sup> This result supports Clarke’s assertion, that the limits to human information processing and attention make it unlikely that an entire representation will be activated during performance.<sup>18</sup>

The sections into which the piece is broken up may be as short as a bar or two, or as long as a page; each can be represented by a mnemonic. An individual mnemonic is activated when it becomes the focus of attention during playing, and may gradually move forward – or be repeated if necessary – to the next mnemonic, connected to the next

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<sup>16</sup> While this involves the conscious mind, it should be noted that the technique of *applying* the mnemonics derives from the principles of the four musical memories—aural, visual, kinaesthetic and cognitive analytical—the first three of which are highly automatic. Sloboda believes that ‘one of the principle problems facing moderate-level performers is the dissociation of the performance sequence from full conscious control’ (Sloboda, *The Musical Mind*, Oxford: Oxford University Press, 1985, 91.)

<sup>17</sup> Aaron, Williamon, ‘Shifting the focus of attention between levels of musical structure’, *European Journal of Cognitive Psychology*, 14, 4 (2002), 493-520.

<sup>18</sup> E.F. Clarke, ‘generative principles in music performance’, In Sloboda (Ed.) *Generative processes in Music*, Oxford: Clarendon Press, (1988), 1-26.



section, thus providing a series of ‘signposts’ for the performer. It is vital for the pianist to exercise these shifts of focus until there are no hesitations, either mentally or physically.

Much recent research, as cited above, has confirmed a great deal of individual difference amongst pianists’ deployment of mnemonics.<sup>19</sup> These differences usually reflect the pianist’s personal preferences. There is, of course, no better or worse method for choosing mnemonics, as long as they provide the most efficient reinforcement of memorisation for the pianist in question.

A music mnemonic therefore may take any form: it may be a number, a series of letters, a feature, an image or a type of color, etc. In short, it is anything that comes to be associated in the performer’s mind with the correct performance of the passage in question. Many pianists limit their choice to tonal aspects of the work, e.g., harmonic, contrapuntal and structural features of the composition. However, the demand on musicians’ memories far exceeds the boundaries of this type of knowledge.

It seems reasonable that many pianists – conscious or unconsciously – adopt the same memory cues for learning as for memory retrieval in performance. However, common knowledge shows that this may not be the best approach, especially for live performance. One of the key features of memorisation in performance is speed; hence memory cues which allow fast retrieval of information during the performance are preferable.

Advanced pianists, through years of training, build a vast storehouse of general musical knowledge. It is such knowledge that helps them to recognise musical patterns,

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<sup>19</sup> See previous footnote No.6, p.35

appreciate the difficulties, provide answers for problem-solving, etc. This type of knowledge is stored in the LTM; yet scientific results show that, in general, recognition times for highly-practised lists stored in the LTM are 200-400 milliseconds longer than those for items stored in the STM.<sup>20</sup>

On the other hand, the STM is extremely limited; its general capacity is estimated at around seven figures, which can be remembered only for a few seconds. Almost any respectable, memory-related performance task requires perhaps a hundred-fold more memory capacity than this. The solution may lay in the technique of the 'hierarchical network model', which means, simply, that the information involved is organised hierarchically.<sup>21</sup>

Criteria for the effectiveness of the application of a mnemonic include the ease of its association with the material being memorised, an appropriate hierarchical organisation for the retrieval of possibly complex information and an allowance for anticipation of the material to be retrieved by the performer. These three categories are discussed below:

*a. Direct association* The mnemonic should provide the most direct and vivid mental association for the pianist. For example, one could imagine a situation where a pianist is practising a certain passage, when someone drops a glass. Thereafter his/her mnemonic for this passage could become the 'glass-drop passage'. This would not be the only means of remembering this passage, but it might leave the strongest impression, and thus

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<sup>20</sup> See K. Anders Ericsson & Walter Kintsch, 'Long-Term Working Memory', *Psychology Review*, 102 (1995), 215.

<sup>21</sup> Richard Gross, *Psychology: The Science of Mind and Behaviour*, 3rd edition (London: Hodder & Stoughton, 1999), 298.



enable the shortest retrieval time for the music. This assertion follows the *flashbulb memory* theory, which means the recollections of event that are personal or social importance, are novel, unsuspected and vivid and have major long-term consequences.<sup>22</sup>

*b. Simplicity of hierarchical organisation.* Quite obviously, the less complex and succinct the information used as retrieval cue, the less the time that is needed for memory search. If the desired information seems to be massive and complex, a hierarchical organization of encoded memory may be applied to ensure the simplicity of the MM.

Chas and Ericsson (1982) undertook a study of methods of hierarchical retrieval.<sup>23</sup> Figure 1 below shows a chart of the organisation of the encoding processes used by one of their subjects, SF, who through training had acquired an exceptional memory for recalling random patterns of numbers. The researchers discovered that SF used mnemonics associated with running (3596 = 3 min and 59'6", or just below a 4-minute time for a male) and other numerical relations to group digits and encode digit groups into subgroups. At the time of recall, SF could easily recreate any of the unique locations of the retrieval structure and use a given location as a cue to retrieve the corresponding group of numbers.

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<sup>22</sup> K. Anders Ericsson & Walter Kintsch, *op.cit.*, 303.

<sup>23</sup> This figure is introduced in the article by K. Anders Ericsson & Walter Kintsch, 'Long-Term Working Memory', *Psychology Review* 102 (1995), 216

Fig. 1: Chart of hierarchical retrieval organisation

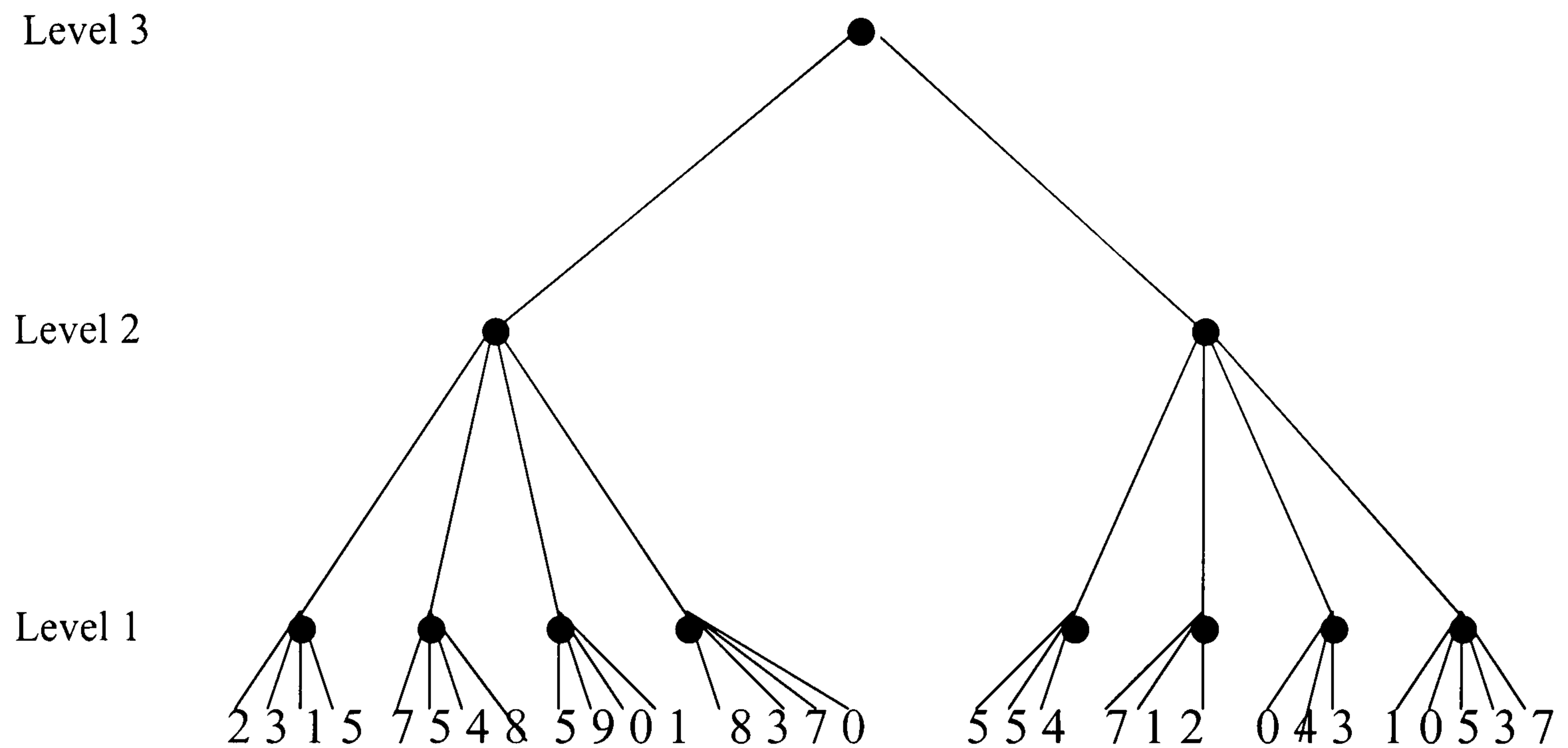


Figure 1. Proposed hierarchical organization of SF's memory encoding of 30 presented digits. The first level contains mnemonic encoding of digit groups, and the second level consists of supergroups in which the relative location of several digit groups are encoded; after Ericsson (1985).

*c. Anticipation.* When the pianist associates the encoded information with the appropriate MM in performance, often a certain amount of time must be allowed for retrieval *prior* to the arrival of successive encoded passages. The anticipatory MM will also allow the pianist to keep track of progress through the piece and provide points of intervention for recovery from a mistake and for the spontaneous variations that made each performance unique.



## Types of music mnemonics

As mentioned above, the creation of music mnemonics (MMs) depends on the individual pianist's personal preference; hence it is usually variable and unpredictable. However, the author's own experience as a performer indicates that some types of MMs are used by many pianists at different levels. Below, these are placed in categories as follows: (1) Inner Speech, (2) Kinaesthetic, (3) Key Note, (4) Imagery, (5) Interval and (6) Relative.

### (1) Inner Speech MM

Psychologists believe that humans start to develop their cognitive skills through interaction with their environment, both the physical world and the surrounding people, and then by learning words to represent new objects vocally. After approximately the age of seven, we stop vocalising our thoughts and instead carry on with 'Inner Speech'. This is the internalisation of words and their mental manipulation as symbols for objects in the environment. We use Inner Speech almost on a daily basis and often have internal conversations with ourselves. We use Inner Speech to help us to memorise in daily life, such as when we verbally repeat a telephone number, people's names or addresses, etc. However, this would be only regarded as *shallow processing* or *maintenance rehearsal*, terms psychologist use to identify that information stored merely by the rote-repetition of verbal information which is used by the brain for a short space of time.<sup>24</sup> In contrast, information stored through elaborate rehearsal is an example of *deep processing*, which generally leads to better retention than the *shallow processing* does. In more specialist

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<sup>24</sup> *Ibid.*, .280.

arenas such as music memorising, the *deep processing* of Inner Speech has been suggested by experts as a powerful and practical aid for recalling the music. Grondahl suggests that ‘Information may also be recalled as inner-speech in the form of verbal representations . . . or of “talking over” strategies for recall’.<sup>25</sup>

Pianists from different learning backgrounds choose different verbal mnemonics. One common example is solmisation, which is either the French *Solfège* system (*fixed-doh*), or the English *Tonic Sol-fa* system (*‘movable doh’*). Each is a method for sight-reading and vocal exercise in which syllabic names, derived from the mediaeval hexachord system, are applied to pitches. The *fixed-doh* system applies one name to all pitch-classes of the same note, e.g. *doh* for C, *sol* for G, etc. This system is practiced in other countries such as Italy, Spain, Russia and Far-East countries. The ‘movable-doh’ system (based on the principles of the mediaeval hexachord system) applies the syllables tonally, i.e., the tonic of a major scale is always called *doh* (‘ut’ in 15/16th-century solmisation), the dominant, ‘soh’, etc. This system (and the Kodaly system, to which is closely related) is used in particular in Britain and its former colonies, as well as in some Eastern European countries like Hungary.<sup>26</sup> Pianists who started solmising at a very early age find it natural to articulate the syllables, either out loud or silently, just as people are at ease when using their mother tongue. Therefore, despite the existence of some scepticism concerning the true benefits of such a system, it can serve as one particular type of Inner Speech which can be used to recall, particularly for pianists who have Perfect Pitch. In addition, these single-syllable phonetics are easy to articulate.

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<sup>25</sup> D. Grondahl, *Thinking Processes and Structures Used by Professional Pianist in Keyboard Learning* (Norges Musikkhogskole, Oslo, 1987), 141.

<sup>26</sup> Michael Kennedy, *The Concise Oxford Dictionary of Music*, 4th Ed. (Oxford University Press, 2004), 686.



Other types of verbal MM are here designated, 'Beat Counting', 'Word' and 'Verbal Connotation' MMs. Beat Counting may seem to many a too-simplistic option for professional pianists or advanced players; this may be so when applied to the piano repertoire primarily before the twentieth century, when the rhythms in compositions are scarcely irregular, but as compositions have gradually been released from fixed rhythmic forms and conventional time signatures, composers have also begun to explore a much wider range of rhythmic possibilities. Some modern works include frequent changes of time signature, even from bar to bar; some omit the time signature altogether; others include unconventional metres, constant tempo changing, multiple cross-rhythms, irregular and long rests, etc. These features may easily trigger memory lapses if the pianist is not careful enough during the memorizing process or in performances. In many cases, pre-rehearsed verbal Beat Counting, despite its simplicity and primitiveness, can produce very quick memory responses. One straight forward example can be found at the end of Prokofiev's 3<sup>rd</sup> Piano Concerto in C: in the *Finale*, where the piano part has a series of four similar runs (from b.137), the repeats are irregular and the pianist must therefore simply memorise the beat-groups as they play along with the orchestra, that is, 4-6-4-7. Hence, this series of numbers become the MM for this passage.

Words themselves provide infinite possibilities. Some pianists use words to remind them of certain passages of music while playing; some go a step further, constructing short sentences from significant words. This is an example of the acrostic, discussed previously. This technique allows for rapid categorisation of domain-specific patterns and accounts for the speed with which experts recognize the key elements in a

problem situation.<sup>27</sup> *Chunking* technique often plays a crucial role, here, because the enormous demand for the information of the music requires pianists to find solution to compress and re-organise the original information.

The ‘Verbal Connotation’ MM is a mnemonic which employs words in a less conventional manner. For instance, a few pianists, including, allegedly, Chopin, have described their colour-coding of different keys to represent difference in moods of music. A hypothetical example could be: B major – Gold; G minor – Brown; etc.. Thus, the use of the word ‘gold’ by a pianist to retrieve music when encountering a B major scale or arpeggio can be regarded as the Verbal Connotation MM.

It must be appreciated, however, that words chosen for a mnemonic function need not have a direct link with the music in question, as long as they hold special meaning for the performer him/herself. An obvious example may employ the *Episodic memory*, when a powerful and unforgettable event occurs in the process of memorisation; thereafter the passage itself is recalled by recollection of the event. ‘Verbal Connotation’ thus includes all verbal possibilities and can compensate for the limitations of other word-mnemonics. Pianists can experiment, inventing their own language or certain ‘sounds’ in their head. All these examples can be regarded as Inner Speech MMs.

## **2. Kinaesthetic MM**

Kinesthetic memory, otherwise known as the motor, finger, muscular and tactile memory, was discussed earlier in some detail. Memorising by rote is commonly regarded as the basic form of rehearsal for pianists, and it consists of the repetition of a bar, phrase, or

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<sup>27</sup> Rita Aiello & Aaron Williamon, ‘Memory’, *The Science & Psychology of Music & Performance* (US: Oxford University Press, 2002), 167-182.



page until it can be played, automatically, by 'feel'. Most empirical studies as well as memory-related strategic advice from professional musicians agree that kinesthetic memory is purely automatic and therefore may become unreliable. A mnemonic based on kinesthesia, thus called the Kinaesthetic MM, on the other hand, is quite different in this respect.

The main difference between kinesthetic memory and the Kinaesthetic MM is that the latter is non-automatic. Pianists can consciously extract memory cues from the kinesthesia of playing and remember these cues as music mnemonics. Since a large part of physical piano playing is facilitated by the fingers, it is not hard to imagine that specific-domain-designed fingerings can be an important component of an MM.

Finger patterns may well be an obvious choice for an MM because examples are omnipresent in piano music. There are many passages where pianists can employ the same fingering, or a group of fingerings, repetitively. However the Finger Patterns MM does not only refer to *convenient* fingerings, that is, fingerings designed for ease of playing, intended to avoid any physical awkwardness. When security of memorisation becomes the top priority for the pianist, s/he can consciously choose a set of fingering or finger patterns to aid the memory, rather than simply choosing the most 'convenient' fingering.

An example can be found in Rhian Samuel's 'Vertigo' (see Ex. 1), taken from the same set of piano pieces, *A Garland for Anne*, as the piece used in the project described in Chapter 4.<sup>28</sup> In bb. 25-6, the sequential, three-note semitone descents in each hand do not suggest similar finger patterns; in fact, it might be easier for the pianist to adopt a set of different fingerings for each hand. At the same time, rotating 432 on the

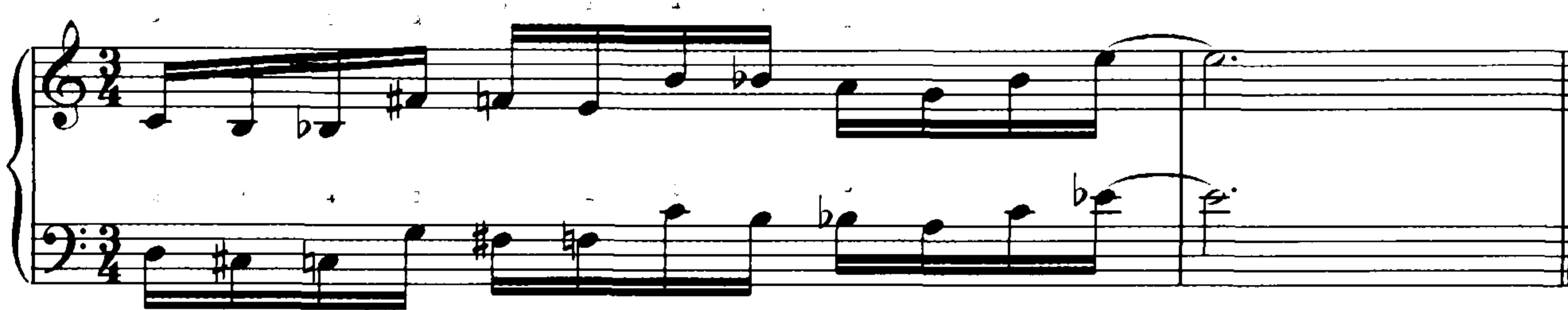
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<sup>28</sup> Rhian Samuel, 'Vertigo', No 4 of *A Garland for Anne* (London: Stainer & Bell, Ltd, 2001), 4-5.

right hand and 234 on the left would probably make a much more memorable *fingering pattern* for an MM.

Example 1. Samuel, *A Garland for Anne*, 2, 'Vertigo', bb. 25-26

Rhian Samuel. Vertigo. bars 25-26



Another type of Kinaesthetic MM may provide a higher level of organization than Finger Patterns. 'Interspersed Respective fingering' is when a key fingering-pattern is selected and connected over a span of time to other similar ones in respective fingerings, —each one governing a group of notes around it.

In Scarlatti, Sonata in F Major, K 471, bar 20-34 (Ex. 2), the left hand has a large leap followed by a group of descending scales. With the complex notation, as well as the awkward hand position, the right hand has a completely separate role from the left; further, all this has to be played with clarity in a rapid tempo. This would be a hard passage for most pianists, and a good set of fingerings is vital for the left hand, as well as for the memory. The suggested fingerings showed in Fig. 3, all on A flat/A to G, may resolve this problem. Moreover, they make a very concise MM, which would be, 2-1, 3-1 and 4-1.



Ex. 2. Scarlatti, Sonata, K.367, bb. 20-34

2  
20  
Scarlati, Sonata K. 367, bars 20-34

26  
30

In the same Scarlatti Sonata, in bb. 35-41, another MM, which we can call the ‘synchronised LH/RH fingerings’ MM, can be used (see Ex. 3 below). The hands are playing contrary-motion scales. Again there are a number of fingering possibilities for the pianist; the fingering 123, 1234 and 12345 for both hands may be a good choice for memorisation.

Ex. 3. Scarlatti, Sonata, k. 367, bb. 35-41



**(3) Key Note MM**

For pianists who have been trained from an early age, Aural and Visual memory are almost innate abilities. This is perhaps due to the fact that the development of these two memories is intrinsic to the training process. Like Kinesthetic Memory, Aural and Visual memories may assist pianists to memorise a piece; however, without the guidance of the conscious mind, they can also be unreliable.

Both the Key Note MM and Imagery MM (the latter to be discussed below) are adopted from Aural and Visual memory, albeit they are non-automatic in their design. They are created, in accord with the pianist's abilities with regard to Aural and Visual Memory, after an insecure passage is recognised and located. It is impossible for pianists to think consciously of every single note they play; most of the lower level of execution of playing still relies on automatic response from practice and familiarity with the piece. Therefore, *assessment* is the vital step pianists cannot miss; omitting this, as well as an incorrect assessment, will surely cause problems.



The difficulty is that no one can be certain of his/her ability regarding Aural and Visual Memory until tested repeatedly on the stage. Naturally, more experienced pianists have a deeper understanding of how well they react under pressure, and therefore know what to look out for during practise, particularly those passages that are prone to memory-slips. For example, in a momentary memory-slip, some can quickly retrieve parts of the music by how it sounds (top melody or bass line in most cases). Those less-fortunate, who cannot retrieve information in the desired space of time, need to create more Key Note MM. A similar assessment can be applied to Visual Memory: some pianists claim that they have a photographic memory, implying that during the process of recall, they can 'read' a mental score and can follow it to play while playing. A lower level of Visual Memory is perhaps more common: sometimes pianists can only 'see' parts of the score, or recall the page turning but nothing else, or the mental picture exists but is unclear, etc.

The Key Note MM is a mnemonic created to respond to particular musical characteristics of the text. These characteristics include for instance, *voice leading* and *harmonic progressions*. Such mnemonics are often used in combination with, for instance, the Inner Speech MM and Kinaesthetic MM. Examples of Key Note MM are given below.

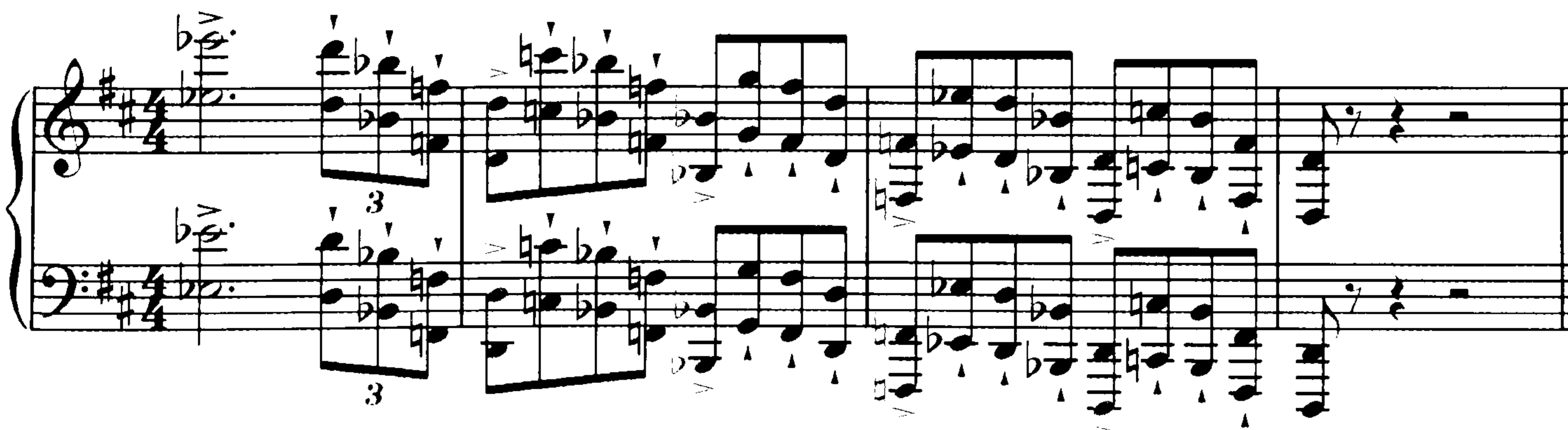
In Ex. 4 below, at b. 36, the pianist is obliged to change the hand position, after the previous descending runs, to chordal playing. The chord, which consists of the notes G, C, and F in the right hand and D flat and F in the left hand, sounds the 'F' more prominently. Therefore, the Key Note MM for this important bar would be 'F'; the other notes can rely on Kinaesthetic or Imagery MM to be secured.

Ex. 4. Samuel, *A Garland for Anne*, 2. *Vertigo*, bb. 33-37: *Combining Key Notes MM and Kinaesthetic MM*



In the next example, taken from the Liszt B Minor Sonata (see Ex. 5), the leaping octaves in both hands may create more technical than memory difficulties for most pianists. However, creating mnemonics at such places would not only help secure memorisation in the mistake-prone passages, but also help with technical preparation, because the anticipation of executing music mnemonics prepares the pianist to aim the jumps more accurately. There are two groups of octaves in each bar, and the leaps occur at the beginning of these groups. The first notes of each leap are D, B flat, F, and D. These therefore become Key Note MMs. It also seems natural for pianists to ‘sing’ these mnemonics internally while playing, therefore invoking Inner Speech MM at the same time.

Ex. 5. Liszt, *Sonata in B minor*, bb. 58–61. *Combining Key Notes and Inner Speech*





#### (4) Imagery MM

The Imagery MM may be applied when pianists focus on a particular image of the score, for instance, a few bars, or a highlighted melodic line, as images can be quick stimuli for recollection. There is also the imagery of the movements, hand position, gestures or particular keys on the keyboard. Again, examples can be found in the third and the fourth bars of 'Vertigo' by Samuel.

In this example, the left hand has to leap upwards approximately three octaves to land on a high-register chord, composed of D, G and B, in the last bar. It seems that at this point it is hard to relate this chord to the previous bars either aurally or kinaesthetically. However, the very first note, B, in the R.H. in b.1, is the same note as the top note of the L.H. chord in b.4. Therefore, if the pianist visually relates these two notes, it may help his/her memory as well as the accuracy of the leap. (see ex. 6).

Ex 6. Samuel, *A Garland for Anne*, 2, 'Vertigo', bb. 1 – 4

The image shows a musical score for the piece 'Vertigo' by Samuel, measures 1 through 4. The tempo is marked 'Allegro' with a quarter note equal to 136 (♩ = 136). The score is written for piano in 2/4 time. The right hand (RH) begins with a melodic line in measure 1, starting on a B note. The left hand (LH) has a more complex accompaniment. In measure 4, the LH has a high-register chord consisting of the notes D, G, and B. A line connects the B note in the RH of measure 1 to the B note in the LH chord of measure 4, illustrating the visual relationship mentioned in the text.

## (5) Interval MM

In the later stages of memorising, there is a period when pianists no longer need to rely on the score, yet are still not fluent enough to perform the piece as one would on the stage. At this point, a slightly revised physical relationship with the piano is adopted as the pianist no longer needs to refer to the score frequently. A sense of stronger kinaesthetic awareness is developed, subsequently resulting in the employment of different memorising techniques.

The 'Interval MM' is a mnemonic based on the intervals between notes, chords, selected key-notes or right and left hands. This mnemonic is measured by the distance between the targeted notes, which do not necessarily neighbour each other. Taking some further examples from Samuel's *Vertigo* (see Ex. 7a, b, and c) similar patterns of minor thirds (simple and compound) occur between the first notes of each pair of beats.

Ex. 7. Samuel, *A Garland for Anne*, 2. 'Vertigo'

a) bb. 5-6





b) bb. 14-15



c) bb. 31-32



In many places, pianists can disregard tonality and distance for the sake of simplifying the MM, thus loading less information onto the brain, for instance, swapping sharps for flats or vice versa, and disregarding the octaves between the intervals. An example can be found in the Liszt Sonata (see Ex. 8 below).

Ex. 8. Liszt. Sonata in B minor, bb. 111-115



The left hand notes of the chords separated by rests can be remembered using enharmonic spelling, particularly given the flat key that follows each time: instead of counting a diminished fourth between the C sharp and F natural, it is probably easier for pianists to think of these intervals as major thirds (Interval MM).

## **(6) Relative MM**

The application of a Relative MM is not usually suggested by the way the score is written, like tonal centres or frequently-appearing notes, nor is it likely to be applied to notes which are significant to the musical meaning of the piece. Their worth is in seemingly random passages, where pianists have less cues to 'hold on' to their memorisation. The 'Relative MM' in such cases could be a good option.

A common way of using a Relative MM is to find a Key Note shared by the notation of both right and left hands; thus, by playing either, memory can be invoked. For example, in Rachmaninov's Second Piano Concerto, in bb. 67-70, the right hand entry is imitated in the second half of each bar by the left hand, meaning that the left hand can relate to the right hand's notation in this passage.

The Relative MM can be quite hidden in the material. A good example is a tricky passage from Liszt's B Minor Sonata (see Ex. 9). The 8<sup>th</sup> to 13<sup>th</sup> bars of the Epilogue (*Andante Sostenuto*) require the pianist's special attention for three reasons: a) after the huge climax and intense concentration of playing for almost half an hour without a stop, the music starts to relax here, and the pianist's attention may waver; b) the continuous modulations with risky descending chords on both hands are written with five sharps and accidentals which, can expose even the slightest mistake; and c) the motive has been



employed twice previously, however always slightly differently and in a different key. Here, LH and RH may be related as show in the example.

Ex. 9. Liszt. Sonata in B Minor, Epilogue, bb. 8-14

**Liszt Sonata - Epilogue**

Andante sostenuto

12 (8) middle group - different

dimin

### A Case Study in the Use of MM

After the extensive discussion of Music Mnemonics above, it might be useful to gather up the suggested mnemonics offered for one complete piece and show them in context. Rhian Samuel's 'Vertigo' from the suite, *A Garland For Anne*, was used to illustrate several MMs; these are now shown below on the complete score,<sup>29</sup> The mnemonics are given in colour as follows:

<sup>29</sup> Permission for the following reproduction of *Vertigo* is kindly granted by publishers, Stainer & Bell Ltd.

1. Aural Mnemonic - yellow line (b.35) The F which occurs in the chords in both hands produces a prominent sound. Remembering the F as Aural MM can trigger a chain-recollection for the rest of the notes for the chords.

2. Visual Mnemonic - green line (bb.1-4): The beginning-note usually triggers the memorisation. Memorised visually (note and its position), it can be associated with the left thumb in b. 4, and can secure a more precise aim for the left hand's huge leap over three octaves. The same motif is repeated in bar 27.

3. Interval Mnemonic – pink line (bb. 5-6; 20-21). At bb. 5-6, F sharp and D sharp make a minor third, followed by the F natural and D natural as minor third, thus could be remembered as the 3rd Interval MM. In bb. 20-21, the left hand has a 2nd Interval MM.

4. Relative Mnemonic – red line (bb. 5-6; 20-21). in bb. 5-6, the Interval MM can describe the semitone interval between the two groups headed by F sharp & D sharp to F natural & D natural; also in bb. 20-21, E natural & D natural to E flat & D flat.

5. Fingering Mnemonic – blue line (b.25): the complexity of these chromatic scales is simplified by these repeated and reversing fingerings in both hands.



Ex. 10 'Vertigo' from A Garland for Anne by Rhian Samuel.

## 2. Vertigo

*Allegro* ♩ = 136

The musical score is written for piano in 2/4 time. It consists of five systems of two staves each (treble and bass clef).  
- **Measures 1-4:** Marked *sfp*. The right hand has a melodic line with a slur over measures 1-4. The left hand has a rhythmic accompaniment. A bracket spans measures 1-4 in the right hand.  
- **Measures 5-9:** The right hand continues the melodic line. A bracket spans measures 5-9 in the right hand.  
- **Measures 10-13:** Marked *a tempo* and *sfp*. The right hand has a melodic line with a slur over measures 10-13. A bracket spans measures 10-13 in the right hand.  
- **Measures 14-18:** The right hand continues the melodic line. A bracket spans measures 14-18 in the right hand.  
- **Measures 19-22:** Marked *a tempo* and *f*. The right hand has a melodic line with a slur over measures 19-22. A bracket spans measures 19-22 in the right hand. The left hand has a rhythmic accompaniment. A bracket spans measures 19-22 in the left hand. There are also smaller brackets over measures 19-20 and 21-22 in both hands, with a *p* dynamic marking above measure 20.

23

*p* *più dolce* (*p*) *ppp*

*a tempo*

*sfp* (*p*) *ppp*

*p* (*p*)

*poco più mosso*

*f* (*p*) *pp*

*poco rall.*

*ppp* (*p*) *sff* *ppp*



## Chapter Four: Memorisation Strategies of Five Chosen Pianists

This discussion of memory in piano performance began with an overview of the main types of memory, and moved to an examination of various types of music mnemonics, and their use in the process of memorisation during both practice and performance. The particular mnemonics presented as examples in Chapter 3, however, reflect the personal opinion and experience of the author, only; this chapter seeks to validate and broaden these categories by drawing on a wider range of professional pianists, examining their memorising techniques with an aim to incorporating them into the presentation of the MM technique offered so far.

A memorisation technique is beneficial only if it works on *repeated* performances; it is most useful when it can be employed by pianists at large. Such techniques need to be tested in a variety of circumstances, for instance, on contemporary works, which may be complex and difficult to memorise, on pieces containing passages which are similar yet differ slightly, and on situations where pianists return to a piece after some time away from it.

Is the proposed MM technique approach beneficial to professional pianists in general? The overview of human memory presented implies that each pianist must invent his/her own memory cues, because each musical passage will offer very different problems and advantages to him/her. On the other hand, the source of such memory cues, as shown in the previous chapter, is often the structure of the music itself: sequences, patterns, etc. So, frequently, what the pianist employs is a structural property of the music—a property which may be discerned by all the pianists who play the same work.

There follows therefore an account of a project which involved several pianists who were invited to memorise unfamiliar works and analyse their memorisation processes. The results of the project are then compared with the theoretical discussion presented above. The ultimate aim is to assemble some general strategies for memorisation which may indeed help the professional pianist in the future

## The Project

### 1. The Task

Five pianists were enlisted to learn by memory two short pieces previously unknown to all of them. During their studies they were asked to keep a diary of their practice sessions. After they had learned the assigned works, they performed them from memory in a hypothetical, live-concert environment that was also recorded. Then, an interview was conducted with each of them.

### 2. The Pieces

The first was a Rachmaninov Prelude, op.23, no.6, and is tonal in style; the second is a contemporary work, entitled 'Morning' from the suite, *A Garland for Anne*, by Rhian Samuel. This latter has some atonal characteristics and had not been performed in public when the pianists started to learn it.<sup>1</sup> These pieces are included complete in Appendix 3 (pp 114 - 122). I chose these pieces for the following reasons:

- i) The two pieces are radically different, and might therefore require completely

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<sup>1</sup> Sergei Rachmaninov, *Prelude For Piano* (Boosey & Hawkes Music Publishers Limited, 1992), 30-33; Rhian Samuel, no.4, 'Morning', *A Garland for Anne* (Stainer & Bell Ltd, 2003), 8-11.



different learning strategies. Any that seemed to relate to each other would therefore be quite significant.

ii) Since this research has to delve into the analysis of individual memorisations, it would be better if the subject could use these works for concerts, subsequently; this would encourage them to take the learning of these pieces seriously.

iii) Most pianists would welcome the addition of miniature pieces to their repertoire, for use, for example, as encores at the end of concerts.

iv) Since the research is concerned with pianists' strategies of memorisation in real-life situations, it is important that the sample pieces are practical/suitable enough to be included in the concerts. Feedback from these pianists would therefore be realistic, and less like a theoretical, 'clinical' experiment, of which many already exist.

### 3. The Pianists

Of the five pianists, three are postgraduate, and two are undergraduate students, all taking piano performance as their first study at the Guildhall School of Music and Drama, London.<sup>2</sup> In this group, the four females come from Canada, China, Russia, Lithuania and the male pianist from the UK. They were carefully chosen because of their competence as pianists and are exceptional in having few problems with memorisation.

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<sup>2</sup> While the pianists have all given their consent to being identified, it was not felt necessary or particularly appropriate to do so.

Pianist A: This pianist was trained in China. She attended local music school during her childhood and later was accepted by the Shanghai Conservatory of Music, one of the best music institutions in the country. Throughout her schooling she studied western musical subjects such as Harmony, Music Analysis, Counterpoint, Music History, as well as her principal study, piano. She came to the GSMD four years ago on the postgraduate course. She is also an experienced chamber music player.

Pianist B is a Russian student, previously trained in the music school attached to the Moscow Music Conservatory, where, like pianist A, she studied music related courses together with her principal performance study piano. She came to the Guildhall on the undergraduate course five years ago and now is on the Postgraduate Performance Course. Pianist B has hardly ever ventured to perform any contemporary works, so to memorise Samuel's work has been a challenge for her.

Pianist C is British. He studied at the Guildhall's Junior Department for six years, then went to Cambridge University, studying composition, while continuing to have piano lessons on a private basis. He then went on to the Guildhall's Master's Degree in Performance course three years ago and is now one of the Student-Fellows of the piano department. Pianist C is an extremely versatile pianist. He has a vast experience of concerto playing, chamber music and accompaniment. He is also an excellent improviser at the keyboard.

Pianist D: This pianist received her education in Canada; after studying in Toronto she



then enrolled on the Guildhall School's Postgraduate Course. While she is embarking on her solo career she also has a professional piano trio, which is gradually becoming a large part of her performance career.

Pianist E: This Lithuanian-born pianist has had a flourishing performing career from an early age, which makes her something close to a child-prodigy. She started studying the piano at the age of three, then went to the pre-conservatory school, then to the Conservatory, enrolling in a double major of composition and piano performance. However, piano seems always be her main focus. Since she came to the Guildhall School she has devoted herself completely to piano performance and is gradually making herself known to the audience in this part of the world very successfully.

#### 4. The Questionnaire

The sheet presented to the participants before they began the project contained instructions and a number of questions, asking for a description of the practice sessions of the memorisation process, including techniques used, and then for a comparison of approaches to the two pieces. Here is the questionnaire:

- 1. Please take these two short pieces and memorise them.*
- 2. Please note the total amount of practice time (in hours) that it has taken you to do so for each piece.*
- 3. Please note each span of time you used from the first session to the last (in hours).*
- 4. Please record on paper and step-by-step, as far as possible, how you memorised the pieces. For instance, if you divided the piece into sections, and*

*what the sections were; if you practised the two hands separately; if you practised the most difficult passage first, etc. (The more information the better; use the additional paper provided if necessary.)*

*5. What methods and idiosyncrasies have you used for your memorisation of the two pieces you have been given?*

*6. Are there any significant differences in the procedure of your memorisation between piece A and B?*

*7. If your answer is YES to question No.6 please write down your personal approaches and reasons.*

*8. In your opinion, where and why are the most difficult passages to memorise in these two works?*

*9. Do you use any specific techniques of memorisation for these passages?*

*10. Do you think by doing this experiment it has helped you be more aware of the issues concerned with memorisation? Please write down any observations you might wish to make about this.*

*11. What general opinions would you like to offer with regard to a pianist's memorisation?*

The responses to the Questionnaire are contained in Appendix 1.

## 5. Recordings

After the pieces were memorised, performances were recorded. These performances took place at the Performance Recital Rooms at the GSMD, on different dates to suite each pianists' individual timetable.

## 6. Follow-up interviews

After the responses to the questionnaire had been studied and the recordings listened to, I interviewed each player for an appropriate length of time, which differed for each. I



recorded these interviews and transcribed them. My observations on them form the bulk of this chapter. The transcriptions record the participants words exactly as they spoke them. I have not attempted to “correct” any grammatical or other error as I wanted to preserve the original sentiments exactly.

### **A Summary of Responses to the Questionnaire**

A study of the questionnaires and the follow-up interviews shows that the five pianists presented highly individual and different approaches in memorising the test pieces. These are describe below.

#### **Pianist A – Conventional Approach**

Pianists A’s approach to memorising Rachmaninov’s Prelude was extremely systematic and conventional. She first divided the whole work into sections and then started to learn them, one after another. The division of the sections is neatly in accordance with the phrasing of right hand’s melodic line, for example, bb. 1-13; 14-22; 23-35. She soon realised that the more challenging part is in the left hand, which is an on-going line of semiquaver accompaniment, with a great deal of ornamentation using similar patterns. In the subsequent sessions, pianist A continued to consolidate her memorisation of the left hand part, depending almost entirely on her Motor Memory and Aural Memory. She also singled out a few harmonic features to help her remember:

From the first two practice sessions I found some harmonic features,

which can help me to memorise this piece. For example, b.14 starts from E Flat Major; from b. 15 to 16 the harmony modulates to A flat major; b. 18 starts from a G7th chord.

In her later practising sessions, pianist A found more places which she recognised and marked as 'danger zones' for memorising:

For example, in bar 23 the left hand started identically with the beginning of the piece. However, from bar 24 the left hand is varied from the beginning, which is very confusing to memorise. I know if I am not careful it is very easy for me to turn back to the beginning, so I had to make sure there are no mistakes.

Yet she seemed not able to find other solutions other than merely repeating these passages as many times as possible:

The coda is difficult to memorise as well, there are no certain patterns I could find to follow as a guide line for memory, so I practised a lot to be assured with my finger memory.

In Samuel's piece, 'Morning', pianist A adopted a similar sectioning-method to the one she used for the Rachmaninov, dividing this work into six sections and memorising them in order. The main memory tool she used for this work was analysing and memorising the intervals:



I found that the 7th, 9th, and 2nd intervals are important components of the piece, which I can see in almost every bar. After two hours of practice I roughly learned the first three sections and can almost memorise those interval patterns. Bb. 37, 39, 44 and 46 all have augmented 4ths in the left hand.

This passage is given below (See Ex. 10)

Ex. 10. Samuel, *A Garland for Anne*, No.4. 'Morning', bb. 44-45

The image shows a musical score for two staves, treble and bass clef, in 2/4 time. The key signature has two flats (Bb and Eb). Measure 44 is marked with a '44' above the treble staff. The treble staff contains a series of chords and single notes, with some notes beamed together. The bass staff contains a bass line with several notes circled and labeled with a '6' below them, indicating a sixth interval. The word '(legato)' is written below the bass staff. The instruction 'sempre cresc.' is written between the staves. There are also accents (>) above some notes in the treble staff.

When Pianist A was asked about the major difference in her learning of these two works, she made an interesting comment:

For Samuel's 'Morning', my main problem is that I can internally remember the notation but my hands cannot follow that quickly. It is the complete opposite situation to when I learned the Rachmaninov prelude, where my hands were ahead of my brain.

This suggests that pianist A had memorised Rachmaninov relying mainly on her Motor

Memory and for Samuel she relied more on her Analytical Memory, as discussed previously in Chapter 2.

The amount of practice time pianist A used to memorise the Rachmaninov was twelve and half hours. However she attempted to perform this work for as many as twelve times before she reached satisfying results. These ‘performances’ are counted here as rehearsals or further learning of the piece, therefore this brings the total practice time to fifteen hours. She spent sixteen hours learning the Samuel and recorded it six times, which amounts to a total time of seventeen and half hours for learning. A table of comparative times for learning is given in Appendix 2.

#### Pianist B - Personalised Approach

As with the previous case, pianist B has also sectionalised the Rachmaninov prelude, but the criteria she used to do so were completely different. Pianist B continued each phrase as far as her conscious memory could reach. She stopped memorising at this point, even if her hands could still play. She would only carry on learning new material if she had already memorised the previous section.

What she called ‘sections’ are sometimes so short that they are more like phrases. The phrases seem to be completely random, often starting and ending in the middle of the rational musical phrase. The measure of these sections are determined by her capability of memorising the new material at each attempt, she stops learning new material as soon as she could not recall the music she just have memorised. To tackle the difficulty of the left hand she also used a similar method. She had carefully chosen a set of fingerings, and



grouped them into small units. The gathering of each unit is often determined by the fingerings, not by the change of harmonies. In the excerpts listed below, lines on the left hand part indicate her internal groupings (see Ex. 12).

Ex. 12. Rachmaninov, Prelude, op.23, no.6, bb. 1-6

The image shows a musical score for Rachmaninov's Prelude, op. 23, no. 6, measures 1-6. The score is in 3/4 time, marked 'Andante', and features a piano (pp) dynamic. It consists of three systems of two staves each (treble and bass clef). The left hand part includes bracketed groupings and a fermata over the final measure of the third system.

Because of her inexperience with contemporary music, Pianist B had great difficulty in learning Samuel's piece. She wrote in her diary:

This piece has such a combination of notes and chords which sounded very alien to my ear that it seemed I could never be able to memorise it.

She confessed that because of this she had to look for every possible cue and also created many 'artificial memory tracks'. On the other hand, once pianist B started getting used to memorising this piece, she progressed faster and faster. She spent two-thirds of her

practice session on the first two pages, which is actually the easier part of the work, and, unlike other pianists, she learned the second part of the piece with considerable speed.

During the learning process of both works, Pianist B had created highly personalised ‘memory cues’ to help herself, many of which seemed to tally with the Music Mnemonics technique presented in the previous chapter. This will be discussed later. Here are some quotations from her interview: <sup>3</sup>

Morning: I did not realise that sometimes when one aims to memorise for the mere sake of memorisation of the piece and disconnect oneself from the purpose of reaching for deeper musical depth, making associations for memory, (like sequences, chromatics, harmonic patterns, etc.) becomes much easier task after a little while in this logic game, though it might be an anti-musical process. . . . The more I got into the modern piece the easier it becomes to memorise, especially for the last pages. Maybe it is because my brain gets used to this language and there is always something common with the beginning and the end of the piece. . . .

Rachmaninov: Almost the exact opposite with *Morning*, I felt its texture could be easily reconstructed only because it is very attractive in sound to my ear (if I enjoy one chord, it memorises itself immediately, the same with any turn of the melody, etc.). . . . When I aim for memorising in time I do not memorise two hands separately. To me it means that I have to remember twice [sic] longer material.

Pianist C – Acute Innate Ability Approach.

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<sup>3</sup> The complete transcription of the questionnaire is included in Appendix 1, pp.96-107.



Anyone who looks through pianist C's practice diary would be puzzled by the fact that he merely played through the Rachmaninov in the first three practice-sessions, and at the fourth, he wrote that he had more or less memorised the whole thing. With Samuel's 'Morning', he took longer, but after the sixth time he had almost memorised it as well. He responded in the interview he has always memorised everything primarily by its sound; this is probably due to his outstanding aural memory.

Those pianists who possess perfect pitch and relative pitch could, for instance, retrieve the main melody in a piece by relying on their Aural Memory in case of a memory slip. Pianist C's ability is similar but his capacity for Aural Memory is considerably greater. This could also explain why C needed to take much longer to memorise the Samuel than the Rachmaninov, since the former piece he had never heard before. He admitted that in all cases he could not internally 'hear' a melody separated from its accompaniment: for him they are one unique sound.

Motor Memory is the other memory tool which pianist C used frequently. Towards the end of practice sessions, he stopped playing through, instead singling out some tricky passages and simply repeating these places until they had sunk in. He often used note-doubling in his practice to strengthen both Motor memory and Aural Memory in the more complex passages; this allowed him to familiarise himself with the music more speedily and securely. It also helped him to highlight those particular passages in his mind, prompting him to be more careful. For instance, at the end of Rachmaninov's Prelude, Pianist C slowly doubled each note until he felt secure; at other times he changed the rhythm around to test his memorisation.

There is almost nothing else used specifically by pianist C for memory retrieval.

However, he also has a certain amount of Visual Memory capability, which means he can remember vaguely the image of the score, though not in great detail.

Pianist C indicated that he had not yet encountered any major memory problem in his extensive concert career. With his exceptional improvisational skill, he feels quite confident, even in the worst scenario of memory failure, that he could still find his way through by improvising.

#### Pianist D – Uneven Performances and Imaginative Association

Pianist D stated that she practised seven hours in total for Rachmaninov's Prelude and ten hours for Samuel's 'Morning'. The average length of each practice session was forty-five minutes for Rachmaninov and one hour for Samuel; this makes nine and ten practice sessions for each piece.<sup>4</sup> During the process of recording, two performances, each one hour in length, of the Prelude, and another three performances, two hours in length, of 'Morning', were rejected. This time was then counted as extra rehearsal time, which was added to the original practice time, which makes a final eight hours of practice and rehearsal time for the Prelude and twelve hours for 'Morning'.

In the interview we traced step-by-step how pianist D had learned and memorised. In Samuel's piece, right from the beginning of studying this piece, she made a very conscious decision to try to memorise as soon as she started to learn the notes. This was partly because she was behind schedule and partly because she was aware of the atonal features in this work, which, she believed, demanded a higher concentration and conscious level of learning process regarding memorisation.

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<sup>4</sup> See the Table of Comparative Learning Times of Five Pianists in Appendix 2, 108-109.



Before learning the notes she took time in the two initial practice sessions to sight-read through the piece several times, in order to grasp the basic concept of this work. She then divided it into several main sections to work on separately. From the third practice session onwards she worked in detail, learning the notes and inserting the fingerings at the same time.

For the first two pages, she discovered that, by selecting a Key Note from each bar, she could line up these notes into a scale-like pattern, which helped her memory immensely. (The details of this will be discussed later.) In the following page, she found some interval patterns which could be vaguely regarded as sequences in bb. 47-48 (see Ex. 13); and characteristic interval patterns in the middle section, bb. 49-58. Incidentally, this middle section's distinctive rhythmic and interval pattern has been noticed by all other pianists.

Ex. 13. Samuel, *A Garland for Anne*, 4. 'Morning', bb. 47-48

Pianist D  
Rhuai Samuel. Morning, bars 47-48

Furthermore, Pianist D also tried to imagine a story line to fit the meaning of the title. For example, she imagined the music in bb. 8 and 9 is like an annoying alarm clock sounding in the morning, while the sudden entrance of the *sf* chord in b. 10 indicates a loud bang as the alarm is silenced!

As pianist D proceeded to learn this piece she found the notation of music became harder and harder and stated that the passages, bb 41-48. and 58-68, are the most difficult to memorise. In the questionnaire, she described the specific means she used to strengthen her memory for the first difficult passage: ‘I practised the left hand alone while singing the right hand’s melody’; given the fact that ‘the rhythmic aspects are more complicated here’, she resolved the problem by making a mental note that the left hand always comes immediately after the right hand’s chords on the beat.

For the next difficult passage she did not describe any specific way of memorising: she merely relied on her motor memory to learn the notes here, by playing through this passage over and over until she believed it was secure in her memory. Interestingly, during the recording session, in the hypothetical concert environment, D had several memory lapses in the second section but made considerably fewer mistakes in the first difficult passage—where she consciously created and used more memory strategies. This phenomenon is consistent through the recording; when the number of her memory cues per page decreased, the number of memory mistakes increased, and vice versa.

As for the other work, Rachmaninov’s Prelude, pianist D listed very few memory strategies. In the interview, D answered that she almost entirely depended on her motor memory when she was learning and memorising this work. There was only one passage, bb. 15-19, where she noticed an underlying linear chromatic progression on the bass line and made conscious effort to remember this feature. Also, she divided the piece harmonically into a few sections according to the key changes, for example, bar 9 started in G minor.



The Rachmaninov Prelude is so different in many ways from 'Morning'. It is in E flat Major, with a salient feature of a simple melodic line in the right hand, which is accompanied by a chromatically-decorated, flowing left hand. Pianist D asserted that she did not need to spend time memorising the right hand as she has perfect pitch and therefore could solely rely on this ability to recall the music. On the other hand, she thought the left hand could be very difficult to memorise absolutely accurately: although composed within a harmonic structure, the chromatic notes are not written in regular patterns and there are subtle differences before each modulation so the memory could easily falter at such places.

Presumably this comprehension occurred towards the end of Pianist D's study sessions, because, in the process of memorising the left hand part, she seemed to employ very few memory tools. Subsequently, almost 100% of the mistakes made during the recording session occurred in the left hand. She admits that, should she relearn this piece, her approach would be quite different from before. Her retrospective comments are: first, she would learn the left hand alone, regarding it as almost as important as the melodic line, so that she would rely more on her aural ability. Secondly, she would learn and memorise this piece by using conscious analytical strategies, as she did when learning 'Morning'; thirdly, she would attempt to be more aware of the notes which linked the hands, and which thus could provide memory cues for each other.

#### Pianist E – Two Different Approaches

Pianist E revealed very little information about her learning process of memorisation in her questionnaire; nevertheless, she gave a much more detailed account of her

memorising process in the interview. The most noticeable feature was that she adopted two completely different approaches in learning the two pieces.

For the Rachmaninov Prelude no particular memory tools were employed to aid her memorisation; rather, she played the piece many times by rote to assimilate the notation gradually. Like all other pianists she realized that the left hand part process was a threat to her memory, yet she did not practise with separate hands, a fact she later regretted. She reflected that this was ‘the riskier way of memorising, I could have stopped anywhere when I did the recording without being able to continue, it was fortunate no mistakes happened.’

As Pianist E comes from Lithuania, a country formerly a part of Soviet Union, she grew up deeply embedded in Russian culture. Rachmaninov’s prelude for her is like a ‘mother tongue’. She claimed this type of music comes very easily and requires relatively less effort for her to learn and memorise. Besides that, she is also knowledgeable of other works by Rachmaninov, which makes her more confident and experienced in memorising this kind of material.

During her practice, pianist E found certain notes and chords particularly difficult to memorise. She marked these places with pencil on the printed music which raised her awareness of these passages. She did not design any other memory strategies to assist her and said in her interview that ‘the places I circled out gradually solved themselves as I became more familiar with the work.’

Though most of these encircled features seem random, they include some passing scales in the left hand part which she consciously assessed. . For example, in bb.9, 10 & 13, she identified these passing scales as diatonic and chromatic scales with the same



fingering, 4321, therefore employing a combination of Aural MM and Fingering MM, as indicated in the following examples (see Ex. 14).

Ex. 14. Rachmaninov Prelude, Op.23, No.6. bb.9-10 & 13



Pianist E found the last two lines of the Prelude extremely hard to memorise. The same method employed in the rest of the piece would not be sufficient for this. She therefore marked out detailed fingerings for the left hand and visually memorised the image of the fingering mark on the score as well as the image of her hand position. In b.40 she also remembered that the left hand's second beat starts on G and then ascends an octave on the fourth beat.<sup>5</sup>

Apart from the ending and the feature of diatonic and chromatic scales, Pianist E used no specific memory strategies. On the other hand, she developed a sense of structure

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<sup>5</sup> Please see the score enclosed in the Appendix 3, 110-118.

of the Prelude, and the more and less difficult passages, thus prompting her to pay extra attention when needed. Below is quotation from her interview:

I have developed internal structure [sic] Rachmaninov's Prelude, divided piece into five sections. The A section (bb.1-8) is important to begin, because the left hand part sets up the main structure of the piece. Then B section (bb. 9-17) has something completely different, followed by the section C (bb. 18-22) which is the most complex. So during the section B and C I have to concentrate a lot because even with slightest mistakes I could make the wrong turn or stop, especially in the C section. Section D (bb. 23-34) is relatively easier because its similarity to the section A, but I have to pay attention to the rhythmic feature on the LF on b.25, which is different from the beginning. Music starts to be different from bb.28-9 in the D section, so I tried to remember the beginning notes of each bar so I couldn't lose the track of the notes, e.g. bb.28-30. Section E (bb. 35-43) is easy, like the section A again, there are fewer notes. To highlight the difficult parts, they are B & C sections, as well as the last two lines (bb.39-43). However, with so much practice and special attention given to the end eventually I felt most confident with these five bars now.

For Samuel's 'Morning', pianist E, as with others, did not either have the advantage of familiarity with the style of the composer, or hearing the piece performed previously. Therefore she found it much harder to memorise. She had to look for memory cues in this piece and was compelled to create highly personalised memory strategies.



Many of these strategies coincide with the author's proposed MM technique. These self-created memory cues left a deeper impression. When she was asked, a year after the recording had taken place, which of the pieces she could recall more clearly, she answered, Samuel's 'Morning'.

**A comparison of the memory cues employed by pianists in the project with  
previously-described MM**

Pianist A

Pianist A adopted a traditional method of learning and memorising. She relied mainly on analyzing and identifying the harmonies to memorise Rachmaninov's Prelude; with Samuel's 'Morning', she couldn't rely so much on this method; its atonality and unfamiliarity compelled her to look for other features in this new work and create her own memory cues.

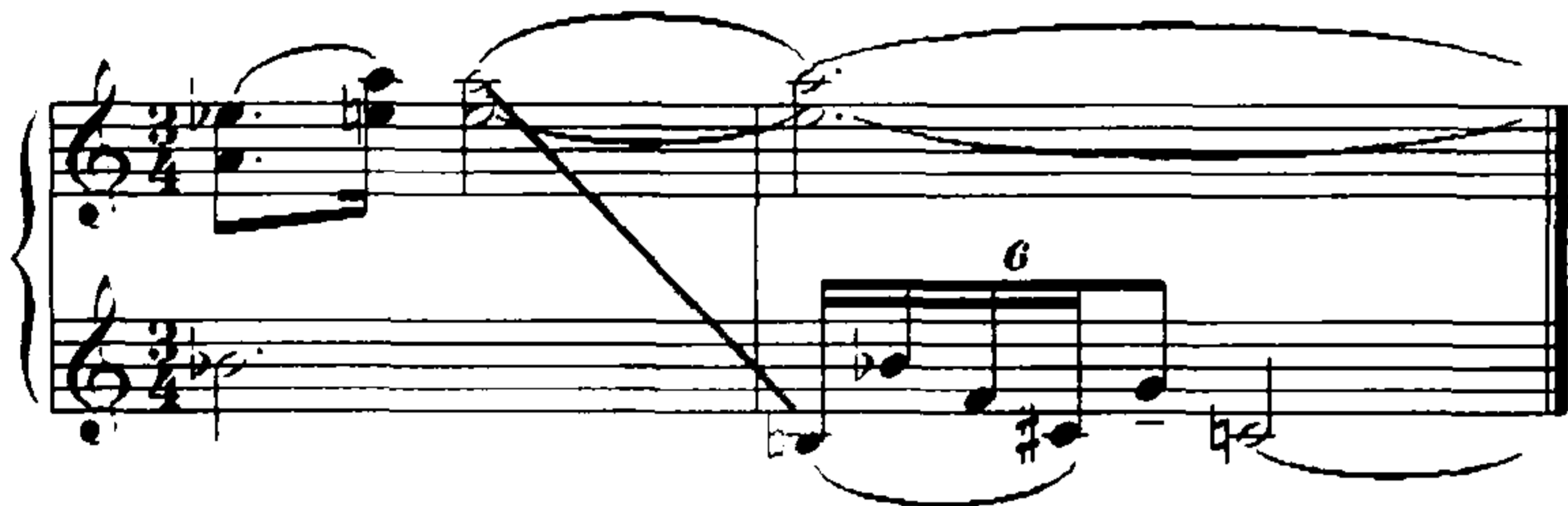
In 'Morning', she discovered that the intervals that join up phrases are often major/minor 2nds, 9ths or 7ths. The 9th intervals could easily be seen as compound 2nds and the 7ths as inverted 2nds. These intervals suggest that notes are linked together, if not literally in the same octave. For example, in the extract below, the long note A in the right hand in b.3 is answered by the B natural in the left hand in b.4; the top E in b.12 answered by the F in left hand in the following bar. (See Ex. 15 a and b.)

Ex. 15. Samuel, *A Garland for Anne*, 4. 'Morning'

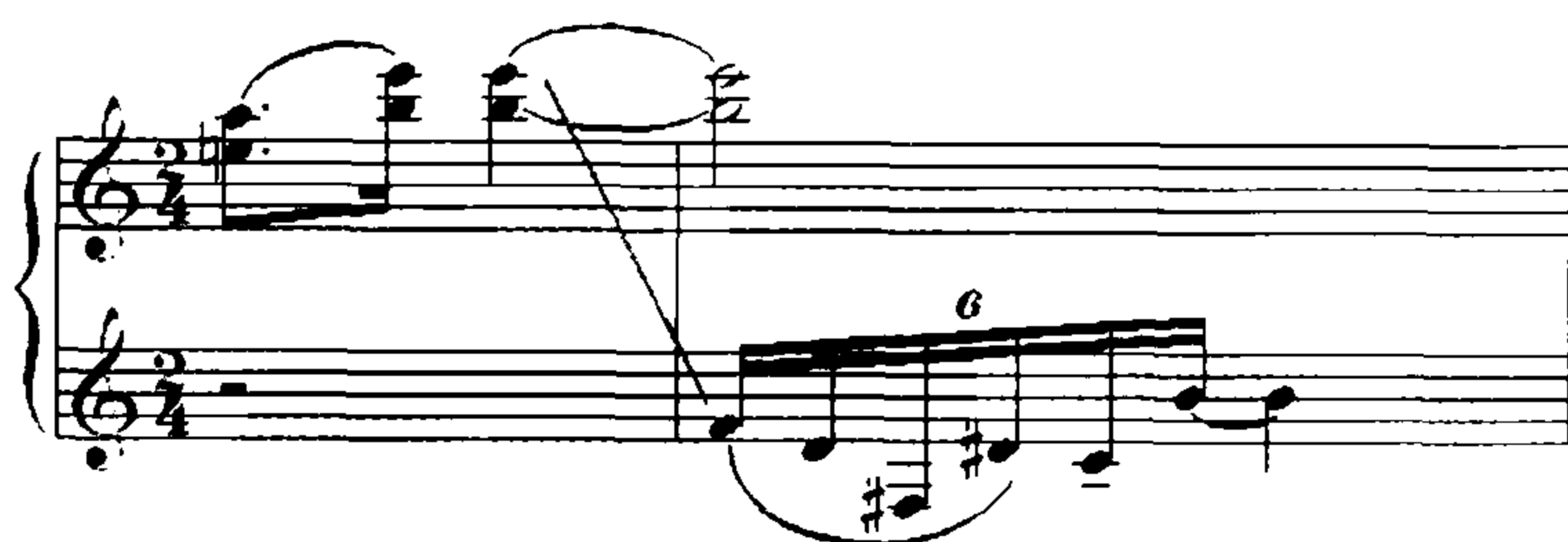
a) bb. 3-4

b) bb. 12-13

Kilian Samuel, Morning, bars 3-4



Kilian Samuel, Morning, bars 12-13



Inner Speech MM was employed when Pianist A was playing the piece. From the interview she revealed that she uses *Solfège* to 'sing' the notes internally at where she mentally highlighted the notes with the special intervals. It is the combination of Inner Speech MM and Interval MM on which she relied for memorising the first two pages of 'Morning'.

### Pianist B

During her assimilation of both works, Pianist B created highly personalised 'memory cues' to help herself, many of which seemed tally with the Music Mnemonics technique presented in the previous chapter. Here are some examples of what she used:

I memorised easy combination of fingers (what might be 1,2,3,4,5, or 5,4,3,2,1). I make unnoticeable accents in my head saying these numbers despite the fact I play many other notes in between this combination. In b.9, I articulated internally on 2 2 3 4 5 and it worked for me. (See Ex. 16.)



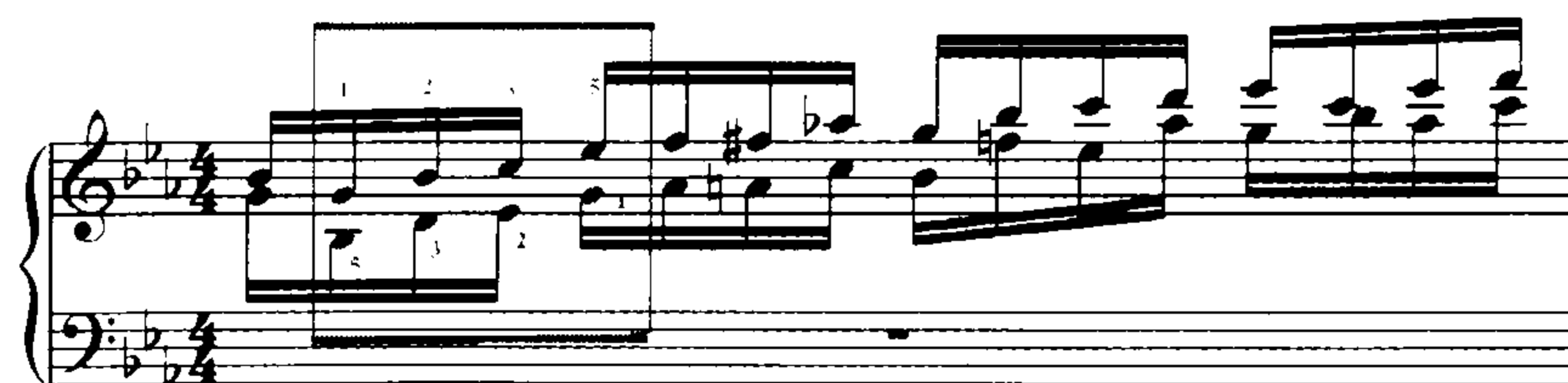
Ex. 16, Rachmaninov, Prelude, op. 23 no. 6, bb. 9-10



This memory cue is the Fingering Mnemonic. The pianist could recall the music by remembering the specific order of a set of fingerings. Pianist B also used a Visual MM as a memory cue, where recollection is aided by having a mental image of score, or keyboard, or certain hand positions:

Sometimes I used visual memory to remember the shape of my hand, usually when both hands play similar motif, like the chord at the beginning of b. 40, right hand is G B flat C E flat and the left hand is B flat D E flat G. (See Ex. 17.)

Ex. 17. Rachmaninov, Prelude, op. 23, no. 6. b. 40



The Key Note Mnemonic is one determined according to a pianist's own preference. Sometimes it can be the harmonic note of the unit, sometimes it is a pitch happens frequently, sometimes it can be an accidental. Pianist B and E also used this technique in

part of 'Morning'. Pianist B said:

What I call 'Hidden designed melody' is not the actual melody, instead they are single notes selected to represent a specially grouped unit. These selected notes then been joined together to form a 'new melody' in my mind to support memory.

This was used in Vivace section, 49-58.

She chose the first pair of dyads of each sequential figure as her Key Note, always playing its bottom note with the thumb in the right hand and the little finger in the left hand (see Ex. 18.)

Ex. 18. Samuel, *A Garland for Anne*, 4, 'Morning', bb. 47-56

The image displays a musical score for a piano piece, specifically measures 47 through 56. The score is written for two staves, treble and bass clef. The tempo is marked 'Vivace' with a metronome marking of a quarter note equal to approximately 136 beats per minute. The key signature is one flat (B-flat major or D minor). The music features a complex texture with many sixteenth and thirty-second notes. In measures 47-50, there are dynamic markings of *ff* (fortissimo) and some notes are marked with accents (>). In measures 51-56, the texture continues with similar rhythmic patterns. A circled note in the right hand of measure 51 is highlighted, corresponding to the 'Key Note' mentioned in the text. The score ends with a double bar line and repeat dots at measure 56.



### Pianist C

This exceptional case offers no further examples of memory strategies, as Pianist C relies only on his extraordinarily high level of Aural and Kinaesthetic Memories, as well as being confident of a sufficient level of improvisational skill to get over any mistakes that might derive from memory failure in performance.

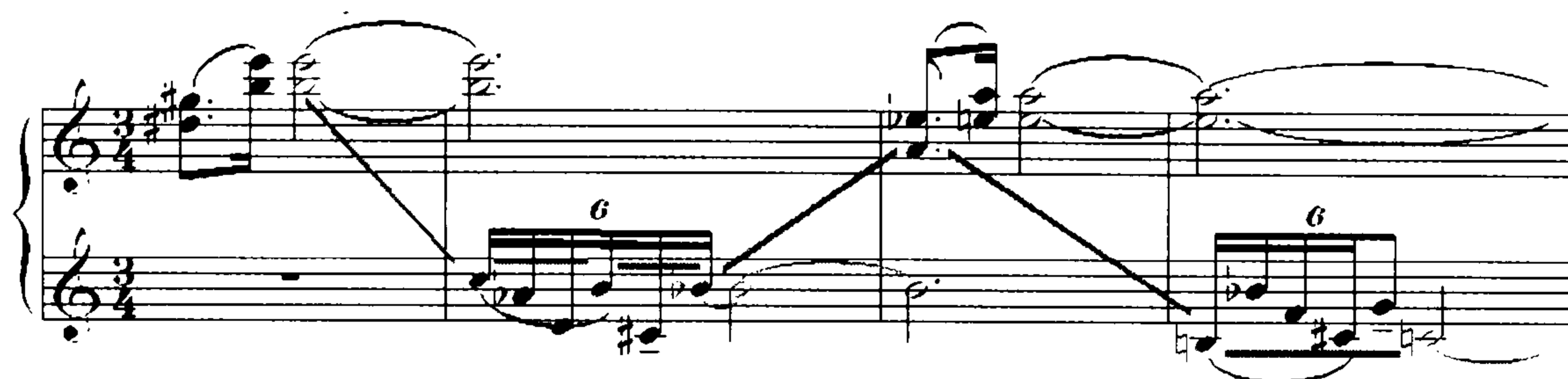
### Pianist D

As an experiment in the retrieval of memorization, after the interview, without forewarning, pianist D was asked to recall both pieces and try to play on the piano as much as she could remember. This was more than three months after her last recording and she had not continued to practise either of the pieces since that time.

Regarding the Rachmaninov Prelude, she remembered the first three bars and the right hand melody of the fourth bar, but was unable to remember the left hand. The 5th, 6th and 7th bars are identical to the first three and then the harmony changes on the 8th bar; again, she only remembered the right hand of this bar. The 9th bar starts from a different key, G minor; as she mentioned in her questionnaire, Pianist D made a mental note of this harmonic feature. In the test she was also able to remember this bar and the following.

When she tried to memorise Samuel's 'Morning', she had used a combination of memory cues including finding the key notes from both hands and connecting these notes into a scale: bb. 1-6, 12-15, 33-36, etc. (See Ex. 19.) This is similar to pianist A's approach, although A did not employ the scale concept.

Ex. 19. Samuel, *A Garland for Anne*, 4, 'Morning', b. 1-4



In the retrieval experiment, pianist D successfully played the eleven bars without much difficulty. Admittedly, the bars in this piece are shorter than in the Prelude; however, considering the atonal characteristics of the piece and the subject's lack of familiarity with contemporary music, this can be regarded significant, in comparing the retrieval result with that of the Rachmaninov.

The retrieval experiment shows clearly that pianist D's method of using Motor and Aural Memory for memorising the Rachmaninov is not as secure as the self-designed memory cues she created for 'Morning', even though, during the recording session, both pieces were played with equal fluency and memory sufficiency. This makes an interesting observation, that, in this instance, at least, Motor and Aural memory decrease drastically after a certain period of time, whereas consciously-designed memory mnemonics stay longer as Long Term Memory.

Another salient feature that emerged during the interview was pianist D's extensive emphasis on the Emotional memory. In the case of 'Morning', she created a story line to help the process of both memorisation and retrieval.



## Pianist E

Pianist E had adopted very different memory strategies for learning Samuel's 'Morning'. As mentioned earlier, she felt alienated by this kind of music and therefore had to create special, personalised memory cues. Many the strategies she created, interestingly, bear much resemblance to the concept of MM technique proposed in the last chapter.

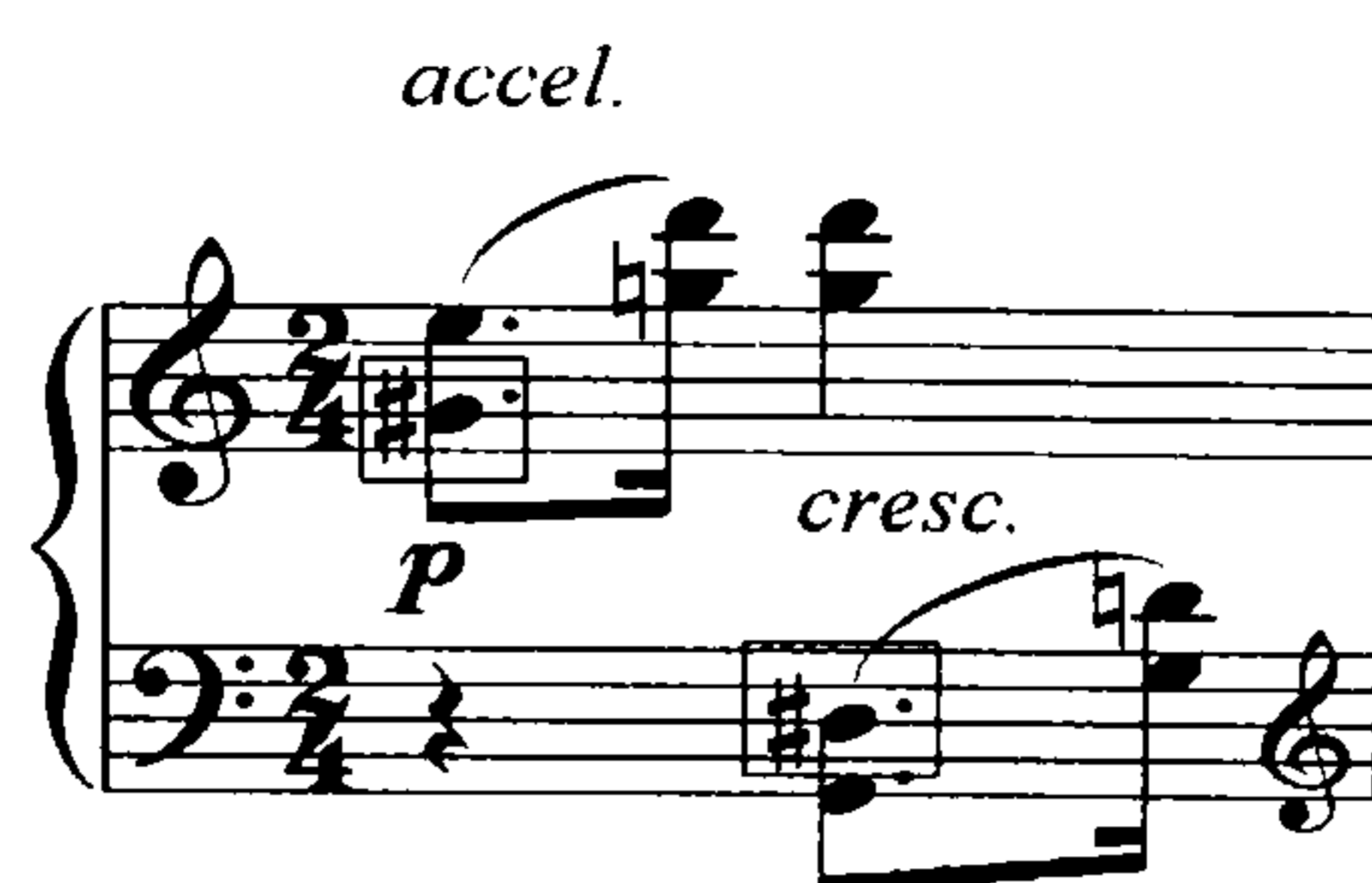
Below are some examples of pianist E's employment of the Key Note MM. In b. 58, she selected key notes E F G A as a short scale in the right hand; in b.37, she selected B A G as another short scale in the left hand. (See Ex. 20.)

Ex.20. Samuel, *A Garland for Anne*, 4, 'Morning', b.58 & 37

The image displays two musical staves from Samuel's 'Morning'. The top staff, labeled '8va', shows a right-hand melody in treble clef with a dashed line above it. The bottom staff shows a left-hand accompaniment in bass clef. The first system (measure 58) features a right-hand scale of E-F-G-A and a left-hand accompaniment. The second system (measure 37) features a right-hand accompaniment and a left-hand scale of B-A-G. The score includes various musical notations such as clefs, time signatures, and dynamic markings.

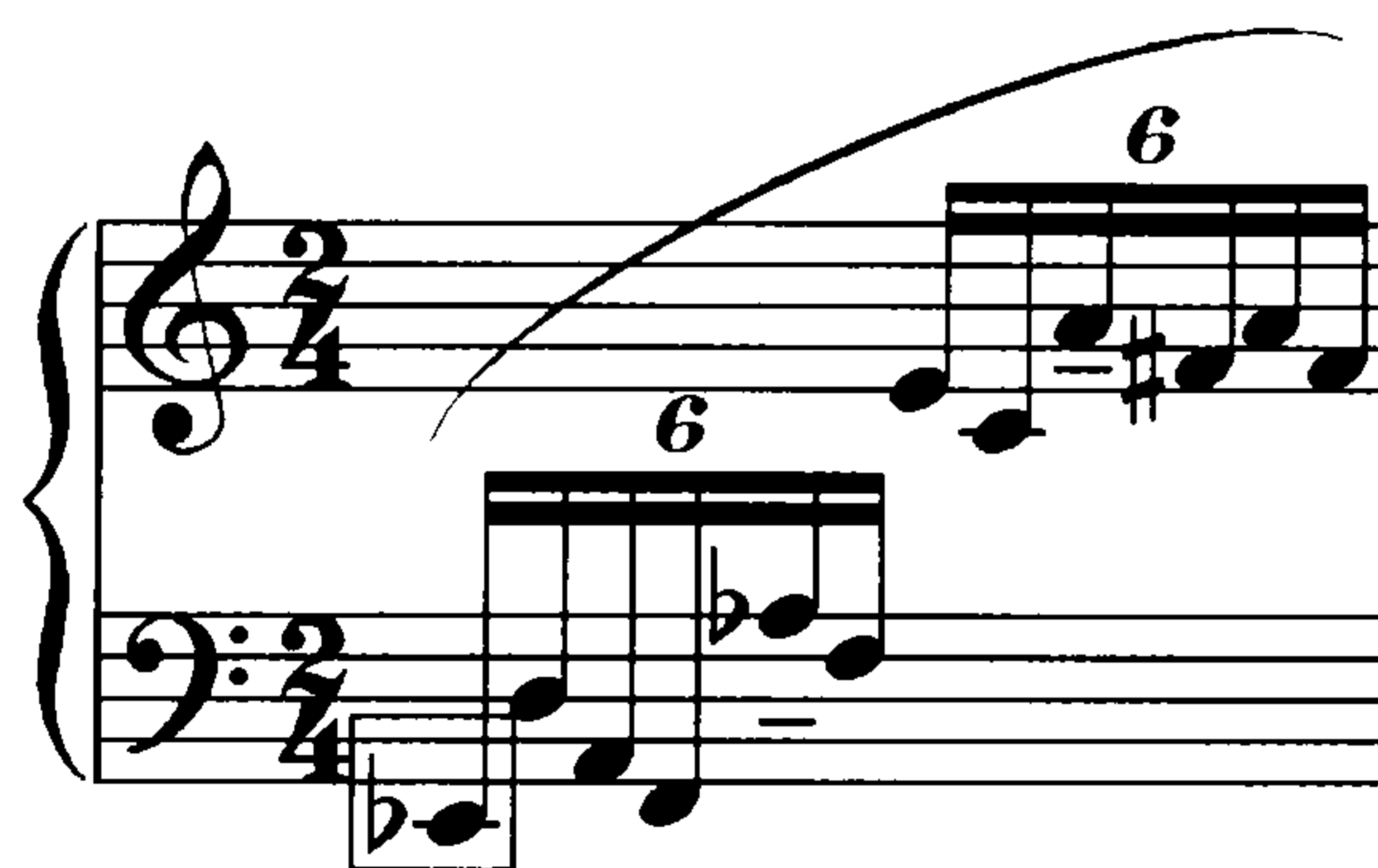
Pianist E used a Visual MM of the score image and the hand positions, with both thumbs located on the sharps, thus her mental image of landing on the black keys as well as the sharp markings on the score strengthened her memory. (see Ex.21.)

Ex. 21. Samuel, *A Garland for Anne*, 4, 'Morning', b.18



In b. 7, she visualised (similar to Visual MM) the first note, E flat, from the score image, as well as the movement of her left hand's leap to the low register. (Because she has no perfect pitch, she had to remember the first notes to start with). See Ex. 22.

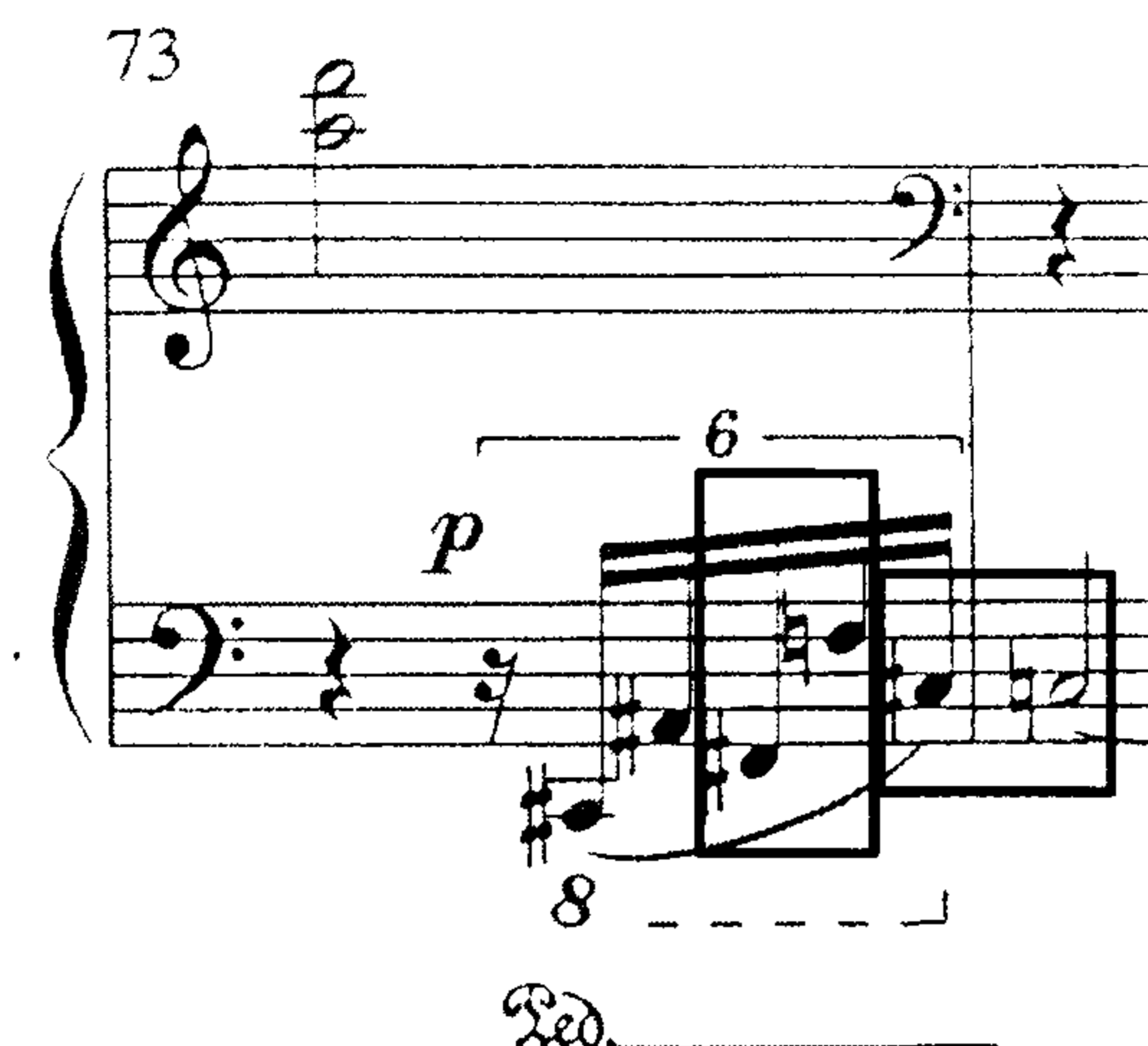
Ex. 22. Samuel, *A Garland for Anne*, 4, 'Morning', b.7



In b.73 she remembered the feature in the left hand as sharps followed by naturals: F sharp to F natural, C sharp to C natural (similar to Visual MM and Relative MM), repeated twice. (See Ex.23)

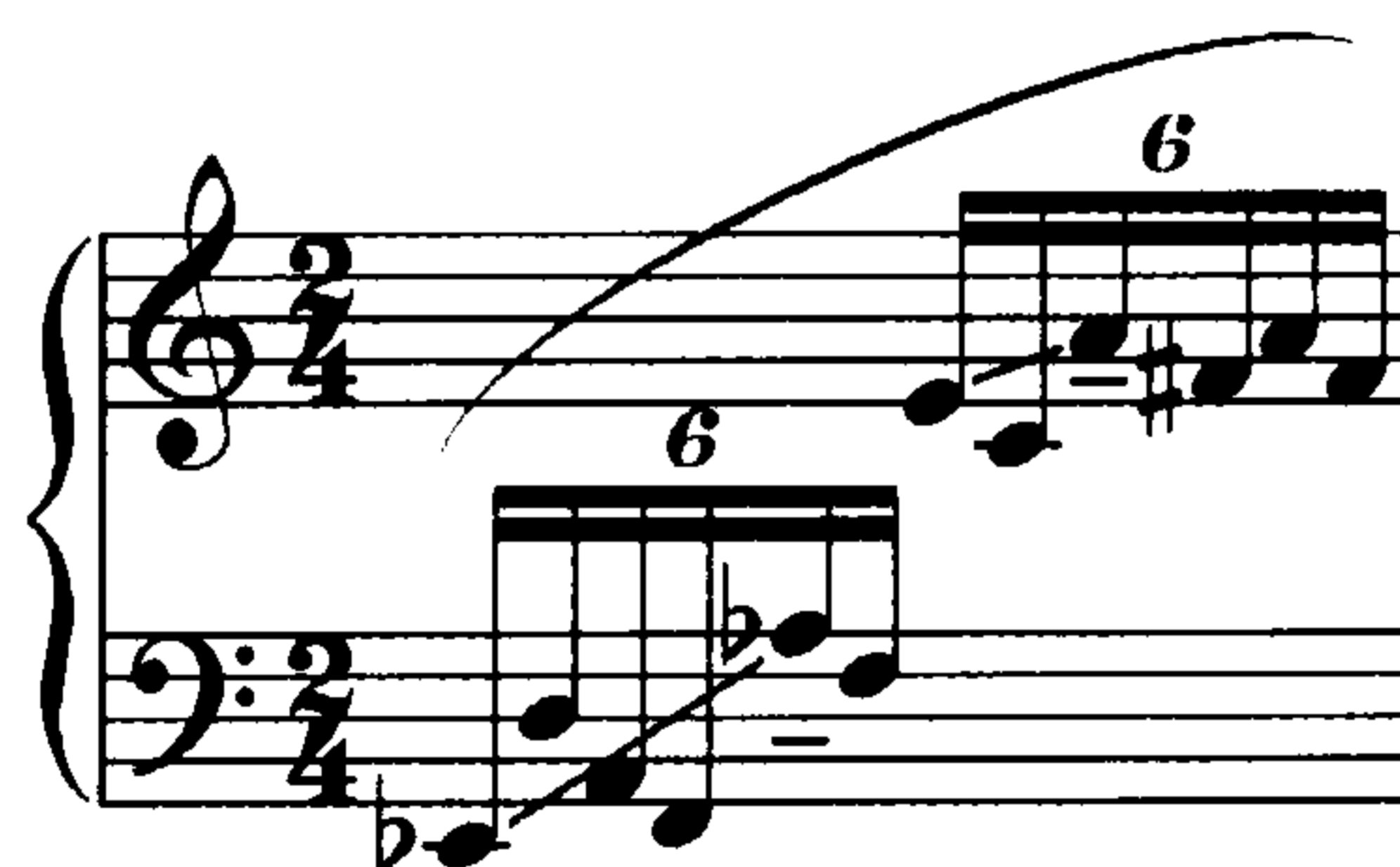


Ex. 23. Samuel, *A Garland for Anne*, 4, 'Morning', b.73



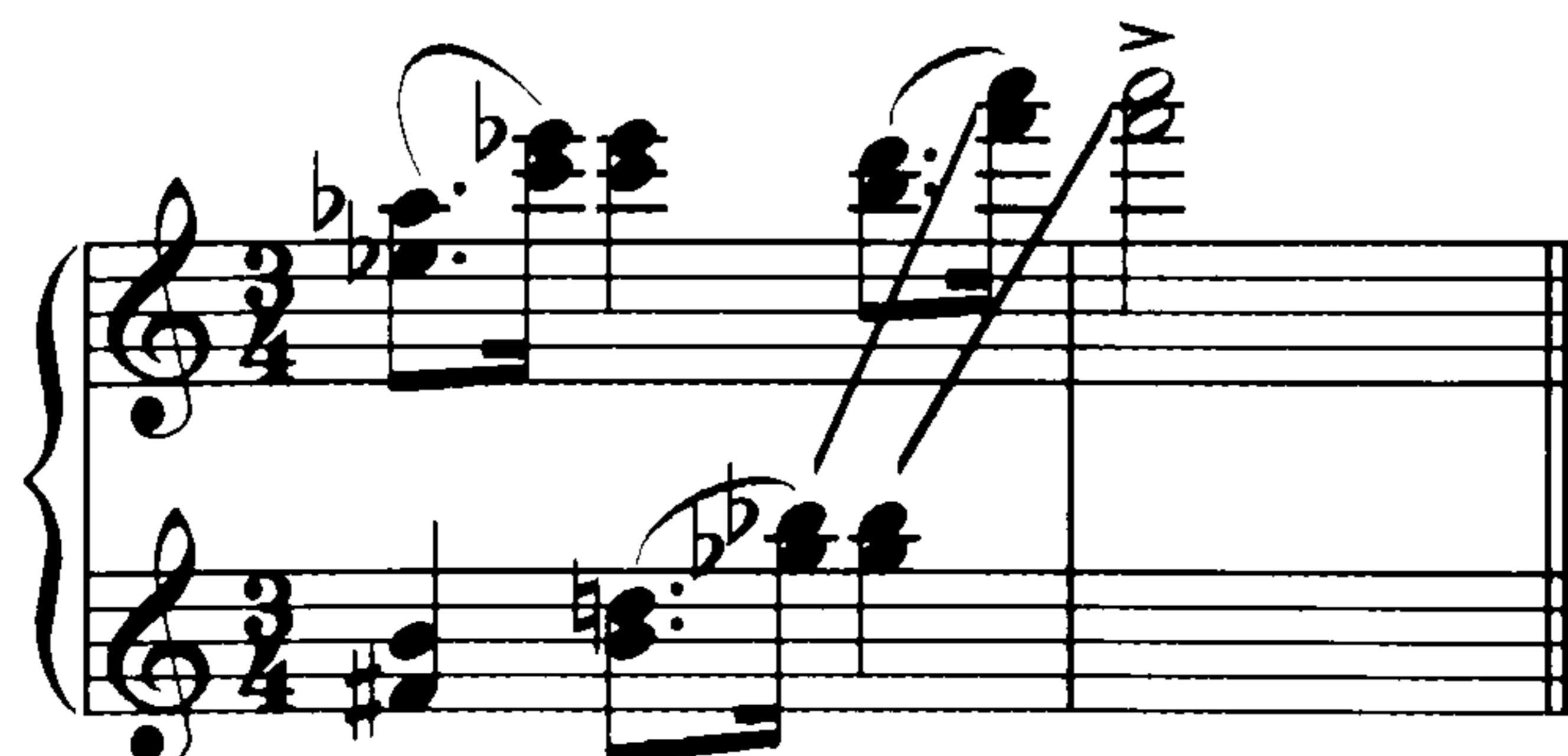
Pianist E selected a small unit of notes and then used the Relative MM to relate these units. In b. 7, for instance, E flat and A flat in the left hand as one unit goes a semi-tone up to the E natural and A natural unit in the right hand (see Ex.24).

Ex.24. Samuel, *A Garland for Anne*, 4, 'Morning', b.7



In b.20, G flat and B flat move to F and A in the right hand one semitone down (similar to Relative MM), though not in the same register (see Ex.25).

Ex. 25. Samuel, *A Garland for Anne*, 4, 'Morning', b.20



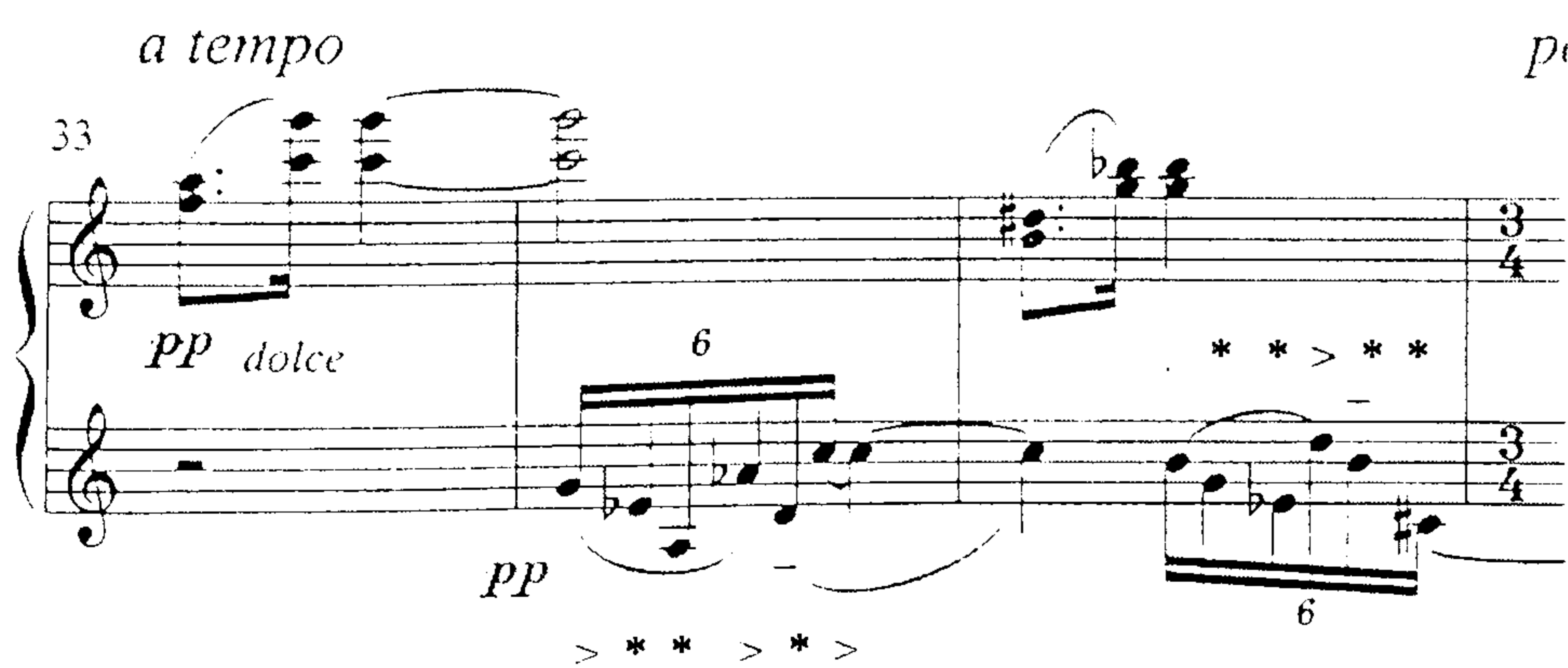
In b.43 Pianist E related the dyads shared by the hands (Relative MM) , E flat - G flat and D flat and F from right to left hand. (see Ex.26.)

Ex.26. Samuel, *A Garland for Anne*, 4, 'Morning', b.43



Pianist E uses specific rhythmic features as cues to trigger her memory; this proves to be a memory tool additional to those proposed in the third chapter. Thus, the Rhythm MM can be added to the list of MM techniques. For instance, in bb.34-5, Pianist E found the left hand part is difficult to memorise, so, in her mind she divided the semiquavers into three small groups, the first of three semiquavers, the second of two and the last, simply a the long note: a tied semiquaver. Her verbal account of these internal patterns is presented as > \* \* > \* >. (see example 27 below).

Ex. 27. Samuel, *A Garland for Anne*, 4, 'Morning', b.33





Like all other pianists who took notice of the clear pattern of the *Vivace* section of 'Morning', pianist E also immediately discovered that the right hand part moves three intervals down repeatedly, so does the left hand part, although played non-synchronously. She also discovered the repeated interval patterns in bb. 62-3 (similar to Interval MM), i.e., in the left hand, the fourth intervals, first descending then ascending (see Ex. 28).

Ex. 28. Samuel, *A Garland for Anne*, 4, 'Morning', bb.62-3



At bb.64-68 the complexity of the music attains its peak. The right hand part is densely written with big stretches, and has to be played in a fast tempo. Every pianist acknowledged these bars are some of the hardest to memorise. Pianist E suggested that, when she encountered this kind of difficulty, she tried to pre-programme an internal melodic line, which doesn't necessarily resemble the music as played. In bb.64-68 she singled out an internal melodic line, C, F Sharp, B and F Natural, and played this many times to engage her Aural Memory (internal Aural MM). The melodic fragment consists of the same notes, although occurring in different rhythms and registers (see Ex.29).

Ex. 29. Samuel, *A Garland for Anne*, 4, 'Morning', bb.64-6

The image shows two systems of musical notation for piano. The first system, starting at measure 62, features a right-hand melody with a forte (*f*) dynamic and a left-hand accompaniment with a mezzo-piano (*mp*) dynamic. The second system, starting at measure 66, includes a decrescendo (*dim*) and a tempo change to 'meno mosso' (approximately 60 bpm). The score includes various musical notations such as dynamics, articulation, and tempo markings.

Some of pianist E's memory strategies are combined memory cues. For instance, in b.48 she singled out a G major chord, as shown below, and remembered its sound (Aural MM) as well as recording the letter-names G D G using her Speech Memory MM to help recall the music. (see Ex.30.)

Ex. 30. Samuel, *A Garland for Anne*, 4, 'Morning', b.48

The image shows a single measure of musical notation, measure 48. It features a right-hand melody with a forte (*ff*) dynamic and a left-hand accompaniment. The score includes various musical notations such as dynamics, articulation, and tempo markings.

In another combined usage of different memory cues, at b.47, pianist E selected the notes, E F and D E, and defined the motif as rotating around the E, therefore



simplifying the information in her memory cue. This is consistent with her predilection to select notes successively, creating scales. This way, information is compressed into manageable memory cues, just as previously suggested as regards the properties of the MM technique (see Ex.31).

Ex. 31. Samuel, *A Garland for Anne*, 4, 'Morning', b.47



### Conclusion

The five pianists' approaches to memorising, as aforementioned, varied greatly from one another, perhaps due to their different background training and idiosyncrasies. Nevertheless there are a few features common to all their memorisation processes.

First is the use of fingerings. Everyone started learning both pieces by marking in their own fingerings, in various places almost throughout each piece. What is interesting was that the fingering markings are selective; for example, none of the five pianists marked many fingerings for the Rachmaninov Prelude's right hand, which provides a rather straight-forward melodic line. The only exception is pianist B, who selectively

marked a few places for the right hand with the same set of fingerings, which suggests that she uses this particular set of fingerings as a memory cue. On the other hand, for the more complex left hand passages, everyone marked in individual and different fingerings throughout. Of course, specially-targeted fingerings are a fundamental tool for pianists to learn to *negotiate* certain passages; but here it is clear that they also prove a means of initiating the memorizing process. The fingerings used by the five pianists for these passages varied considerably. The fact that the patterns had to be worked out and then learned from the page, and did not come automatically suggests that, contrary to what most people believe, kinaesthetic memory can serve as a non-automatic memory tool for memorisation. This confirms what was previously suggested: ‘A large part of physical piano playing is facilitated by the fingers; it is not hard to imagine that specific-domain-designed fingerings can be an important component of MM.’<sup>6</sup>

Secondly, all of the pianists divided long passages into smaller sections so they could tackle memory difficulties separately and in detail. Pianist B divided sections almost phrase by phrase. This way the bulk of information could be sufficiently dissected for a personalised internal memory map of the piece to be constructed.

Thirdly, despite the different levels of their Aural Memory, all pianists claimed that they largely rely on their hearing memories. In fact, pianist C is almost entirely dependent on his Aural Memory in the memorising process.

Fourthly, an innovative MM (rhythmic MM) was proposed by pianist E, when she tried to create an internal rhythmic mnemonic to help her to recollect. This mnemonic can be incorporated into the collection of the MM mentioned in the previous chapter.

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<sup>6</sup>See Chapter 3, 13.



Fifthly, the pianists tended to create memory-retrieval cues, either conventionally, personally or innately when they met problematic passages. Out of the five pianists in the study, four used specially created memory strategies. Only pianist C, with his extraordinary and highly developed aural capability and improvisational skill, did not rely on overt memory strategies. Moreover, pianists tend to create these memory cues for less familiar and memory-challenging works, in this case, Samuel's 'Morning'. These cues, as long as they had been consciously considered, were more likely to lead pianists to successful results of memorisation in the performance that followed, and to allow them to retain this information for considerable periods of time.

## APPENDIX 1: Answers to the Questionnaire

### Pianist A

Recording date: 04/12/03. Take 4, take 7

2. Please note the total amount of practise time (in hours) that it has taken you to do so for each piece.

Rachmaninov: 12 hours 30 min.

Samuel: 16 hours.

3. Please note the amount of time each session took.

Rachmaninov:

23.11.03	1 hour
25.11.03	1 hour
26.11.03	1 hour 30 min
27.11.03	1 hour
28.11.03	1 hour
29.11.03	1 hour 30 min.
30.11.03	1 hour 30 min.
1.12.04	1 hour
2.12.04	1 hour
3.12.04	1 hour
4.12.04	1 hour

Rhian Samuel:

29.10.03	30 min.
30.10.03	2 hours
1.11.03	2 hours 30 min.
2.11.03	3 hours
3.11.03	2 hours
break, approximately 4 weeks	
27.11.04	1 hour
28.11.04	1 hour
29.11.04	1 hour
31.11.04	1 hour
2.12.04	1 hour
3.12.04	1 hour

4. Please record on paper and step-by-step, as far as possible, how you memorised the pieces. For instance, if you divided the piece into sections, what were these sections? Then, did you practise the two hands separately? Did you practise the most difficult passage first? Etc. (The more information the better; use the additional paper provided if necessary)

Rachmaninov:

From first session of practice I start sight-reading the piece, meanwhile divide the piece into three sections: bar 1-13; bar.14-22; bar.23-43. I decided to start leaning the first section slowly. Since the left hand appear to be complicated and has many notes, I tried to find some patterns, but with no much success. There are only few details I can follow, then I tried to play both hands together.

In the second session, I practised what I have learned so far and concentrate on learning the second section. (bar.14-22) Similar to the first section, the left hand is more difficult to memorise, so I mainly concentrate to learn the notes of the left hand.

From the first two practice sessions I found some harmonic, scale features, which can help me to memorise this piece. For example, bar 14 starts from E Flat Major; bar 15 starts from A flat major; bar 18 starts from dominant 7<sup>th</sup> chord.

From the third session I began to memorise the first and second sections. I start to memorise phrase by phrase. (usually every 4 bars a phrase by the right hand's melody)



Apart from doing this I mentally insert small features to guide my memory, such as a specific chords, hand position, bass notes, etc.

The fourth session I continue to practise the first and second sessions (1-13, 14-22) and try to connect all the information I learned with the physical playing. I analyzed the harmonies in detail and also tried to memorised aurally, since that by this stage I am familiar enough with the piece to know how it should sounds. If I made a mistake I tried to find the correct note by my ear without looking at the score. If I still could not find the right notes I look at the score with more scrutiny and remember them deliberately. There are some places where I always made mistakes: bar 9 for example, my ear doesn't 'hear' the notes so I often forget; bar 8 has tricky harmonic changes and so I try to solve the problem by remembering the fingerings which I put in specifically for this place.

From the fifth session I began to learn the third section. (bar 23-43) Started to learn from left hand because it's identical with the beginning of the piece. However, from bar 24 the left hand is varied from the beginning, which is very confusing to memorise. I know if I am not careful it is very easy for me to turn back to the beginning, so I had to make sure there is no mistake. From bar 28-30, a middle voice added to the right hand which is hard to memorise, so I play it separated from other parts until I am totally familiar with its sounds. Whenever I play this bar I always pay more attention to the middle voice instead of the top voice, which is the main theme. The coda is difficult to memorise as well, there is no certain patterns I could find to follow as a guidance for memory, so I practised a lot to be assured with my finger memory.

I use the six session to continue to learn the third section. Basically I revised what I have done in the last session.

I use very same approach to practise from the seventh to the eleventh sessions. I tried to play this piece from beginning to end by memory, and revise the details and the small features I found in my previous practice sessions, and strengthen my memory each time as I played through the piece. I didn't learn this work as quick as I would wanted, and my hands seemed always able to find the notes before my brain can follow, which made me feel insecure sometimes. I kept practicing this piece after I memorised it, until everything really sank in deeply and eventually I feel very secure about my memory.

Rhian Samuel:

In the first session I read through this piece from beginning to the end, and divided it into six sections, which almost follows the divisions by the double lines of this composition: bar 1-11; 12-32; 33-48; 49-60; 61-68; 69-78.

From the second session I began to analyse this piece, I found out some key features which made it easier to follow for memorisation. I found that the 7th, 9th, and 2nd intervals play are important component of the piece, which I can see in almost every bar. After two hours of practise I roughly learned the first three sections and can almost memorise those interval patterns. Similar patterns appeared in the left hand of bar 34 and bar 41 although on the different keys. Bar 37, 39, 44 and 46 all have augmented 4th. (or diminished 5th)

In the third practice session I tried to memorise the first three sections (bar1-48) and start to learn the remaining parts. At the same time, I tried to find patterns as I did previously. (Memory features Jue has found in this piece will be transcribed in detail in a separate paragraph)



In the fourth session I start to memorise section four to six. (bb. 49-78) Different from the rest of the piece, section four (bb. 49-60) has very regular patterns and I have to practise a lot to get the technique precision. Section five is more difficult because there are big jumps and the intervals are irregular, so I just have to rely on the physical practise to memorise and get skillful with the keyboard geography of this section. Section six is quite easy to memorise. There are fewer notes and the tempo is slow so I found no difficulty to memorise the last section.

I tried to play though the piece in the fifth session. My major problem is that I can internally remember the notation but my hands cannot follow as that quick. It is the complete [opposite] situation from when I learned the Rachmaninov, where I hands are ahead of my brain. The third section and the fifth section are particularly hard to memorise, nevertheless I felt I more or less learned this piece by now. I took a break from practise this piece for about six weeks after this session.

From six session to twelfth session I revise all the figures of intervals, patterns, etc. and basically playing repetitively so my hands could catch up with my brain. I also use metronome to guide the tempo changes marked on the score.

*5. What methods and idiosyncrasies have you used for your memorisation of the two pieces you have been given?*

Rachmaninov: Mainly depend on the analysis of the harmonies. This helped a bit, but I still need to practise each hand separately, specially left hand (motor memory). The aural memory is also equally important.

Morning: Connecting the intervals through both hands, helped me to connect the whole piece.

*6. Are there any significant differences in the way your memorised pieces A and B?*  
Quite different.

Rachmaninov: No significant patterns. I mainly relay on the aural and motor memory and also harmonic analysis.

Morning: Interval features through the whole piece.

*7. If your answer is YES to question No.6 please write down your personal approaches and reasons.*

*8. In your opinion, where and why are the most difficult passages to memorise in these two pieces?*

Rachmaninov: no particular passages, mainly the left hand. I spent a lot of time practising the left hand (finger memorisation) when I encounter a certain pattern that I can not follow.

Morning: bars 61-68 It is a really fast passage. Even when I memorised it, my hands were not able to coordinate well enough, therefore I had to practise it a lot.

*9. Do you use any specific techniques of memorisation for these passages?*

Rachmaninov: Bass line, hand positions, harmony, memorise hands separately.

Morning: Finding intervals. Finding the connecting notes between both hands



10. Do you think by doing this experiment it has helped you be more aware of the issues concerned with memorisation? Please write down any observations you might wish to make about this.

Yes. I was aware of the several techniques I used for memorisation.

11. What general opinions would you like to offer with regard to a pianist's memorisation?

Analyse the thoroughly and use as the foundation of the memorisation. Structure, Harmony, phrasing, etc...

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## Pianist B

Final Recording: 17/12/03  
LRR – Studio recording

1. Please take these two short pieces and memorise them.  
OK

2. Please note the total amount of practise time (in hours) that it has taken you to do so for each piece.

Until total memorising, excluding practice of performance:

Rachmaninov .- 4 hours 35 minutes

Modern piece.- 18 hours 50 minutes

3. Please note each span of time you used from the first session to the last. (in hours)

Rachmaninoff:

26/04 - 30min.

29/04 - 25min.

30/04 – 35min.

04/05 – 30min.

05/05 – 30min.

07/05 – 45min.

09/05 – 15min.

21/05 – 20min.

22/05 – 10min.

29/05 – 25min.

04/06 – play through

Modern piece:

Since 10<sup>th</sup> of June until 15<sup>th</sup> July -  
every day for half an hour

4. Please record on paper and step-by-step, as far as possible, how you memorised the pieces. For instance, if you divided the piece into sections, and what the sections were; if you practised the two hands separately; if you practised the most difficult passage first, Etc. (The more information the better; use the additional paper provided if necessary)

I have divided the piece into sections. I have marked the sections in the score with big brackets [ ]. Each bar I memorise has its own technique but it all comes through association and maximum creation of links between everything. I almost always talk to myself when I am on the first stage of looking at the piece, because sometimes I remember something not because I memorised properly, but because I remember how I talked about this. I always divide the piece in little sections (2-3 bars) and add the next couple after dealing with the current two. Never memorise more than one page a day (with these two pieces. It is different with something smooth like Haydn), otherwise it all



gets mixed up.

I knew that I can only memorise them from the beginning bar by bar because if (sic.) I learn the difficult places first, I get confused and forget it all again.

There are things which I knew about my memory which I discovered during this process. I knew that for me it (sic.) only works if I do not learn those two works both at the same time. I knew that my perfect pitch will make Rachmaninov to be learnt immediately, but it will disturb me if I learn the modern piece at the same time because then (sic.) I would tend to (sic.) always hear wrong advices from my pitch influenced (sic.) by the modern piece.

Morning: I did not realise that sometimes when one aims to memorise for the mere sake of (sic.) memorisation of the piece and disconnect oneself from the purpose of reaching for deeper musical depth, making associations for memory, (like sequences, chromaticism, harmonic patterns, etc.) becomes much easier task after a little while in this logic game, though (sic.) it might be an anti-musical process.

The more I got into the modern piece the easier it becomes to memorise, especially for the last pages. Maybe it is because my brain gets used to this language and there is always something common with the beginning and the end of the piece.

Rach: Almost the exact opposite with *Morning*, I felt its texture could be easily reconstructed only because it is very attractive in sound to my ear (if I enjoy one chord, it memorises itself immediately, the same with any turn of the melody, etc.)

When I aim for memorising in time I do not use to memorise two hands separately. To me it means that I have to remember twice longer material.

Rachmaninov Prelude:

There are a few very specific tips for my memory I've used here.

1) The first one was to memorise the middle voice (in the right hand chords) like a melody. I need it because I often get correct harmony but in the wrong position. For example: bars 11-12 (see green circle), bars 21-22. And, of course, mainly on the page 32 where it is a separate voice.

2) memorisation through easy combination of fingers (what might be 1,2,3,4,5, or 5,4,3,2,1). I make unnoticed accents in my head saying these numbers in order despite I play many other notes in between this combination. Look at bar 9: I articulated intentionally on 2 2 3 4 5 and it worked for me. (inner speech) Sometimes I concentrate on repeated note most frequently appeared in a short passge (sic.). For example bars 37-38 F repeats, or bar 8 E flat.

The red slur above left hand, shows that how I have phrased the left hand internally (sic.) in the first session, in order to make it easier for my memory because they have been cut into shorter/quicker segments in my mind (sic.) to remember. It often starts from the second note after the notes on each beat, I do not know why.

Bar 27,33 and 42 turns out to be the hardest one for some reasons I cannot fathom and the following 4 bars are also complicated. I found it hard to remember some of the bigger chords, like in bars 18-19 and 28.

The coda line in bars 39-42 was carefully analysed and learnt in small sections:

Bar 39 Left Hand up to G is the same as the opening



- Then right hand E flat and F, and left hand C and D had the same fingering 2 1
- Easy motifs are memorised by visual memory, like the chord at the beginning of bar 40, right hand's G B flat C E flat with left hand's B flat D E flat G.
- Two tritons 4<sup>th</sup> interval with resolution in fact (sic.) between the left and right hands: right hand: B flat C – left hand: F E flat; right hand: D E flat – left hand: A flat G in bar 40.

The last two bars were also learnt gradually in small sections.

Morning –Rhian Samuel

This piece have such combination of notes and chords which seemed I could never be able to memorise at the beginning of the learning. Nevertheless, forcing myself to get through I discover few common features which helped me to memorise it.

These were:

- 1) Almost every little bit has a chromatic connection with the previous one. See the drawing in green lines on the score. Bar 2-6, 10-15, 33-37, 71-72, etc.
- 2) There are also patterns of chords like sequence of sixths, fifths, fourths and thirds (bars 18-21)
- 3) The second half of the piece has many clashing intervals which I marked in green circles in the score. Bar 37, 43, 60, etc.
- 4) The Vivace section is actually the easiest section to remember. Once I understood how it was made up, I did not have to look at the music. Right hand only goes in thirds C A F D B all the way through. Left hand also, excluding just one step forward E C, D B, C A, B G. The section is also divided in three lines (three slurs in the score).
- 5) Hidden designed melodies to support memory, marked in red lines. Bar17, Vivace section, 59, etc.
- 6) As I was getting through, the more time I spent with the first with the first two pages, then something clicked and it got easier. As if my memory understood what was demanded, the last page became the simplest one to learn.

*5. What methods and idiosyncrasies have you used for your memorisation of the two pieces you have been given?*

- 1) Repeating shorter sections over and over rather than play through.
- 2) Finding the biggest possible amount of associations like chromaticism, repeating chords, similar patterns, clashes.

*6. Are there any significant differences in the procedure of your memorisation between piece A and B?*

Yes, in the first piece I was fundamentally supported by my pitch and natural memory, in the second I had to create lots of tips for my head.

*7. If your answer is YES to question No.6 please write down your personal approaches and reasons.*

Everything I used probably will be totally useless for any other person. It is just the case of knowing how exactly works on your own memory and wich methods are progressive for it.



8. *In your opinion, where and why are the most difficult passages to memorise in these two works?*

Rachmaninoff

Bar 27 (and maybe 27-32 was not comfortable either). Also bars 13, 33 and 42.

Morning:

The first bar! I never remember the chord to start. I spend ages with the first 2 pages.

Nothing worked, but then it suddenly got better, and the last page was memorised from the first reading.

9. *Do you use any specific techniques of memorisation for these passages?*

I tried to describe it in the previous pages. I hope it will be useful in some way

10. *Do you think by doing this experiment it has helped you be more aware of the issues concerned with memorisation? Please write down any observations you might wish to make about this.*

Yes, it helped me indeed. The more I got into this specific task, the more hidden connections I found, as well as tips and quicker ways of doing it.

11. *What general opinions would you like to offer with regard to a pianist's memorisation?*

I am deeply convinced that one must always demand from ones memory more than what it is used to do, and that it develops the same way as technique does when working with studies. The more you stretch your memory, the better it becomes.

I was working in the C major sonata by Haydn (Hob. 50), and Chopin Scherzo number 3 parallel with the modern piece. Because of this modern-war-training, haydn was completely memorised in two days, and the Scherzo just in four days. I believe that was the result of this scratching.

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## PIANIST C

1. *Please take these two short pieces and memorise them.*

2. *Please note the total amount of practise time (in hours) that it has taken you to do so for each piece.*

Rachmaninoff:

4 hours (to get through) + 3 hours and 30 minutes (to full comfortable).

Samuel:

5 hours (to get through) + 3 hours (to full comfortable).

3. *Please note each span of time you used from the first session to the last. (in hours).*

See below.

4. *Please record on paper and step-by-step, as far as possible, how you memorised the pieces. For instance, if you divided the piece into sections, and what the sections were; if you practised the two hands separately; if you practised the most difficult passage first,*



*Etc. (The more information the better; use the additional paper provided if necessary)*

20th November: 30' Rach., 15 min. Samuel. Went through both pieces, sight-reading both. Tried to find a few key points in Samuel.

28th November: 30' Rach., Played through very slowly a few times, tried at actual tempo.

5th December: 10' Rach., 5' Samuel. Played through both slowly.

7th December: 1 hour Rach. Played a few times. Fingered half of LH in detail.

8th December: 1 hour 40' Rach. Changed fingerings and fingered rest of the piece, beginning to fall into place. Comparison of similar passages, find 3 bars practised a lot, LH/RH alone. 20 min Samuel. Isolated more problematic areas, split into sections.

9th December: 10' Rach. Played through, was able to get through (just) without music.

15' Samuel. Played slowly twice, once through.

10th December AM: 45' Rach. Ok, just (...) checking. 1 hour 30' Samuel. Realised was not working, tried section by section, got through most of it. Used colours to highlight points.

10th December PM: 2 hours 20' Samuel. More section work, lots of testing and repetition. Performed both to friends ok but quite a few memory slips.

11th December: 30' Rach., 30' Samuel. Better, but still not perfect.

January/ February: Player both on a matter of occasions, total time probably 2 hours each.

*5. What methods and idiosyncrasies have you used for your memorisation of the two pieces you have been given?*

Generally speaking, a mixture of musical practice (i.e. generally playing through the pieces to try to absorb them naturally), and more mechanical techniques (slight photographic memory- i.e. where things appear on the page; technical repetition, etc.) Fingering pieces tends to be a large step in the process. More details below...

*6. Are there any significant differences in the procedure of your memorisation between piece A and B?*

Yes.

*7. If your answer is YES to question No.6 please write down your personal approaches and reasons.*

Rachmaninov – Required a more gradual sinking in of the music in terms of harmony/melody/rhythm. I did not divided this into sections, just played from begging to end many times (occasionally using particular techniques – note doubling, very slow practise, different rhythms, hands separately, etc.)

Samuel – Much more mechanical learning. Had to split piece into sections and learn in concentrated way (i.e. just testing myself on a section until I knew it properly). For more difficult passages I had to select some key points to hold on to and learn them in a fairly unmusical way.

*8. In your opinion, where and why are the most difficult passages to memorise in these two works?*

Rachmaninoff: No specific passages, just general structure stile difficult as there are many similar fluctuations in LH in particular.

Samuel: Bars 36-39 (especially bar 37); bars 43-48; bars 59-68 (especially bar 59).



9. *Do you use any specific techniques of memorisation for these passages?*

Rachmaninov: Note doubling, visual memory (a little)

Samuel: Very mechanical methods (i.e. just making myself remember specific chords by name), lots and lots of repetition!

10. *Do you think by doing this experiment it has helped you be more aware of the issues concerned with memorisation? Please write down any observations you might wish to make about this.*

Has definitely made me think about it more, though I have always been fairly aware of various memory issues. See below.

11. *What general opinions would you like to offer with regard to a pianist's memorisation?*

Deeply individual/subjective. In some ways I do not feel I have typical memorisation patterns. Everyone uses a mixture of techniques. For me a lot of it is a fairly instinctive and unconscious memorising, but often needs to be supplemented by mechanical learning for further security. The most dangerous time on stage is if I switch between these levels of consciousness.

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Pianist D

1. *Please take these two short pieces and memorise them.*

2. *Please note the total amount of practise time (in hours) that it has taken you to do so for each piece.*

Rachmaninov 7 hours

Samuel 10 hours

3. *Please note each span of time you used from the first session to the last (in hours).*

Roughly,

Rachmaninov 45 min. x 9 sessions + another 2 recording sessions of approximately 45 min.

Samuel 1 hour x 10 sessions + another 3 recordings

4. *Please record on paper and step-by-step, as far as possible, how you memorised the pieces. For instance, if you divided the piece into sections, and what the sections were; if you practised the two hands separately; if you practised the most difficult passage first, Etc. (The more information the better; use the additional paper provided if necessary)*

Rachmaninov:

1-2 session find out the formal structure (see notes)

Three main ways of memorising: aural, fingering and awareness of the harmonic changes e. g. sections

From bar 15, bass line C, B flat, A flat, G, F, E flat (sic.), D, D flat, C/V – F

Retrieve: first 3 bars, 4<sup>th</sup> bar without left hand. 2<sup>nd</sup> phrase identical, can't remember the left hand from bar 9. Roughly bar 11.



Around bar 29 the fingering becomes irregular and I found it much harder to memorise. Possibly because I rely mainly on Fingering/Motor memory in this work. Motor memory is the least reliable, because it is inflexible and becomes mechanical.

Samuel:

1-2 times: played through few times, not all the notes but right rhythm and dynamics, to see the general picture. Looking for the repetitions and associations of the music with its title and trying to 'feel' the music.

3rd session: I started learning the notes properly. After understanding the structure of the piece I divided it into sections. Work according to the structure and sections. Consciously trying to memorise as soon as possible, and not moving to next section until the previous one was learned.

Memorisation emphasis on chromatic lines and connecting both hands.

4th session: start to revise from bar 1-32 and practice them. Learn next section to bar 38

5th session: again briefly revise them and learning new section. Thinking harmonically (38): diminished chords on both hands. I personally enjoy the harmony in this bar. Bar 40 think in terms of emotion and color.

6,7 and 8th sessions. Learn until the end of 3rd page and practicing from the beginning up to bar 60. Patterns from 49 I make four groups of three bars each. Left hand bar 50 C sharp – D, 51 B – C, etc.

9 and 10th sessions: played through but didn't have enough time to study properly

*5. What methods and idiosyncrasies have you used for your memorisation of the two pieces you have been given?*

Discussed in section question 4.

*6. Are there any significant differences in the procedure of your memorisation between piece A and B?*

Yes

*7. If your answer is YES to question No.6 please write down your personal approaches and reasons*

Samuel: Since it is much less tonal and structured (in a classical way), I had to incorporate much more imagination in order to memorise this piece. Also I had to work much harder to find connections between the phrases (much more analysis).

Rachmaninof: memorising the underlying harmonies, concentrating on memorising the left hand and if so would feel secure.

*8. In your opinion, where and why are the most difficult passages to memorise in these two works?*

Samuel bars 41-48, 58-68

*9. Do you use any specific techniques of memorisation for these passages?*

I memorised left and sing the right hand. The rhythm aspects are more complicated here. Syncopation.



10. Do you think by doing this experiment it has helped you be more aware of the issues concerned with memorisation? Please write down any observations you might wish to make about this.

Yes. Like how to memorise in a short time

11. What general opinions would you like to offer with regard to a pianist's memorisation?

I am not sure if memorisation is such separate process to the learning process. The better and deeper I know the piece, the better I can memorise it. It is also about making associations or memory cues.

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### **Pianist E**

Recording date: 27 November 2004. Rachmaninov: 1 take; Samuel 5 takes

1. Please take these two short pieces and memorise them.

OK

2. Please note the total amount of practise time (in hours) that it has taken you to do so for each piece.

Rachmaninov: 4 hours 15 minutes  
Samuel: 5 hours 45 minutes

3. Please note each span of time you used from the first session to the last (in hours).

Rachmaninov:	Samuel:
1 hour per day (3 days)	1 hour a day (3 days)
15 minutes (3 days later)	20 minutes (6 days later)
5 minutes a day (last 6 days)	15 minutes (3 days later)

4. Please record on paper and step-by-step, as far as possible, how you memorised the pieces. For instance, if you divided the piece into sections, and what the sections were; if you practised the two hands separately; if you practised the most difficult passage first, Etc. (The more information the better; use the additional paper provided if necessary)

I did not practise two hands separately. But know I think that I have done that, it would be very useful (for Rachmaninov)

Rachmaninov: I practised at first the passage at the very end. I memorised it first. After I divided the piece in six sections (A B C D E F G) and memorised each one separately (see in the scores). My mistake was that I did not practise the left hand alone. After that I would have been much more safe and confident.

Samuel: I divided it in sections as well. It was very difficult to memorise the last page,



because I could not find any relationship between all the notes. At the end I tried to find out more intervals or chords to help me to learn this piece.

*5. What methods and idiosyncrasies have you used for your memorisation of the two pieces you have been given?*

I divided it in small sections and learned one at first.

*6. Are there any significant differences in the procedure of your memorisation between piece A and B?*

Yes. Rachmaninov's piece is much easier in a way, because it has a melodic line. In Samuel's piece I had to play lots of time to find out some clear melody.

*7. If your answer is YES to question No.6 please write down your personal approaches and reasons*

I always that if you can sing the melody, you can memorise it very fast.

*8. In your opinion, where and why are the most difficult passages to memorise in these two works?*

Rachmaninov: At the end.

Samuel: At the end. Because there is lots of notes. You have to find the system how to memorise it and use your logical thinking.

*9. Do you use any specific techniques of memorisation for these passages?*

Intervals, chords, right fingering.

*10. Do you think by doing this experiment it has helped you be more aware of the issues concerned with memorisation? Please write down any observations you might wish to make about this.*

I think that all the piano pieces are different, and need different approaches. So, I am not so sure that it helped for learning specific pieces in the future, but it helped for learning that kind of piece later.

*11. What general opinions would you like to offer with regard to a pianist's memorisation?*

Do not try to learn all the piece straight on. Specially if it is a modern piece. If you do not like the piece, try to find some beautiful moments: it could be some phrase, rhythm or just one chord. Everybody has to work on harmony, because it is so easy to lose it, when you follow the melody. It was interesting to do it, because I was sure that it is not possible to learn Samuel's piece, but it is!



**Appendix 2:**  
**Table of Comparative Learning Times of Five Pianists**

	<b>PIANIST A</b>	<b>PIANIST B</b>	<b>PIANIST C</b>	<b>PIANIST D</b>	<b>PIANIST E</b>
<b>Recording Date</b>	Rachmaninov: 04/12/04. Samuel: 23/02/04	Rachmaninov: 04/12/04. Samuel:17/12/03	Rachmaninov & Samuel: 6/02/04	Rachmaninov: 23/02/04 Samuel: 22/12/04	Rachmaninov: 4/12/04; Samuel: 27/11/04
<b>Total amount of practise time (in hours)</b>	<b>Rachmaninov:</b> 12 hours 30 min. <b>Samuel:</b> 16 hours.	<b>Rachmaninov:</b> 4 hours & 35 minites <b>Samuel:</b> 18 hours & 50 minutes	<b>Rachmaninov:</b> 4 hours (to get through) + 3 hours and 30 minutes (to full comfortable). <b>Samuel:</b> 5 hours (to get through) + 3 hours (to full comfortable).	<b>Rachmaninov:</b> 7 hours <b>Samuel:</b> 10 hours	<b>Rachmaninov:</b> 4 hours 15 minutes <b>Samuel:</b> 5 hours 45 minutes
<b>Amount of time each session took</b>	<b>Rachmaninov:</b> 23/11/03:1hour 25/11/03:1hour 26/11/03: 1hour & 30 min 27/11/03:1hour 28/11/03 :1hour 30/11/03: 1hour & 30 min. 1/12/04: 1hour 2/12/04:1hour 3/12/04:1hour 4/12/04:1hour <b>Samuel:</b> 29/10/03:30min. 29/10/03:30min. 1/11/03:2hours & 30 min. 2/11/03:3hours 3/11/03:2hours Approximately 4 weeks break 27/11/03:1hour	<b>Rachmaninov:</b> 26/04/03:30min. 29/04/03:25min 30/04/03:35min. 04/05/03:30min. 05/05/03:30min. 07/05/03:45min. 09/05/03:15min. 21/05/03:20min. 22/05/03:10min. 29/05/03:25min. 04/06/03:play through <b>Samuel:</b> Since 10/06/03 until 5/07/03: Everyday practised for half an hour	<b>Rachmaninov:</b> 20/11/04:30min. 28/11/04:30min. 5/12/04: 10min. Samuel. 7/12/04: 1 hour 8/12/04: 1 hour 40 min. 9/12/04: 10 min. Played through. 10/12/04:45min. 11/12/04:30min. <b>Samuel:</b> 20/11/04:15min. 5/12/04: 5min. 9/12/04: 15' Samuel. Played slowly twice, once through. Played through. 10/12/04 AM: 1 Hour 30min. 10/12/04 PM: 2	<b>Rachmaninov:</b> 45 min.x 9 sessions + another 2 recording sessions of approximately 45 min. <b>Samuel:</b> 1 hour x 10 sessions + another 3 recordings	<b>Rachmaninov:</b> 1 hour per day x 3 days 15 minutes x 3 days 15 minutes x 3 days <b>Samuel:</b> 1 hour a day x3 days 20 minutes x 6 days 15 minutes x 3 days



	28/11/03:1hour 29/11/03:1hour 31/11/03:1hour 2/12/03:1hour 3/12/03 - 1 hour		hours 20' 11/12/04:30min		
<b>Takes</b>	Rachmaninov: 12 takes Samuel: 6 takes	Rachmaninov: 4 takes Samuel: 8 takes	1 take only for each piece	Rachmaninov: 7 takes Samuel: 9 takes	Rachmaninov: 3 takes; Samuel: 5 takes
<b>Accuracy score of memory recall in performance*</b>	Rachmaninov: 4 out of 10; Samuel: 6 out of 10	Rachmaninov: 7 out of 10; Samuel: 5 out of 10	Rachmaninov: 10 out of 10; Samuel: 6 out of 10	Rachmaninov: 6 out of 10; Samuel: 3 out of 10	Rachmaninov: 8 out of 10; Samuel: 6 out of 10
<b>Performance Satisfactory Score*</b>	Rachmaninov: 8 out of 10; Samuel: 8 out of 10	Rachmaninov: 8 out of 10; Samuel: 6 out of 10	Rach: 10 out of 10; Samuel: 7 out of 10	Rachmaninov (recording incomplete): 7 out of 10; Samuel: 7 out of 10	Rachmaninov: 8 out of 10; Samuel: 6 out of 10

\* Indicates the satisfactory level in scale from 1-10: 1 being fail and 10 being excellent.

# Appendix 3: scores of Rachmaninov Prelude and Samuel's Morning

Rachmaninov, Op.23, No.6

## Prelude Op.23 No.6

RACHMANINOV

*Andante*

The musical score is presented in a grand staff format, consisting of a treble clef staff and a bass clef staff. The key signature is two flats (B-flat and E-flat), and the time signature is common time (C). The tempo is marked *Andante*. The score begins with a piano (*pp*) dynamic. The first system (measures 1-2) shows a melodic line in the treble clef and a rhythmic accompaniment in the bass clef. The second system (measures 3-4) features a triplet of eighth notes in the treble clef, with a piano (*p*) dynamic. The third system (measures 5-6) continues the accompaniment. The fourth system (measures 7-8) includes a mezzo-forte (*mf*) dynamic and a *dim.* (diminuendo) marking. The fifth system (measures 9-10) starts with a piano (*p*) dynamic and ends with a *cresc.* (crescendo) marking.



2

11

*mf*

*p*

13

*p*

15

*poco a poco cresc.*

17

19 *8va* *f* *dim.* 3

21 *p*

23 *p*

25 *dim.*



35

*p* *cresc.*

Musical notation for measures 35 and 36. Measure 35 starts with a piano (*p*) dynamic. Measure 36 features a crescendo (*cresc.*) dynamic. The piece is in a minor key with a 7/8 time signature.

37

*f* *mf* *dim.*

Musical notation for measures 37 and 38. Measure 37 begins with a forte (*f*) dynamic. Measure 38 shows a mezzo-forte (*mf*) dynamic followed by a decrescendo (*dim.*). The piece is in a minor key with a 7/8 time signature.

39

*pp*

Musical notation for measures 39 and 40. Measure 39 starts with a pianissimo (*pp*) dynamic. The piece is in a minor key with a 7/8 time signature.

41

Musical notation for measure 41. The piece is in a minor key with a 7/8 time signature.

42

*rit.* *m.g.*

Musical notation for measures 42 and 43. Measure 42 includes a ritardando (*rit.*) dynamic. Measure 43 ends with a fermata and the marking *m.g.* (mezzo-giochi). The piece is in a minor key with a 7/8 time signature.

Samuel, *A Garland for Anne* 4 'Morning'

# 4. Morning

(*'You lie in sleep . . . .'*)

*Broadly, yet delicately,* ♩ = 80

The musical score is written for piano and bass. It begins with a treble clef and a 3/4 time signature. The key signature has one sharp (F#). The tempo is marked as ♩ = 80. The score is divided into four systems, each starting with a measure number (1, 6, 10, 15). Dynamics include *p*, *mp*, *sf*, *pp*, *f*, and *p*. Performance instructions include *rall.*, *accel.*, *trem. growing faster*, and *Ped. sim*. The score features sixteenth-note patterns and sixteenth-note chords, with some measures marked with a '6' indicating a sixteenth-note figure. The piece concludes with a *cresc.* marking.



4

27

Musical score for measures 27-30. The piece is in 4/4 time with a key signature of two flats (B-flat and E-flat). The score is written for piano with a grand staff. Measures 27 and 28 feature a melodic line in the right hand with a slur and a dynamic marking of *pp*. Measures 29 and 30 continue the melodic line with a dynamic marking of *m.g.* and *m.d.*.

29

Musical score for measures 29-32. The piece is in 4/4 time with a key signature of two flats. The score is written for piano with a grand staff. Measures 29 and 30 feature a melodic line in the right hand with a slur and a dynamic marking of *m.g.* and *m.a.*. Measures 31 and 32 continue the melodic line with a dynamic marking of *m.g.* and *m.d.*.

31

Musical score for measures 31-34. The piece is in 4/4 time with a key signature of two flats. The score is written for piano with a grand staff. Measures 31 and 32 feature a melodic line in the right hand with a slur and a dynamic marking of *mf*. Measures 33 and 34 continue the melodic line with a dynamic marking of *mf*.

33

Musical score for measures 33-36. The piece is in 4/4 time with a key signature of two flats. The score is written for piano with a grand staff. Measures 33 and 34 feature a melodic line in the right hand with a slur and a dynamic marking of *dim.*. Measures 35 and 36 continue the melodic line with a dynamic marking of *dim.*.

19 *cresc.* *ff* *mp cresc.*

23 *più mosso* *ff* *mf*

27 *meno mosso* *p* *f* *mf (trem. growing faster)* *sf*

33 *a tempo* *pp dolce* *pp* *poco accel.*

37 *meno mosso* *poco rall.* (no break)



41 *a tempo* *più mosso* *accel.*

*pp*

44 *sempre cresc.*

*(legato)*

47 *Vivace, ♩ = c.136*

*ff*

51

55



*Poco meno mosso*, ♩ = 120

59

*ff*  
*(stet)*

62

*f*  
*mp legato*  
*f*

66

*dim.*  
*p*

*rall.*

*meno mosso*, ♩ = c.60

70

*mp*  
*mf*

73

*p*  
*p*  
*rall.*  
*(L.H.) 8*



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