

MOTOR ACTION IN PERFORMANCE

ROSTROPOVICH AND RICHTER'S REPEATED RENDITIONS OF PROKOFIEV'S CELLO SONATA OP. 119

*Ju-Lee Hong*¹

Goldsmiths College, University of London
Music Department

ABSTRACT

Phrasing is a primary concern for performers in the process of interpretation, because its structure is associated with the music's formal designs; many empirical researchers have therefore considered the relationship between timing and dynamic in performance and phrase structure (see Todd 1992). Performers' tendency towards dynamic modification in phrase boundary is most often discussed in relation to timing fluctuation in performance (e.g. Todd 1992; Dunsby 1995). For instance, Todd (1992) creates the algorithmic model of tempo and dynamics through a series of filters. He calls the relationship between expressive timing and dynamic the 'motor action'. Previous empirical studies using Todd's model of performance (1992) include papers by Bruno Repp (1998, 1999a, 1999b, 1999c): 103 commercially recorded performances of the first five bars of Chopin's Etude in E major.

In this paper, repeated renditions in the second movement of Prokofiev's Cello Sonata Op.119 by Rostropovich and Richter (the historical première concert in 1950 and the 1955 studio recording) will be analysed empirically and theoretically with reference to Todd's 'motor action'. I use *Sforzando* (Johnson 1997) to measure tempo and dynamic modification and the accuracy of my method is about +/- 60 milliseconds. My empirical investigation finds that Rostropovich and Richter execute phrase boundaries in an identical fashion in the repeated renditions. Most phrase gestures in Rostropovich and Richter correspond to Todd's (1992) algorithmic model of 'motor action'. Judging from how phrase gestures are shaped in the two performances in relation to my phrase analysis, it can be suggested that Rostropovich and Richter may have perceived the second movement of Prokofiev's cello sonata as neoclassical. In order to reach more conclusive remarks on the topic, more samples of performances and scores of Prokofiev's cello music should be investigated in a similar way, which shall be the next step of the research.

Keywords - motor action, phrase, performance analysis, repeated renditions, Prokofiev's cello sonata, Rostropovich, Richter

1. INTRODUCTION

Musical performance is an act of interpretation. Analysing modifications of performance expression, such as timing and dynamic, reveals the performers' perception of musical works and performing trends and styles in the context of performance practice. In this paper, repeated renditions of the second movement of Prokofiev's Cello Sonata Op.119 by Rostropovich and Richter (the historical première concert in 1950 and the 1955 studio recording) will be analysed empirically and theoretically.

During the past decade, due to the recent significant development of technology, empirical approaches to analysing musical performance have been introduced (Bowen 1996 etc). Cognitive psychologists have used automatic computation mechanisms extensively in their analyses of musical performance since the 1930s (Seashore et al 1936). But the empirical approach to analysing performance is a pioneering field in musicological study, partly because until recently acoustic analysis software has been too cumbersome and insufficiently accurate for detailed work at the levels at which expert performance operates. I analyse performances using a computational process, because quantitative performance data provides scientific evidence to the academic community and it also reinforces my listening response to performances. But a crucial limitation of empirical approach is that however functional a computational system might be, performance data could be unintelligible, until data is understood in relation to musical experience and/or analysis.

The necessity of applying theoretical approach to analysing performance is closely intertwined with the limitation of empirical approach. In musicology, 'analysis' conventionally indicates score analysis, which provides a solid basis for examining a performer's contribution to interpretation. And therefore the relationship between musical performance and analysis has been one of the heated topics for both music theorists (Rink 1995 etc) and empirical musicologists (Cook 1995 etc) during the past decade. But limitations can be noticed from both theorists' and empirical musicologists' approaches of studying performance in relation to analysis. For instance, theorists argue that performance is evaluated according to the authors' analytical reading of the score rather than trying to discover what performance represents. Empirical musicologists often

¹ Email: jl.hong@gold.ac.uk

critically review the already published score analysis rather than the music's structure being analysed for performance analysis.

2. LINKS TO PREVIOUS STUDIES

Phrasing is a primary concern for performers in the process of interpretation, because its structure is associated with the music's formal designs and therefore phrase has been studied as a main debate from both empirical (e.g. Todd 1992 etc) and theoretical (e.g. Harter 2003 etc) perspectives. Performers' tendency towards dynamic modification in phrase boundary is most often discussed in relation to timing fluctuation in performance (e.g. Dunsby 1995; Repp 1999; Todd 1992). For instance, Todd's (1992) algorithmic model of tempo and dynamics claims that there is a single motor action between expressive timing and dynamics in performance. Todd creates the algorithmic model of tempo and dynamics through a series of filters, which is based on 'the idea that musical phrasing has its origin in the kinematic and dynamic variations involved in single motor action' (Todd 1992: 3541). This arose from a simple presumption that expressive timing and dynamics in performance are related, particularly in certain interpretative styles of the Classical and Romantic repertoire. According to Todd (1992), a *crescendo* and a *diminuendo* normally accompany an *accelerando* and a *ritardando* in performances; he calls the relationship between expressive timing and dynamic the 'motor action'. Dunsby similarly suggests that performers 'tend to speed up in *crescendos* and slow down in *diminuendos* unless they make the necessary correction for this' (1995: 76), which he calls 'motor logic', but he adds that highly skilled performers tend to play timing and dynamic independent from each other. Although both Todd and Dunsby acknowledge the motor action between expressive timing and dynamics in performance, their views on the issue contrast. That is, whilst Todd assumes that there is a single motor action between expressive timing and dynamics in performance, Dunsby believes that this is not the case in highly skilled performance. Since the theory of performance model is based on phrasing, however convincing both Todd and Dunsby's arguments appear to be, it is necessary to investigate expert performers' practice empirically.

Previous empirical studies² using Todd's model of performance (1992) include papers by Bruno Repp

² Eric Clarke and Luke Windsor (1997, 2000) also consider Todd's 'motor action' in their systematic studies. They investigate both human and algorithmic performances, which can be seen as the most direct way of testing the algorithm. By algorithm, I mean Todd's computer-based model of performance, which is an artificial intelligence model of musical expression. Clarke and Windsor's studies reveal that Todd's algorithms for timing and dynamics in performance do not correlate with one another in expert human performances. See, Windsor, W.L. & Clarke, E.F. 'Expressive Timing and Dynamics in Real and Artificial Musical Performances: Using an Algorithm as an Analytical Tool', *Music Perception*, 15 (2): 127-152, 1997 and Clarke, E.F. & Windsor,

(1999a, 1999b and 1999c). He investigates 103 commercially recorded performances of the first five bars of Chopin's Etude in E major, which reveal that pianists' 'independent control' over expressive timing and dynamic in phrasing provides a variety of meaningful shapes of the Etude opening.³ There are, however, some limitations to Repp's study. That is to say, only a short excerpt from Chopin's Etude was investigated and therefore it is suspected that different outcomes could have been drawn if a longer or different excerpt had been studied. Additionally, despite the implication given in the opening of the article, that 'individual differences' in many renditions would be considered in detail, the individuality of each performance is hardly discussed. Returning to the findings of previous empirical studies, 103 commercially recorded version of Chopin's E major Etude correspond to Dunsby's theory of phrase in performance regarding the execution of expressive timing and dynamic. But what would be the case of Prokofiev's duo performances? This is the aspect that I intend to discover in this paper. The ways in which various cadential points are shaped with tempo and dynamic modifications in the repeated renditions of Prokofiev's cello sonata will be examined in this investigation.

Moving on to a theoretical perspective of Prokofiev's phrases, Courtenay Lucille Harter (2003) claims that the 'four neoclassic elements', namely 'balance, clarity, proportion and tonality' can illuminate the phrase structure of Prokofiev's music efficiently (p.19). Harter's (2003) claim that balance and clarity are achieved through the repetition of material and proportion applies to the use of an equal number of measures in combined phrases. The concept of tonality as a neoclassic element relates to harmonic progression and harmonic rhythm in the common-practice style. Harter's perspective of 'four neoclassic elements' in Prokofiev's phrase structure is valid, but her study lacks consideration of performance issues, despite the fact that phrase is a significant aspect in performance.

3. INVESTIGATION

3.1. Method

By empirical performance analysis, I analyse expressive timing and dynamic in recordings using a computer-assisted process. Performance data was captured using Rod Johnson's *Sforzando* (1997). By a theoretical approach to performance analysis, I analyse recorded performances relating to phrase structure. In other words, the collected quantitative performance data will

W.L. 'Real and Simulated Expression: A Listening Study', *Music Perception* 17 (3): 277-313, 2000 for further information.

³ Similar findings are also observed in my own previous empirical study. See, Hong, J., 'Investigating expressive timing and dynamics in recorded cello performances' in *Psychology of Music* Vol. 31, No.3, pp.340-352, 2003.

be interpreted in relation to analytical interpretation of the piece.

Figure 1 shows Rostropovich and Richter's (1950) dynamic range and timing fluctuation in the second movement performance of Prokofiev's cello sonata Op.119.

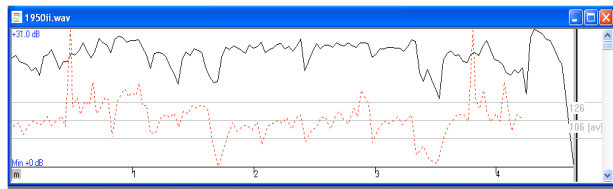


Figure 1. Dynamic range and timing fluctuation: the Première of Prokofiev's Cello Sonata Op.119, second movement.

An entire sound file of the second movement is entered into the *Sforzando* software graphic system, which automatically creates the graphic representation of dynamic modification of performance, which is illustrated with a solid line in Figure 1. It is shown that dynamic levels are in the range of 0 to 31 decibels (dB). Timing fluctuation data in performance is obtained through a tap-along or reverse conducting method i.e. left side of computer mouse is tapped on one beat per bar while listening to the recording, which the computer automatically records the time of each tap. The captured timing data automatically creates the graphic representation of timing fluctuation, which is illustrated with a dotted line in Figure 1. The accuracy of this tapping method is around about +/- 60 milliseconds; while the precision of my computer's internal clock is about 60 milliseconds, the response-time of the human operator's finger tapping is about 30 milliseconds and the average human timing perception is about 30 milliseconds. Therefore, it is safe to ignore variations of less than 60 milliseconds. Additionally, accuracy also depends on the operator's tapping at the beginning of each event accurately.

3.2. Investigated Recordings

Prokofiev's cello sonata op.119 (written in 1949) is the first work to be produced in collaboration with the cellist, Rostropovich and the success of the sonata première inspired Prokofiev to plan three more works for the cello, op.125, op.132 and op.134. The world première⁴ of sonata op.119 was in Moscow on 1st March 1950 by Rostropovich and Richter, in the presence of Prokofiev. A recording of the première concert is

⁴ One of the close friends of Prokofiev, Myaskovsky, wrote in his diary: 'Yesterday Rostropovich and Richter gave a first public performance of Prokofiev's Cello sonata – an amazing, first-class work' (Nestyev 1960: 418). Nestyev, I., *Prokofiev* trans, Florence Jonas Stanford University Press, Stanford, 1960.

commercially available and is therefore used as a starting point of this case study. Five years after the première, the sonata was recorded by the Rostropovich-Richter duo in a studio in Moscow. Many different record labels have released the 1955 recording and I have studied Chant du Monde LDX 78388 in detail for this study in order to investigate repeated renditions by the same artists. Table 1 shows the details of recordings that have been investigated for this study.

Dates	Artists	Label	Movement duration
1950	Rostropovich (cello)	EMI Classics	04:35
(1997)	Richter (piano)	72016	
1955	Rostropovich (cello)	Chant du Monde	04:40
	Richter (piano)	LDX 78388	

Table 1. Investigated recordings

4. RESULTS

4.1. Phrase structure of the second movement

The scherzo second movement of the cello sonata op.119 is in F major and ABA form. The ternary form is divided into smaller sections: the first section is divided into three sections (bars 1-23, 24-34, 35-48) and the second part is sectionalised into two (bars 49-66, 67-90). The third part, a shortened version of the first part, stands on its own. A clear distinction is illustrated between the first and second part in modulation and with changes in meter and tempo marking. My phrase structure analysis suggests that due to the chromatic expression, i.e. occasional 'wrong notes' and the combination of progression within relative keys and shifts to distant keys, it seems most appropriate to consider the cello sonata as extended tonal music. There is very little evidence of proportion in the second movement of the cello sonata. The repetition and transposition of thematic ideas in the cello sonata, however, enable the achievement of balance and clarity in the second movement of the cello sonata and therefore the phrase structure of the movement can be considered as neoclassical.

But do Rostropovich and Richter perceive the movement as neoclassical in performances? This is the aspect that I intend to discover in this paper. MR and SR in the following text indicate Mstislav Rostropovich and Sviatoslav Richter respectively.

4.2. Phrases in the 1950 première and 1955 performance

Let us investigate how performance phrases are structured on a macro scale. Table 2⁵ indicates how

⁵ The AC indicates authentic cadence, which is American terminology for perfect cadence. Half and deceptive cadences indicate British terminology of imperfect and interrupted cadences respectively.

phrase boundaries are expressed with timing and dynamic in performances.

Phrase	Cadence	1950	1955
b1 - b6	HC	<i>dim, rit</i>	<i>dim, rit</i>
b7 - b13	HC	<i>dim, rit</i>	<i>dim, rit</i>
b14 - b17	HC	<i>cresc, rit</i>	<i>cresc, rit</i>
b18 - b24	HC	<i>cresc, accel</i>	<i>cresc, accel</i>
b25 - b28	HC	<i>cresc, accel</i>	<i>cresc, accel</i>
b29 - b34	PC	<i>dim, rit</i>	<i>dim, rit</i>
b35 - b40	HC	<i>dim, rit</i>	<i>dim, rit</i>
b41 - b49	AC	<i>dim, rit</i>	<i>dim, rit</i>
b50 - b57	HC	<i>cresc, rit</i>	<i>cresc, rit</i>
b58 - b66	AC	<i>dim, rit</i>	<i>dim, rit</i>
b67 - b77	DC	<i>dim</i>	<i>dim</i>
b78 - b89	HC	<i>dim, rit</i>	<i>dim, rit</i>
b90 - b93	DC	<i>dim, rit</i>	<i>dim, rit</i>
b94 - b99	HC	<i>dim, rit</i>	<i>dim, rit</i>
b100 - b104	HC	<i>dim</i>	<i>dim</i>
b105 - b113	AC	<i>dim, rit</i>	<i>dim, rit</i>

Table 2. Phrase boundaries in 1950 and 1955 performances

As can be seen in performance data in Table 2, phrase boundaries are executed identically in the two performances and the overall tempo in both renditions indicates MR-SR's perception of the movement as a three part form of ABA.

To summarise the investigation, overall, authentic cadences are emphasised with diminuendo and ritardando, deceptive cadences are always marked with diminuendo, although there are instances where ritardando is not accompanied and plagal cadence is also highlighted with diminuendo and ritardando. It appears that there is no certain rule about the shaping of half cadence regarding timing and dynamic in MR-SR's performances of the second movement. Most phrase gestures in MR-SR correspond to Todd's (1992) algorithmic model which shows that there is a single motor action between expressive timing and dynamics in performance.

5. CONCLUSION

Bearing in mind that Todd's performance model arose from a presumption that timing and dynamics in performance are related in Classical and Romantic repertoire interpretative styles, it can be suggested that judging from the ways in which phrase boundaries are shaped in the two performances, MR-SR's phrase gestures show that the investigated performers may have perceived the second movement of Prokofiev cello sonata as neoclassical.

The use of a computational system helps me to identify exact levels of tempo modification in performance and performing tendency and style are distinguished in the context of performance practice. Indeed, in order to

reach more conclusive remarks on the topic, more samples of performances and scores of Prokofiev's cello music should be investigated in a similar way, which will be the next step of the research. I close this paper by claiming that amongst many different ways of researching musical performance as a scholarly discipline, more ought to be done in the pioneering field of performance analysis. It is also hoped that if performance analysis software could be developed by members of DMRN for musicians per musicologists, through which the user can control various features of interface in degrees and processes without too much difficulty, so that the use of technology in musical research can go beyond the line of assisting aspects that can be done by humans.

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