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10. Memorisation of Twentieth-Century Piano Music: A Longitudinal Case Study

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Introduction

Multiple memory systems are involved in learning and memorising a new piece of music. Practising notated music includes a large amount of repeating passages and longer sections that appear in serial order. During practice, auditory and procedural (or motor-based) memory are inevitably spontaneously activated (Chaffin et al., 2016). The playing of each passage is influenced by the preceding and following passages, and performing music is firmly based on serial cueing (Chaffin et al., 2023). However, auditory and motor-based memory are activated implicitly, without conscious awareness. These memories are not reliable enough to allow for a performance to be entirely successful if something goes wrong (Chaffin et al., 2016).

To perform efficiently, musicians need to integrate different types of memory: implicit or spontaneous and explicit or declarative. Declarative memory is activated when memorisation is deliberate and conscious. Research has shown that expert musicians deliberately, repeatedly, and systematically pay attention to particular locations in the music. If these locations remain relevant for monitoring the memorised performance, they are called performance cues (PCs). PCs may refer to aspects of the music that musicians pay attention to during a performance, such as basic technical issues (e.g., fingering, technical difficulties), interpretation, expression, and structure. Musicians form their mental

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map of the piece as they start practising at different locations during the memorisation process (Chaffin et al., 2002; Ginsborg & Chaffin, 2011), and PCs become retrieval cues that they can use efficiently during a performance. The mental map provides content-addressable access to the musician's memory for the piece once it is successfully memorised. When memory is content-addressable, the musician can start to perform the piece from the particular section or passage they are thinking of (Ginsborg et al., 2012). The function of PCs in a mental map is twofold. During a performance that unfolds smoothly, PCs are a source that allow the musician to perform spontaneously, expressively, and with conviction (Lisboa et al., 2018). At the same time, they are also landmarks where the musician can restart or continue the performance following a memory lapse or mistake (Chaffin et al., 2002). Research has shown that the use of PCs during performance is flexible and that not all PCs are always used during repeated performances. Core PCs are features that are identified during practice and retained as retrieval cues in each performance, while non-core PCs are the features retained as retrieval cues only in some performances. Spontaneous thoughts about the music being performed also appear and may be retained as PCs in subsequent performances (Ginsborg & Bennett, 2021; Ginsborg et al., 2012).

Memorisation strategies used by expert musicians (e.g., deliberate encoding of novel material) are similar to those used by experts in other domains (e.g., playing chess, memorising digit strings, acting, dancing; see Chase & Ericsson, 1982; Ericsson & Kintsch, 1995; Noice & Noice, 2006). In general, expert memorisation is characterised by three principles: meaningful encoding of new material, efficient use of a retrieval structure or mental map, and prolonged practice to ensure fast retrieval from long-term memory (Ericsson & Kintsch, 1995). These principles also apply to memorising music. Research has shown that expert musicians rely strongly on the formal structure of the piece from the earliest stages of practising, identify PCs within the formal structure, and use them when preparing for memorised performance (e.g., Chaffin et al., 2002; Ginsborg et al., 2006). Consequently, the mental map of the piece often corresponds to its hierarchical organisation into sections and subsections. Like experts in other areas, musicians engage in extended encoding and retrieval practice to achieve fast retrieval from declarative as well as motor and auditory memory (Chaffin & Imreh, 2002).

Longitudinal case studies revealed that memorisation follows similar patterns irrespective of the musical style of the piece that has to be memorised and performed by heart (e.g., Chaffin, 2007; Chaffin et al., 2023; Chaffin & Imreh, 2002; Ginsborg et al., 2006, 2012). Musicians memorise works of varying complexity in similar ways (Chaffin, 2007; Chaffin et al., 2013; Noice et al., 2008; Soares, 2015). However, when the piece is free-form or has a complex non-tonal structure, musicians have to develop their understanding of the musical structure in order to segment the piece into meaningful sections. In this way musicians impose a narrative or a musical story onto the piece. The musician's understanding of the musical structure informs their practice and memorisation (Chueke & Chaffin, 2016; Fonte, 2020; Soares, 2015).

The number of studies investigating the memorisation of 20th century and contemporary repertoire has begun to increase, but there are fewer studies involving non-tonal rather than tonal repertoire (Fonte, 2020). To expand the literature on the memorisation of 20th century and contemporary music, Žauhar et al. (2020) examined the process whereby a piano student learned and memorised a short piece by the Croatian composer Boris Papandopulo (1906–1991) for international competition: his Fourth Study for Piano composed in 1956. Although it has a formal structure that follows structural conventions of the Western classical tradition, it is polytonal and uses a wide range of harmonies (Detoni, 2008). Like the advanced students who took part in the case studies reported by Miklaszewski (1989) and Nielsen (1999, 2004), for example, the piano student relied on the formal structure and her segmentation of the piece from the earliest stages of practising, and used structurally relevant bars throughout the whole process of practice, as do experienced musicians (e.g., Chaffin et al., 2002). However, she also repeated structurally relevant and technically difficult bars more than other bars in each learning stage, suggesting that repetition was the primary practice strategy.

In this study, we wanted to explore the process whereby the student and the professional pianist learned and memorised the same piece of music, so we used the same procedure as described by Žauhar et al. (2020). To date, few multiple-case longitudinal studies comparing the memorisation of the same piece by two or more musicians have been reported (e.g., Fonte, 2020; Ginsborg, 2002; Williamon & Valentine, 2002). Because we have already published the study with the piano

student (Žauhar et al., 2020), we present here only the results of the study with the professional pianist. In the discussion, however, we take the opportunity to compare the learning processes of the two performers, who had different proficiency levels, and the outcomes of those processes. The comparison aimed to gain insight into the similarities and differences between their strategies for mastering and memorising the music.

Aims

The study aimed to investigate the process whereby a professional pianist learned and memorised a short piece of 20th century music and to examine the effects of its formal structure and technical complexity on the amount of practice undertaken (starts, stops, and repetitions). We anticipated that the pianist would rely on the formal structure of the piece and the segmentation she made from the earliest stages of practising, as was shown in other studies with expert musicians (e.g., Chaffin, 2007; Chaffin & Imreh, 2002). Moreover, we expected that the use of the formal structure would be more pronounced than in the practice process of the piano student mentioned earlier (Žauhar et al., 2020) who learned the same piece. Unlike the student, who worked on difficult bars in each learning period, we expected the professional pianist to work on technical difficulties only early on in the process. However, we also expected her to pay attention to certain difficult bars in the later stages of practice so that they would become retrieval cues.

Method

The pianist

Dunja Crnjanski (the second author of this chapter) holds an MA in piano performance and specialises in chamber music, focusing on contemporary repertoire. Dunja regularly performs in public as a chamber musician and accompanist. She was not acquainted with the music of Papandopulo until she began to practise the Fourth Study for Piano within the framework of this research study.

The music

Papandopulo's Fourth Study for Piano (*Allegro Vivace*) (1956), in 3/8, is part of the cycle Eight Studies for Piano. The studies are in various styles, from the baroque toccata to tango and blues, and are also influenced by folk music (Kovacic, 1996). Each study is a miniature, exploring the sound possibilities of the piano. The Fourth Study is a scherzo form that parodies the waltz, enriched by polytonality and a more comprehensive range of harmonies than is typical in most classical traditions. Its main theme is the accompaniment, from which the melody emerges only intermittently in a sequence of repetitions coloured differently each time; these features produce its parodic quality. Heavily accented, the Study has to be played at a fast, precise tempo, requiring a skilful piano technique (Detoni, 2008) and efficient retrieval if it is to be performed effectively. It has 153 bars and a duration of 1:30 minutes.

Procedure

The pianist was asked to prepare the Fourth Study for Piano for a performance from memory. She made audio recordings of 20 practice sessions, which were subsequently transcribed (see Data preparation), and she completed a practice diary after each session by describing it briefly (e.g., 'I worked on putting together the whole composition. I practised certain parts by heart. I worked on difficult passages. I focused on memorising.' [Session 5]). In order not to interfere with the pianist's spontaneous process of practising, more detailed instructions were not given. The diary was used for the purpose of collecting short notes about practice that could be used when defining the learning periods once the whole process of practising had ended. The descriptions from the diary were also useful for integrating into the interpretation of the results.

At the end of the preparation process, the pianist performed from memory in front of the first author only, due to the COVID-19 pandemic restrictions. The performance was recorded but those data are not included in the analysis. After the pianist had given the performance from memory, she divided the practice sessions into four learning periods on the basis of the diary entries. The first author listened to the recordings of the practice sessions and transcribed them; on this basis, she also identified four learning periods, consistent with those identified

by the pianist, and presented them in Table 10.1. The average duration of one session was 29:54 minutes, and the whole practice process took ten hours over seven weeks.

Table 10.1 Description of learning periods and practice sessions

Learning period[a]	Practice Session	Days from the start of practice	Practice session duration (min:sec)	Practice segment[b] length (bars) Mean	Range of segments length	Practice segments *n*
Section-by-section and putting together	1	1	32:12	3.53	1–31	320
	2	2	32:38	4.75	1–32	257
	3	3	31:26	6.06	1–77	228
	4	9	34:41	5.99	1–50	223
	5	10	32:55	6.39	1–65	213
	6	11	30:44	7.55	1–117	191
	7	12	30:04	7.06	1–60	203
Memorisation	8	13	31:20	6.27	1–40	235
	9	14	31:48	8.63	1–61	184
	10	15	28:10	6.34	1–61	261
	11	16	32:45	8.57	1–64	221
Improving fluency and consolidating	12	17	31:04	7.54	1–107	254
	13	18	30:44	7.10	1–84	261
	14	20	22:11	10.28	1–130	141
	15	31	30:26	6.24	1–60	323
	16	35	23:15	10.27	1–153	153
Polishing	17	37	30:20	8.18	1–108	282
	18	38	16:26	10.83	1–153	106
	19	46	30:23	7.87	1–153	268
	20	51	34:23	9.64	1–153	232

[a] Learning period included practice, memorising, and practising performance to demonstrate technical fluency, interpretation, and expressivity.

[b] One practice segment represents one episode of uninterrupted playing.

After the performance from memory, the pianist was also asked to mark on the score the bars that she had relied on during memorisation, and to note the aspects of the music that she paid attention to in each of the reported bars. She was further asked to mark the bars that she found technically difficult during practice. Finally, she described the other ways in which she prepared for practice and performance, such as listening to other pianists' recordings and reading the score without playing.

The study was conducted according to the Code of Ethics of the University of Rijeka.

Materials

Twenty recorded practice sessions were transcribed using the Study Your Music Practice software tool (Music Lab, University of Connecticut, 2020). The first author listened to the audio recordings of the practice sessions and made the transcriptions by noting the start and end bars of each practice segment in each session. These are illustrated in Figure 10.1 (Session 3: an early practice session with mainly short practice segments; and Session 16: a later practice session with longer, more integrated practice segments). The transcripts, which should be read from left to right and bottom to top, show how the practice unfolded. When all the practice segments had been transcribed, the number of starts, stops,[1] and repetitions of each bar were counted for each session.[2]

1 Only deliberate starts and stops were counted; those caused by technical or memory errors were not counted.

2 For more details about the methods used in this type of research, see Ginsborg (this volume, Chapter 11).

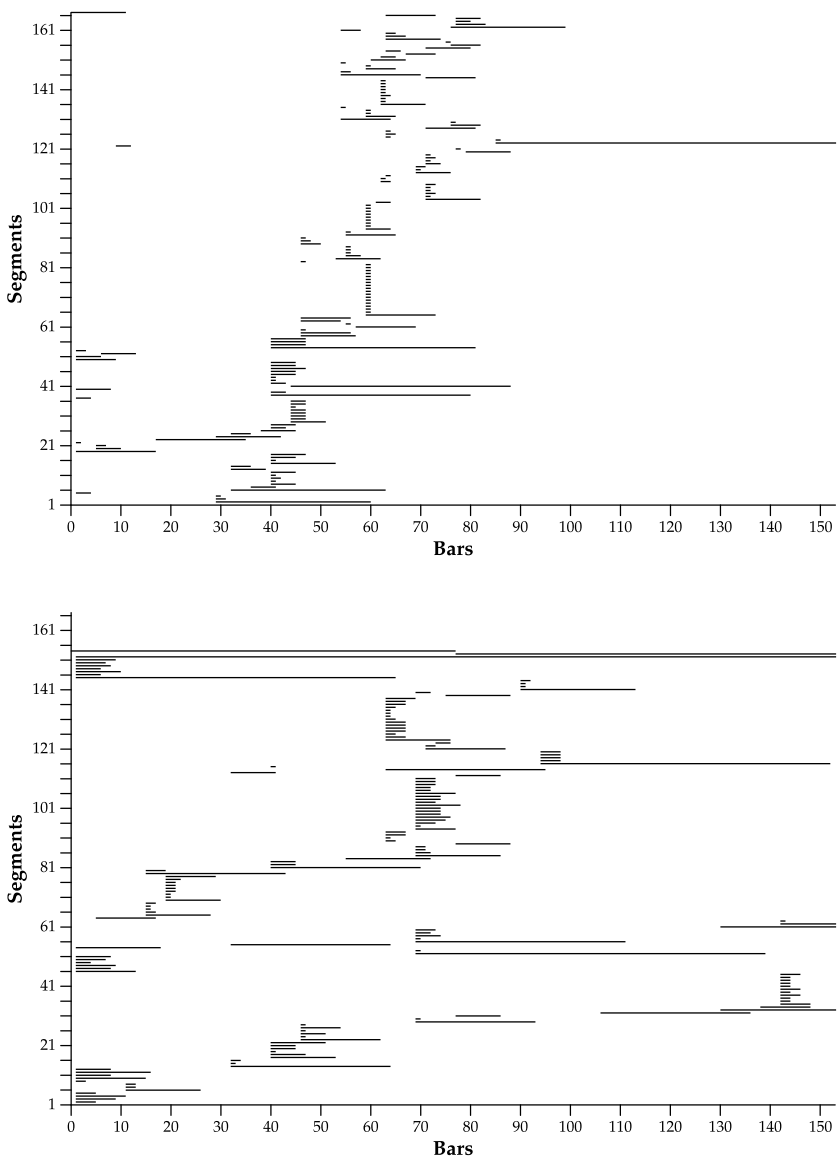

Fig. 10.1 (a) Session 3 (early) and (b) Session 16 (late)

Data analysis

Multiple regression analyses were performed to examine the effects of the formal structure of the piece, the pianist's segmentation of the piece, and technical difficulties, on the amount of practice (i.e., the numbers of starts, stops, and repetitions) during the four learning periods. The predictor variables were formal structure ('structural bars' at the beginnings and endings of sections) as determined by a music theorist (Žauhar et al., 2020); the pianist's segmentation of the piece in addition to its formal structure ('structurally relevant bars' at the beginnings and endings of sections she reported as relevant for memorisation); technical difficulty (bars reported as 'technically difficult'), and basic PCs (bars reported as 'technically difficult' as well as relevant for memorisation and monitoring of the performance).

The pianist's segmentation of the piece matched the formal structure only to some extent, $\varphi(151) = .47$, $p < .001$,[3] because she did not mark all the structural bars as relevant for memorisation and monitoring of the performance. However, she did mark additional shorter segments, such as bars containing harmony changes, as structurally relevant. These structurally relevant bars were included as a predictor variable to observe their contribution to the amount of practice. They were not correlated with the structural bars as defined by the music theorist, $\varphi(151) = -.06$, $p > .05$. There were no significant correlations between the four predictor variables, $\varphi(151)$ ranged from -.09 to .12, $p > .05$. Three outcome variables were used to represent the amount of practice: numbers of starts, repetitions, and stops. The first bar of the piece was not included in the analyses of starts, and the last bar was not included in the analyses of stops.

Results

Multiple regression analyses were performed to investigate the effects of formal structure, the pianist's segmentation of the piece, technical difficulties, and basic PCs on the amount of practice in the four learning periods (Table 10.2).

3 Phi (φ) correlation coefficients were calculated to check if the predictors were independent.

Table 10.2 Results of multiple regression analyses for four learning periods

	Section-by-section and putting together			Memorisation			Improving fluency and consolidating			Polishing		
Predictor variables	Starts	Repeti-tions	Stops	Starts	Repeti-tions	Stops	Starts	Repeti-tions	Stops	Starts	Repeti-tions	Stops
Formal structure												
Beginning of section	.33***	.06	.23**	.38***	.07	.17*	.28**	.13*	.11	.33***	.15	.03
End of section	.03	.07	.40***	−.02	−.04	.28***	.08	.04	.13	−.03	.02	.25**
Pianist's own segmentation												
Beginning of section	.68***	.23***	.26***	.49***	.10	.11	.67***	.18**	.14	.50***	.17*	.05
End of section	−.02	.12	.15*	−.02	−.01	.12	−.01	−.04	.03	−.01	−.02	.19*
Technical difficulties	.03	.14*	.08	.05	.10	.03	.01	−.02	.07	−.02	.19*	−.08
Basic PCs (e.g., jumps)	.06	.53***	.11	.10	.31***	.02	.12*	.64***	.01	−.05	.22**	−.02
R^2	.53	.36	.28	.37	.12	.11	.52	.45	.04	.34	.14	.10
$F(6,145)$	28.11	14.01	9.92	14.05	3.28	3.06	26.61	19.83	1.27	12.66	3.81	2.77
p	< .001	< .001	< .001	< .001	< .01	< .01	< .001	< .001	ns	< .001	< .01	< .05

Note. For all predictors standardised coefficients are shown (β).

*$p < .05$; **$p < .01$; ***$p < .001$

A horizontal version of this table may be viewed online at https://hdl.handle.net/20.500.12434/46be45c0

The predictors together accounted for 10% to 53% of the variation in the amount of practice. The results of the regression analyses are interpreted below. Where applicable, comments from the practice diary are included to complement the interpretations, given that the pianist's short descriptions of the practice sessions are a helpful source of information.

The regression analyses showed that the pianist relied on the formal structure and her segmentation in four learning periods, that is, during the whole process of preparing for the performance from memory. As can be seen from Table 10.2, starts were predicted by the beginnings of sections within the formal structure and the pianist's segmentation. Beginnings in the pianist's segmentation were the main predictors of starts in each learning period. Stops were predicted by the beginnings and endings of sections within the formal structure and the pianist's additional segmentation in the first learning period. In the second learning period, stops were predicted only by structural bars, and in the fourth learning period by endings of sections.

In the first learning period (section-by-section and putting together), the pianist worked in short segments, as shown by her choice of beginnings of sections as starting places, and the beginnings and endings of sections as stopping places. According to her practice diary, she did this to master the musical material, and it can be inferred that she also did so to link landmarks in the piece together. Furthermore, she reported in her practice diary that she began to memorise some segments as early as the fourth practice session.

In the second learning period, the pianist focused on deliberate memorisation. From Table 10.2, it can be observed that she started more often at the beginnings of sections in the formal structure and according to her own segmentation. However, she stopped more often at the beginnings and endings of sections only within the formal structure. This result suggests that the pianist practised starting at multiple locations within larger segments corresponding to the formal structure.

In the third learning period, the pianist consolidated her memory for the music and improved the performance's fluency from memory. As can be seen from Table 10.2, starts were predicted by the beginnings of sections and basic PCs. This indicates that the pianist was encoding

additional landmarks as starting points. In the practice diary, she reported working on phrases and/or sections as well as on details, directing her attention to locations that were demanding to memorise, and aiming to play without effort. In this period, she began to play the piece fluently from memory.

In the final learning period (polishing), starts were predicted by the beginnings of sections and stops by the endings (Table 10.2). The pianist reported that practice was intended to make her feel comfortable while playing and to prepare her for performing from memory.

Some effects of the beginnings of sections were also observed in repetitions. From Table 10.2 it can be observed that the pianist repeated bars at the beginnings of sections according to her own segmentation, more often in the first, third, and fourth learning periods. Beginnings of sections within the formal structure predicted repetitions only during the third, consolidation, period.

The effects of technically difficult bars on repetitions were observed in the first and the final learning periods, although basic PCs predicted repetitions in all four periods (Table 10.2). In the first period, the pianist repeated difficult bars to master them. In the fourth period, she repeated them to overlearn them or to feel more comfortable when playing them. As reported in the practice diary, she directed her attention towards PCs representing technically difficult bars throughout all four periods to ensure that she would ultimately perform them fluently and effortlessly.

Discussion

In this study we examined the process whereby a professional pianist learned and memorised a short piece of 20th century music, Papandopulo's Fourth Study for Piano. Several findings can be highlighted. Firstly, the results show that, in the process of preparing the Fourth Study, the pianist relied on its formal structure and her segmentation of the piece throughout the process of preparing to perform it from memory. Secondly, technically difficult bars affected repetitions in the initial and final learning period. Furthermore, bars including technical difficulties that were used as basic PCs and were relevant for memorisation predicted repetitions in all four learning periods. Below,

we compare the learning processes of the professional pianist with those of the piano student who took part in the study by Žauhar et al. (2020) and highlight the similarities and differences between their strategies for mastering and memorising the music. The results are discussed with reference to studies carried out in Western Europe and the USA using a similar procedure, as few have been conducted in the Western Balkans.

One of the key findings of the present study is that the effects of the structure were identified from the earliest stages of practice. That is, the pianist used structural bars as starting and stopping places more often than the other bars. Moreover, when asked to describe her preparation for the process of practising, she reported that she read the score without playing it to gain an overall idea of the structure and technical complexity of the piece. She also estimated how difficult it would be for her to master the material and play the piece. Other experienced musicians have also been observed to form an overall idea of the structure of music they are to perform, its tempo, and any potential technical problems, before starting practice (Chaffin et al., 2003; Hallam, 1995). In the present study, the pianist reported that she tried to 'understand a structural and artistic idea of the piece', which corresponds to what Neuhaus (1961/2000) calls the 'artistic image'. Her practice, in learning and memorising a new work, was consistent with that of expert memorisers. These results corroborate the findings of other studies on the memorisation of music by, for example, Bach (e.g., Chaffin & Imreh, 2002; Lisboa et al., 2018), Debussy (Chaffin, 2007), and Stravinsky (e.g., Ginsborg et al., 2006), and show that similar memory processes occur during the memorisation of music pieces with a clear-cut formal structure, irrespective of the style of the music. The memorisation processes are similar also for music that has a complex and challenging structure (e.g., Chopin's *Barcarolle*, Op. 60, Chaffin et al., 2013). When the piece is free-form (e.g., Schoenberg's Op. 11, No. 3, Chueke & Chaffin, 2016) or has a complex non-tonal structure (e.g., Messiaen's *Oiseaux Exotiques* and other non-tonal pieces from the 20th and 21st centuries, Soares, 2015), the musician has to develop their own understanding of the musical structure to be able to segment the piece into sections. Once the musician has segmented the piece into sections that are meaningful for them, the process of memorisation is again similar to that observed with highly structured pieces (Chueke & Chaffin, 2016;

Fonte, 2020; Soares, 2015). Expert musicians use the structure of a piece to organise their practice and memorisation, regardless of its length and complexity and/or how long they have to prepare it for performance from memory (Chaffin, 2007; Ginsborg et al., 2006; Noice et al., 2008). In this way, the (formal) structure becomes a ready-made retrieval scheme when the piece is performed from memory.

In previous studies, the musicians who participated often determined the formal structure of the piece themselves (Chaffin & Imreh, 2002) or in discussion with other musicians (Žauhar & Bajšanski, 2012). In general, musicians tend to agree on the formal structure of a piece (Chaffin et al., 2016), although they may have different ways of segmenting it for memorisation, or other ways of analysing it and understanding its structure (Ginsborg et al., 2006). In the present study, as in Žauhar et al.'s (2020) study with a piano student, the formal structure was determined by the music theorist and the professional pianist. The segmentation of the piece by the pianists in both studies matched the formal structure identified by the music theorist to some extent, although the pianists were of different levels of expertise. Neither marked all the structural bars, and both marked other bars as relevant. According to their segmentations, they used their structurally relevant bars as starting and stopping places more often than other bars, which confirms that structuring the material during practice plays a vital role in preparing for performance from memory. Yet, while the student was aware of the formal structure from the earliest stages of practising and used structural bars as starting and stopping places, as observed in other studies involving students as participants (e.g., Williamon & Valentine, 2002), she repeated structural bars identified by the music theorist more often than other bars in each learning period. On the other hand, the professional pianist repeated structural bars defined by the music theorist more often only in one of the learning periods, when improving fluency and consolidating memory.

In the present study, the effects of the technical difficulties of the piece were observed in the initial and final stages of practice. The professional pianist reported, however, that few technically difficult bars became PCs. These bars needed attention throughout the whole learning process, as demonstrated by the number of times they were repeated. They were also bars at which the pianist started practice segments, but

only at the consolidation stage, suggesting that she identified them as starting points on the mental map so that they would become retrieval cues. By contrast, the student who memorised the same piece worked on technically difficult bars throughout the learning process (Žauhar et al., 2020). The number of starts at and repetitions of difficult bars decreased over time, as observed in other studies involving students (e.g., Williamon & Valentine, 2002; Žauhar & Bajšanski, 2012). Nevertheless, unlike the professional pianist, the student needed to continue working on these bars to master their technical difficulties.

Another important finding is that the professional pianist who took part in the present study began to memorise early on, in the fourth practice session. Chaffin (2007) reported a similar finding in a study involving a concert pianist's memorisation of Debussy's *Clair de Lune*, a piece in a simple ABBA form; the pianist started playing from memory in the fourth practice session even though she had not yet completed the section-by-section learning period. Early memorisation characterises the practice of experienced musicians even when they prepare more complex pieces (Chaffin et al., 2003), as this means they can begin to develop their mental maps and practise retrieving at least some segments of the music. By memorising difficult passages early on in the learning process, they reduce the load on working memory and free up attentional resources for other aspects of the piece (Chaffin, 2007). Like other experienced musicians, the pianist in the present study devoted the second learning period to deliberate memorisation, and the third to consolidation and improving the fluency with which she played from memory. By contrast, the student in the parallel study (Žauhar et al., 2020) only started memorising after completing the section-by-section, whole-practice, and improving-fluency learning periods. Taken together, these findings suggest that using landmarks in the formal structure to memorise in the earliest stages of practice enables performers to focus on details while developing a mental map of the music. Research with singers of different proficiency levels also pointed out the importance of starting to memorise early on in the practice process, and highlighted that early strategic memorisation contributes to performance efficacy more than expertise (Ginsborg, 2002).

Specific teaching is necessary if musicians are to improve their practice by becoming aware of and using their knowledge of formal structure.

Expert musicians participating in longitudinal case studies have been asked to repeatedly report their thoughts and describe the strategies they use while practising. There is evidence that it is helpful for professional musicians to report their thoughts during practice, as this increases their conceptual understanding and improves memorisation (Lisboa et al., 2011). It can also be helpful for students (Lisboa et al., 2015, 2018; Timperman & Miksza, 2019) to identify the landmarks in a piece of music that have been shown as beneficial to more experienced musicians. It would contribute to the development of their own efficient memorisation strategies and help them to master new pieces of music. In a study investigating string students' immediate and delayed recall of memorised études, for example, verbalisations about learning were shown to be effective in later performances, once the pieces had been retained for some time in long-term memory (Timperman & Miksza, 2019). Chaffin et al. (2013) reported a longitudinal study examining the learning of Chopin's *Barcarolle*, Op. 60, by an experienced pianist who was also a music theorist, and who made a detailed Schenkerian analysis of the complex structure of the piece. Although carrying out this analysis did not have immediately observable effects, it was reported to be helpful in the learning process when the pianist subsequently came to prepare the piece for public performance. The ability to recognise formal patterns in music increases as students learn to analyse pieces and pay attention to the reasons why some places may be particularly useful when forming mental maps (Timperman & Miksza, 2019). Such strategies can help students develop a deeper understanding of the piece, and strengthen their ability to encode it securely and retrieve it when performing from memory.

Conclusion

The findings of this study confirm that the memorisation of Papandopulo's Fourth Study for Piano followed established patterns of music memorisation (e.g., Chaffin & Imreh, 2002) corresponding to general memory principles (Ericsson & Kintsch, 1995). The professional pianist who took part in the study relied on the formal structure and her own segmentation of the piece while preparing to perform it from memory. She deliberately developed a mental map of it to serve as a reliable retrieval structure. The results of this study corroborate the findings of previous studies with concert and jazz pianists (e.g., Chaffin & Imreh, 2002; Chueke & Chaffin, 2016; Fonte, 2020; Noice et al., 2008; Soares,

2015); a cellist (e.g., Lisboa et al., 2018); and a singer (e.g., Chaffin et al., 2023; Ginsborg & Chaffin, 2011; Ginsborg et al., 2006), and contribute to their generalisability. To date, memorisation of music pieces of different styles has been examined from late Baroque to contemporary music. This study expands the repertoire used to investigate the memorisation of 20th century and contemporary pieces to include music of Croatian heritage. It also represents an interdisciplinary collaboration between a performer and cognitive psychologists, established to investigate the memorisation of music.

Studies including participants of different levels of proficiency who learn the same piece of music (e.g., Ginsborg, 2002) are rarely conducted, so the comparison between the processes of memorisation of a professional pianist and a piano student offers an important contribution, even though the comparison is descriptive, which presents a limitation. Such comparisons have implications for the teaching of efficient practice. For example, Lisboa et al. (2015, 2018) have shown how a teacher may encourage their students to report thoughts during practice to improve its quality. Reporting thoughts helps students to develop content-addressable access to memory, and consequently, memorisation becomes more reliable. The metacognitive awareness of the musician's learning process and progress is also characteristic of the practice of expert musicians (Chueke & Chaffin, 2016). Detailed comments recorded during practice provide insight into the focus of a musician's attention during the learning process (Chaffin et al., 2003), and confirm that professional musicians have a good understanding of their learning strategies, the difficulties they encounter, the actions they must take to fix passages that go wrong, and how to improve their performance (Hallam, 1995). In the present study, we collected only brief descriptions of practice sessions, which were congruent with analysis of the amount of practice undertaken. Reporting thoughts during practice, and discussing them with the teacher, could also improve students' awareness of their strengths and weaknesses when preparing new pieces for performance.

It can be concluded that by deepening the understanding of the musical material being learned, and with the appropriate use of memorisation strategies, the quality of practice improves. Organising practice according to the principles of expert memory could speed up and improve the processes whereby students prepare repertoire for performance from memory.

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