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Blanka Bogunović and Sanela Nikolić

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Memorizing the Contemporary Piano Piece of Music: The Effects of the Formal Structure, Pianist's Segmentation, and Technical Difficulties

Valnea Žauhar,¹ Aleksandra Matić,² Ana Dražul,³ and Igor Bajšanski⁴

^{1,4} *Department of Psychology, Faculty of Humanities and Social Sciences, University of Rijeka, Croatia*

² *Music Association "A. Jug Matić", Rijeka, Croatia*

³ *Music School "Ivan Matetić Ronjgov", Rijeka, Croatia*

¹vzauhar@ffri.hr

Abstract

The aim of this study was to examine the process of preparing a contemporary piece for performing at an international competition for young musicians. The pianist, a second-year student at a music high school, had recorded her practice of the Fourth Study for Piano (*Allegro Vivace*) by Boris Papandopulo. Thirty-two recorded practice sessions were transcribed and analyzed with regards to five learning periods: section-by-section, practicing the whole, tightening fluency, memorization and polishing. We examined the effects of the formal structure, the pianist's segmentation of the piece in addition to the formal structure, and technical difficulties on the amount of practicing in five learning periods. The results showed that practice segments started and/or stopped more often on structural bars and on bars marked by the pianist herself. The effect of the pianist's segmentation was greater than that of the formal structure in four learning periods. The results also showed that the pianist used repetitions as a practice strategy consistently during the learning process: repeating of difficult bars decreased as the practice progressed, however, repeating structural bars persisted until the end of preparing the piece for performing at a competition for young pianists. The results of this study contribute to the findings previously reported in the literature with students enrolled as participants and confirm that similar strategies are used when memorizing compositions of traditional and contemporary repertoire.

Introduction

Longitudinal case studies of concert and jazz pianists (Chaffin & Imreh, 1997, 2002; Noice, Jeffrey, Noice, & Chaffin, 2008), cellists (Chaffin & Lisboa, 2008; Chaffin, Lisboa, Logan, & Begosh, 2010; Lisboa, Chaffin, Schiaroli, & Barrera,

2004), singers and conductors (Ginsborg, Chaffin, & Nicholson, 2006a, 2006b) have shown that professional musicians encode music scores in terms of the formal structure of a piece of music from the earliest stages of practicing. The studies revealed that experienced musicians set different performance cues (structural, expressive, interpretative, basic) within the hierarchical organization of the piece and think about them repeatedly during practice, thus strengthening the associations with different places in the music scores. By relying on performance cues, musicians direct their attention to different aspects of the music that have to be learned, memorized, and performed. The deliberate setting of performance cues (or landmarks) within the hierarchical organization of the piece of music leads to the formation of an easily retrievable mental map once the piece is memorized. The mental map allows the musicians to monitor their own performances and to recover from mistakes or memory failures if they occur.

Deliberate encoding of music scores in terms of the formal structure develops as a function of expertise (Williamon & Egner, 2004). Williamon and Valentine (2002) examined practicing by piano students at different levels of proficiency. Their results showed that all pianists, regardless of the level of proficiency, segmented the compositions by J. S. Bach that were assigned to them for the purposes of the study into meaningful sections. When the segmentations were influenced by piano teachers, they were congruent with formal structures of the pieces of music. When segmentations were made exclusively by piano students themselves

they were not necessarily in accordance with the formal structure. Although the identification of the formal structure of the piece varied between the piano students, the results showed that they used the structure of their segmentations in the course of practice. More precisely, they started and stopped their practice increasingly on “structural” bars and decreasingly on difficult bars across the learning process. Moreover, the frequency of starts and stops increased on “structural” bars and decreased on difficult bars systematically with increases in the level of skill: more experienced piano students relied on their structure earlier in the process of practicing and performed more successfully. A case study with one advanced piano student that prepared Prelude and Fugue in e-minor by J. S. Bach (Well-Tempered Clavier I, BWV 851) for a memorized performance showed that the pianist used the formal structure of the piece in order to organize her practicing and memorizing as more experienced musicians do (Žauhar & Bajšanski, 2012). The use of the formal structure during practice and memorization reflects the level of musical understanding.

To date, studies that examined memorizing of the traditional repertoire (e.g., Chaffin & Imreh, 1997, 2002; Chaffin & Lisboa, 2008; Williamon & Valentine, 2002; Žauhar & Bajšanski, 2012) and studies that examined memorizing of the contemporary repertoire (e.g., Chueke & Chaffin, 2016; Ginsborg & Chaffin, 2011; Ginsborg, Chaffin, & Demos, 2012; Ginsborg et al., 2006a, 2006b) showed that musicians use similar practice and memorization strategies. In the study by Jónasson and Lisboa (2016), advanced guitar students memorized a contemporary piece composed for the purposes of the study and predominantly used segmentation as the main practice strategy. Memorization of contemporary pieces reflected the level of proficiency as observed in the studies with the traditional repertoire. Tsintzou and Theodorakis (2008) found that an expert in contemporary piano music segmented the atonal piece more efficiently and learned the piece faster than piano teachers and piano students. However, if the music is free of form, as Schonberg’s Op. 11, No. 3 examined

in the study by Chueke and Chaffin (2016), the performer is the one that has to “develop a musical story to serve as a mental map” (p. 253). The results of the case study by Soares (2015) showed that using structural landmarks can be helpful even with the very complex atonal structure. However, he pointed out that the correspondence to the formal structure of the piece of music, in that case, can be limited and that a wider range of different musical dimensions is used in order to form a mental representation.

In this study, we examined the process of preparing a contemporary piece with the formal structure within the frame of classical traditions enriched with the use of polytonality and a wider range of harmonies. For this purpose, one piano student with nine years of formal musical training prepared the Fourth Study for Piano by the Croatian composer Boris Papandopulo for participation at an international competition for young musicians.

We examined the dimensions on which practicing of the “lilting waltz-scherzo in which Papandopulo explores various metric stresses against gently oscillating harmonies” (Everett, 2011: 4) was based. More precisely, we examined the effects of the formal structure, the pianist’s segmentation of the piece in addition to the formal structure, and technical difficulties on the amount of practicing. The amount of starts, stops, and repetitions on different points in the music score were expected to reveal the points to which the pianist directed her attention during the process of preparing the piece for performance at the competition. We hypothesized that the pianist would rely, to some extent, on the formal structure of the piece during practice and especially during memorization. However, we expected that the pianist would rely on her own segmentation in addition to the formal structure during the whole learning process, given that she identified sections that were meaningful for her. In general, we expected that the use of structural bars in order to organize practice would increase, and using difficult bars would decrease, with the progress of the learning process as observed in other studies (e.g., Williamon & Valentine, 2002).

Method

The Pianist

A second-year student (age = 16) at the music high school Ivan Matetić Ronjgov, Rijeka, Croatia, participated in the study. The student regularly performs in public and participates in national and international competitions. At the time of her participation in the study, she had nine years of formal musical training.

The Piece of Music

The Fourth Study for Piano, composed in 1956, is part of the cycle Eight Studies for piano that reflect different musical styles from the baroque toccata to the contemporary dance forms of tango and blues (Kovacic, 1996). This cycle is characterized by harmony, aesthetics and rhythms present in jazz and pop music. The influence of folk music is also present. Furthermore, the studies are characterized by polytonality and are technically demanding (Detoni, 2008). They are “full of humorous, melodic, harmonic, and rhythmic turns” (Kovacic, 1996: 101). The Eight Studies do not represent a formal unity, instead, each study is one characteristic miniature exploring the sound possibilities of the piano. Therefore, they can be performed independently (Kovacic, 1996). Studies with fast tempi require skillful piano technique, and studies with slower tempi show different moods (Detoni, 2008). This cycle is considered Papandopulo’s best work for solo piano (Kovacic, 1996).

The Fourth Study for Piano (*Allegro Vivace*, 3/8) is a “joyous and optimistic scherzo of a waltz” (Detoni, 2008: 10) with a touch of parody on the waltz form. The traditional structure of the piece is broadened with the use of polytonality and a wider range of harmonies. In this study, the accompaniment is given great importance, which paradoxically makes it the main theme of the piece. The melody, on the other hand, emerges periodically, and parts of the melody, colored differently each time, sequentially repeat adding even more parody to the piece (Detoni, 2008). The performance of the Study requires sharp accentuation and precise

control of the tempo. The Study has 153 bars, and it takes about 1 minute and 30 seconds to perform.

Procedure

The pianist was required to learn the Fourth Study for Piano (*Allegro Vivace*) by Boris Papandopulo. This piece of music was part of a repertoire assigned by her piano teacher for the international competition for young musicians. Each practice session was recorded by the pianist. Furthermore, after each practice session, the pianist fulfilled the practicing diary (date, time, description of the practice session). After the completion of the practice process, the pianist divided the practice sessions into five learning periods: section-by-section (sessions 1 to 4), practicing the whole (sessions 5 to 13), tightening fluency (sessions 14 to 19), memorization (sessions 20 to 25) and polishing (sessions 26 to 32).

During the practice process, the pianist determined the bars that were technically demanding for her. After the competition, the pianist was asked to segment the piece and mark in the score the bars on which she relied during the process of practicing in order to make the performance successful.

Data Preparation and Variables

Thirty-two recorded practice sessions (of an average duration of 30 minutes) were transcribed following the transcripts introduced by Chaffin and Imreh (1997). The number of starts, stops, and repetitions of each bar were counted for each session. One part of the transcript from practice session 1 (bars 1–20) is shown in Figure 1.

The effects of the formal structure, the pianist’s segmentation of the piece in addition to the formal structure, and technical difficulties on the amount of practicing (starts, stops, and repetitions) were examined in five learning periods. It is important to note that starts included deliberate starting at different bars, and that stops included deliberate stopping at different bars within the piece of music. Stops caused by errors were not included in the analysis.

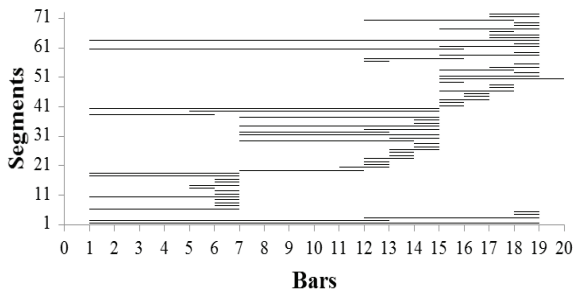


Figure 1. One part of the transcript from practice session 1.

The structural bars (beginnings and ends of sections) were determined by the second author who analyzed the formal structure of the piece for the purpose of this research.

The pianist's segmentation made after the competition matched the formal structure only to some extent ($r = .51$) because she did not mark all structural bars as relevant, however, she marked some additional bars as relevant. Only those additional bars were considered when analyzing the effect of the pianist's segmentation of the piece in addition to the formal structure.

Difficult bars were determined by the pianist during the process of practicing.

Results

In order to investigate the effects of the formal structure, the pianist's segmentation of the piece in addition to the formal structure, and technical difficulties on the amount of practicing in five learning periods multiple regression analyses were performed. When analyzing starts, the first bar of the piece was not included in the analysis, and when analyzing stops, the last bar of the piece was not included in the analysis. The results are shown in Table 1. The predictors (the formal structure, the pianist's segmentation, and technical difficulties) together accounted for 10% to 43% of the variation in the amount of practicing (that is, starts, repetitions, and stops).

The analyses showed that repeating was used as a practice strategy during the whole process of practicing. In each learning period, repetitions were predicted by technical difficulties and the beginnings of the sections within the formal

structure. When practicing the whole and tightening fluency, repetitions were additionally predicted by the beginnings of the sections within the pianist's segmentation. In the final learning period, repetitions were additionally predicted by the endings of the sections within the formal structure.

As expected, technical difficulties were the main predictor of repetitions in the initial stages of practicing, and the contribution of technical difficulties decreased with the progress of practice within the first three learning periods. Still, repeating technically difficult bars persisted until the end of practicing as well as repeating structural bars.

With regard to the number of starts and stops, the analyses in general showed that the practice segments started and/or stopped more often on structural bars and on bars marked by the pianist herself than on other bars.

More precisely, in the section-by-section learning period, the beginnings of the sections predicted the number of starts, and the endings of the sections predicted the number of stops. Moreover, the starts were predicted by technical difficulties. The observed results suggest that the pianist segmented the piece and practiced isolated sections.

When practicing the whole, starts were again predicted by the beginnings of the sections and by technical difficulties. In this learning period, the endings of the sections within the formal structure significantly predicted starts, too. Interestingly, stops were predicted only by the beginnings of the sections marked by the pianist. The observed results indicate that the pianist segmented the piece during practice and used different starting points. Moreover, the use of the beginnings of the sections as starting and stopping places suggests that the pianist linked the segments.

During tightening fluency, starts and stops were predicted by the beginnings of sections within the pianist's segmentation showing that the pianist continued to practice by linking the segments as in the previous learning period. Stops were additionally predicted by the end-

Table 1. Results of multiple regression analyses for five learning periods.

Predictor variables	Section-by-section			Practicing the whole			Tightening fluency			Memorization			Polishing		
	Starts	Rep.	Stops	Starts	Rep.	Stops	Starts	Rep.	Stops	Starts	Rep.	Stops	Starts	Rep.	Stops
TD^a	.19**	.57***	.10	.15*	.37***	-.04	.11	.27***	-.10	.04	.23**	-.08	.09	.28***	.09
	FS^b														
Begin section	.31***	.16*	.03	.22**	.23**	.01	.02	.22**	.04	.27***	.19*	.01	.36***	.20**	.33***
End section	.00	.11	.36***	.16*	.06	.07	-.05	.08	.14*	-.07	.08	.27***	.03	.24**	.15
	PS^c														
Begin section	.43***	.09	.05	.58**	.18*	.44***	.63***	.19*	.45**	.51***	.02	.26***	.32***	.05	.03
End section	-.04	-.08	.20*	-.03	-.10	.06	-.02	-.07	.20**	.08	-.11	.24**	-.03	-.08	-.01
R2	.31	.36	.18	.44	.22	.20	.41	.16	.27	.33	.10	.21	.23	.17	.13
F(5,146)	13.09	16.35	6.45	22.89	8.21	7.41	20.00	5.55	10.78	14.26	3.26	7.59	8.64	5.85	4.30
p	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.01	.001	.001	.001	.001

^a TD = Technical difficulties; ^b FS = Formal structure; ^c PS = Pianist's segmentation in addition to the formal structure; * $p < .05$; ** $p < .01$; *** $p < .001$.

ings of sections within both, the pianist's segmentation and the formal structure. Interestingly, during tightening fluency, the pianist did not use the beginnings of sections within the formal structure as starting places.

However, during memorization, starts were predicted by the beginnings and stops by the endings of the sections pointing to the use of the formal structure and the pianist's segmentation as meaningful units when deliberately preparing the piece for the performance. Moreover, as in the previous stage, stops were predicted additionally by beginnings and endings of the sections within the pianist's segmentation.

In all four learning periods described so far, beginnings of sections within the pianist's segmentation were the main predictors of the number of starts. This result suggests that the pianist relied more often on her own segmentation when organizing her practice.

Finally, during polishing, starts were predicted by the beginnings of the sections, and both the formal structure and pianist's segmentation, equally contributed. In this final learning period, stops were predicted by the beginnings of sections within the formal structure, too, showing that the pianist strengthened practicing the sections by starting and stopping at the same places.

In sum, the results showed that the pianist moderately relied on the formal structure during practice, instead, she used her own segmentation in order to organize her practice more often. Also, the pianist used repetition as a practice strategy in each stage of preparing for performance.

Discussion

The amount of practice of different points within a musical composition, provide behavioral evidence about the aspects of music that were in the focus of musicians' attention during practice. Previous studies have shown that starting and stopping at structural bars provide a reliable and easy retrievable mental representation of the piece of music (e.g., Chaffin, 2007; Chaffin & Imreh, 1997, 2002).

In this study, we investigated the effects of the formal structure, the pianist's segmentation of the piece in addition to the formal structure, and technical difficulties on the amount of practicing during five learning periods.

In accordance with earlier studies with students practicing and memorizing compositions from the traditional (Williamon & Valentine, 2002) or contemporary (Jónasson & Lisboa, 2016) repertoire, this study showed that the pianist used structural bars to organize her practice. In this study, we included two structural levels as predictor variables: the aspects of the formal structure of the piece, and the pianist's segmentation in addition to the formal structure. We observed that the pianist used the formal structure moderately, and relied predominantly on her own segmentation. The use of structural bars is observed in each learning period, however, different practice strategies can be identified in different learning periods. For example, practicing isolated sections can be observed in the section-by-section learning period, and linking the segments can be observed in the following learning stage (practicing the whole). Besides using bars within the formal structure and her own segmentation as starting and stopping points, the pianist started more often on technically difficult bars. As reported earlier by Williamon and Valentine (2002), starting with difficult bars decreased through the learning process, and the results of this study showed that difficult bars did not predict starts from the third learning period onwards.

As observed in earlier studies with professional pianists (e.g., Chaffin & Imreh, 2002) and advanced piano students (Žauhar & Bajšanski, 2012), the results of this study showed that the piano student repeated technically difficult bars more often in the earlier stages of practicing. Repeating difficult bars decreased within the first three stages of practicing. However, the pianist in this study retained the strategy of repeating difficult bars in the stages of memorizing and polishing, which can also be observed in previous studies (e.g., Chaffin, 2007; Miklaszewski, 1995; Žauhar & Bajšanski, 2012), given that some difficult bars require continuous practic-

ing and over-learning in order to be performed properly.

Contrary to the results of previous studies, the pianist used the strategy of repeating structural bars consistently in each learning period. Moreover, while practicing the whole and tightening fluency, the pianist repeated more often the bars marked as relevant in her own segmentation. Repeating the beginnings of sections within the formal structure and within the pianist's segmentation suggest the use of the strategy of practicing those bars out of the context of the sections as meaningful units. Although practicing different starting points and segmenting the piece in smaller sections is a useful practice strategy, repeating only the beginnings of sections, without integrating them within the context, could be an ineffective strategy because deeper analysis of the music material is missing. With an increase in the level of proficiency, there is an increase in repeating longer sections (Gruson, 1988; Hallam, 1997).

In the third learning period, during tightening fluency, the pianist relied predominantly on her own segmentation when starting and stopping the practice segments. The use of both the formal structure and additional segmentation is observed during memorization, suggesting that the pianist organized her memorizing by defining multiple starting and stopping places as other students (Williamon & Valentine, 2002; Žauhar & Bajšanski, 2012) and more experienced musicians do (e.g., Chaffin & Imreh, 2002). In the final polishing stage, the influence of the pianist's segmentation is observed only in selecting beginnings of sections as starting points, whereas the influence of the formal structure is observed in all aspects of practicing: starts, repetitions, and stops, suggesting the importance of the formal structure in strengthening memory for performance at the competition.

In sum, the results show that the pianist directed her attention to different aspects of the piece of music and used different learning strategies during the preparation for a memorized performance. This study provides an observation of memorization of a contemporary piece by Boris Papandopulo expanding the range of compositions examined to date and confirming

that similar strategies are used when practicing and memorizing compositions of traditional and contemporary repertoire.

In this study, the pianist used the segmentation of the composition that was meaningful for her. In order for the young pianists to gain benefits from the use of the formal structure, detailed, explicit instruction about the usefulness of deliberate encoding of the piece of music with regards to its formal structure would be needed. Providing explicit instruction about the formal structure could encourage the pianist to improve her own segmentation and deepen the analysis of the piece. Moreover, the explicit instruction about the use of performance cues in the process of practicing, and implementing the use of protocols designed in order to encourage self-study could be useful for students to broaden the insight into their own learning and memorization processes (Chaffin, Demos, & Crawford, 2009; Ginsborg & Chaffin, 2011). More recently, Gerling and Dos Santos (2017) showed that young musicians at different levels of proficiency readily accepted the use of PC protocols during the practice of compositions of different musical styles. They showed that training in PC protocols can result in the acquisition of a meaningful strategy. With greater involvement in the process of practicing, musical understanding could be improved, as well as the efficiency of the process of preparing the piece for a memorized performance and the efficiency of the performance itself.

Conclusion

The results of the study mostly confirmed previous findings and contributed to the results previously reported in the literature with students enrolled as participants.

This study showed that the pianist used repetitions as a practice strategy consistently during the process of preparing the piece for performing at the competition for young pianists. Also, the pianist predominantly used her own segmentation to organize her practice. Although the effects of the formal structure were also observed, detailed, explicit instruction about the usefulness of deliberate encoding of the piece of

music with regards to its formal structure would be needed in order for the young pianists to gain benefits from the use of the formal structure as a reliable retrieval scheme.

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