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Violin portamento: An analysis of its use by master violinists in selected nineteenth-century concerti

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ABSTRACT

Portamento [shifting technique] is regarded as one of the most difficult and intricate aspects of violin playing. Given that each performer's decision to select a particular portamento is based on his/her musical interpretation, the use of portamento is very individualistic in nature. No pedagogical sources are available for students and teachers to generate critical thinking about when, why, and how violinists might employ portamento. The decision making process regarding its use remains intuitive and amorphous. In this study, portamento styles were examined in real performances by master violinists, Heifetz, Huberman, Kreisler, Mutter, D. Oistrakh, Perlman, Shaham, and Vengerov. Target Intervals (TIs) in which portamenti were employed were extracted with computer software from the first movement of Brahms, Lalo, Mendelssohn, and Tchaikovsky concerti. The selected TIs were analyzed, considering musical factors and individual characteristics of performers. Computer software programs generated visual images of portamento execution, these spectrographs, displayed the progression of pitch change and intensity over time as well as patterns and type of portamento.

Results showed that the performers tended to agree more on the type of portamento in descending intervals. B-portamento, occasionally called the French slide, and L-portamento, known as

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the Russian slide, were associated with Kreisler and Heifetz, respectively. Portamento patterns identified each violinist's idiosyncratic performance style. The older generation of violinists tended to use portamento more frequently than the younger generation. Performers tended to retain the same type of portamento across performances at different periods of their lives, but they seemed to continue to develop their performance styles, using portamento as an identifiable trait in multiple performances.

The findings of this study imply that the use of technology may open up new possibilities for both teaching strategies and scientific research regarding musical performance.

Keywords

Violin performance, violin portamento, Visualization of aural perception

INTRODUCTION

The violin is a sensitive instrument, responsive to subtle moves by the performer and capable of being played with personal style and emotion. Racster (1905) believed that the violin was created out of a desire to imitate the human voice. Elman (as cited in Applebaum, 1972) described the violin "as a medium second only to the human voice as expressive of total beauty" (p. 10). In comparing the piano to the violin, Menuhin (1986) admitted that he had bypassed selecting the piano whose sound was made through technical means, for the violin, an instrument that attracted him because it allowed him to adjust the pitch, making him feel that he was projecting his own voice rather than the piano's "voice ready-made" (p. 8). Boyden et al. (1989) described the violin as follows:

> The violin is one of the most perfect instruments acoustically and has extraordinary musical versatility. In beauty and emotional appeal its tone rivals that of its model, the human voice, but at the same time the violin is capable of particular agility and brilliant figuration, making possible in one instrument the expression of moods and effects that may range, depending on the will and skill of the player, from the lyric and tender to the brilliant and dramatic. Its capacity for sustained tone is remarkable, and scarcely another instrument can produce so many nuances of expression and intensity. (p. 1)

Each violin has a different history as well as a distinctive character and tone. This leads many violinists to have an emotional attachment to their instrument—when I play I feel as if the sound of the violin becomes a human voice telling my own version of a musical story. Distinguishable characteristics of the violin such as sustained notes, sliding sounds, and vibrato give any performance an individually unique quality. It is no wonder that as a violinist I also feel each unique moment of communication with the audience through my violin.

When it comes to the left hand, the touch of the violin becomes very personal. While dropping and lifting my fingers on the wooden fingerboard, I am struck by the irony that such an expressive instrument requires such severe discipline in technique. Without proper discipline, one cannot manage to express one's musical ideas. In this regard, Dounis, a famous pedagogue concerned with solving technical problems, stated:

> Why, after many years of hard study, are so large a proportion of these gifted students unable to climb the heights? They are musically talented; they also have a natural, physical aptitude for the instrument; they work hard. What is their handicap? The non-mastery of technique. Without technical mastery the road to musical expression is barred. (as cited in Costantakos, 1988, p. 93)

Kovachs (as cited in Costantakos, 1988) reported that concentrating only on musical expression results in long hours of ineffective practice. Even at the level of master performers, the balance between technique and expression is crucial. For instance, when Francescatti was asked what he thought of Kreisler's philosophy about practicing, which recommended minimal routine practicing for adult artists to relieve anxiety and stress, he said, "I appreciated Kreisler's approach and I'm sure it helped many players to relax…. But in Kreisler's case there were times that his neglect of technical work showed in his playing" (as cited in Applebaum, 1978, p. 179). Francescatti implied that Kreisler's melody was admirably beautiful, but that it was occasionally disturbed by imperfect technique.

Casals furthermore emphasized that musical expression should be pursued without technical interruption, saying, "The most perfect technique is that which is not noticed at all" (as cited in Baldock, 1992, p. 45).

Nevertheless, it seems to be agreed upon that the mastery of technique must ultimately result in musical expression. Neaman (as cited in Campbell, 2003) reported that he constantly reminded his pupils that technique exists only to serve the music, helping them to move beyond the mechanics of violin playing in order to pursue the spirit of the music. Many master performers and pedagogues such as Accardo, Delay, Haendel, Kreisler ,Oistrakh, and Williams, also emphasized that the musical function of violin, as a singing instrument, should not be overshadowed by breathtaking technical display (Applebaum, 1972; Elman et al., 1987; Potter, 1984, 2001; Tsung, 1993). Francescatti, who criticized Kreisler's neglect of the technical aspects of violin playing, also suggested that a violinist concentrate more on "musicianship and artistry than to amuse oneself with pyrotechnics" (as cited in Applebaum, 1978, p. 158). Elman criticized the current performance trend where there was "too much stress on sheer mechanical" (as cited in Applebaum, 1972, p. 10). However, he also warned that technical insecurity caused overexcitement and lack of clarity.

Among the techniques in violin playing, shifting has been regarded as one of the most debatable areas because it distinctively represents a performer's technical skill as well as his/her musicianship (Auer, 1921/1980; Flesch, 1924/2000; Yampolsky, 1967). Flesch (1924/2000) claimed that shifting was the most difficult part of the entire system of left-hand technique and "a violinist's rank in a large measure can be determined by his attitude towards the shifting used for musical expression" (1960/1978, p. 329). Neumann (1969) viewed shifting as one aspect of the art. Even though many pedagogues and master performers have discussed the use of shifting, the focus has been limited to general principles of the technique and the explanation of types of shifts.

Shifting can be categorized into two broad types: technical shifting and musical shifting. Technical shifting literally focuses on the change of position of the left hand for the sake of technical convenience. On the other hand, musical shifting is often used in melodic passages for artistic reasons. The sound of the gliding finger is deliberately emphasized to underscore an affecting expression.

Technical and musical shifting are considered equally important in violin playing by Flesch (1924/2000) who stated:

> It becomes very clear that without an accomplished "mechanism" one's expressive power never achieve the fullest development of one's "inner riches." Total mastery of shifting is thus, with purity of intonation and tone, one of the indispensable prerequisites for a high level of artistry. (p. 16)

However, he continued, "the application and manner of execution of the portamento [shifting] should never depend on technical factors but primarily on musical" (p. 17). Most famous performers and pedagogues believe that shifting should be used for musical purposes, rather than mere technical means. In other words, logical and artistic phrasing should be considered the most critical reasons for the use of a specific shifting. Robjohns (1930) advised that "musicianly phrasing" was the first thing to consider before technical perspectives; the rules of the shifting technique should "be modified as musicianship and common-sense demand" (p. 51). Dounis also emphasized:

> There was a reason for making the physical motion of gliding and pulling your finger from one note to another rather than just the word "shifting." There were connections and when you put notes together, you would start to think of it in connection with music, making phrases. (as cited in Costantakos, 1988, p. 67)

Musical shifting has been a varying practice throughout different periods of time, according to violin schools and performers. Its use became prevalent in the nineteenth century Romantic period. In particular, during the period from the late nineteenth century to the early twentieth century, master performers such as Sarasate (1844–1908), Ysaÿe (1858–1931), Kreisler (1875–1962), Thibaud (1880–1953), and Heifetz (1900–1987)

developed intensely individual styles of musical shifting. Musical shifting was embraced in serious music because of its distinctively characteristic effect (Flesch, 1960/1978).

The use of musical shifting became so popular; its repetitive use became a common practice in nineteenth century. Until the first half of nineteenth century, many great violinists such as Paganini, Spohr and Lvov often used shifting in succession with the same finger. However, in the twentieth century, it was not acceptable to use several consecutive shiftings with the same finger unless it was designated by the composer (Yampolsky, 1967). Many violinists warned about its excessive use and asserted that musical shifting was more convincing when employed less frequently (Applebaum, 1972; Babitz, 1959; Flesch, 1924/2000; Robjohns, 1930). Flesch (1960/1978) stated that a string player could accomplish an ideal performance by restricting his use of musical shifting to passages calling for intense expression.

In the twentieth century, modern violinists were able to slide from any note to another with any finger or combination of fingers, and this became the standard of good modern performance (Babitz, 1959). However, toward the end of the second half of the twentieth century, although more freedom of presentation was allowed than at any other period, ironically, contemporary young players tended to avoid musical shifting in order to produce a clean sound. This cleaner and more articulated sound, made possible with the introduction of the modern extension and contraction, was attributed to a change in training (Stowell, 2001).

Most violinists who began studying around the second half of the twentieth century might not have mastered musical shifting convincingly enough to avail themselves of its use in their playing. In fact, many renowned pedagogues held that slides and position changes for musical expression were “archaic, even vulgar” and restrained their students from making use of them (Roth, 1989, p. 308). Without a doubt, finger techniques to generate heightened emotions have been looked down upon and often done away with altogether during the past few decades by those who deemed them “indicators of superficial sentimentality and gross taste” (Roth, 1995, p. 1152). The avoidance of slides, however, was extreme at times and this caused some criticism to be leveled at a certain lack of feeling in violin playing. In this regard, Steinhardt, a violinist of the Guarneri String Quartet, stated:

> There is a tendency nowadays—a “purity” which goes together with the mechanical spirit of our age—to abjure glissando [musical shifting]. A young cellist recently told me that Mr. So-and-So plays “cleanly” because he avoids glissandi. I asked him whether the performance of a singer making a glissando in a Mozart or Verdi aria would therefore be considered “dirty.” (as cited in Blum, 1986, p. 46)

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Steinhardt argued that avoiding a glissando [musical shifting] has nothing to do with a clean sound; and that he, as a contemporary performer, enjoyed using the old-fashioned glissando. He believes that the glissando reveals a string player's personality and mirrors his or her soul.

However, according to Steinhardt, many students at the present time, are afraid of using a glissando because it might be considered in bad taste or even ridiculous. This has resulted in not only students but also famous contemporary players not using as much portamenti as the old master players, for the sake of pursuing what they think of as a clean sound. Elman also maintained:

> Styles in violin playing change, I realize, as they do in every art, but I feel disturbed by veering away from romanticism which the young generation of violinists are doing. Of course, we live in a fast age; definitely a mechanical age. But should we play the great Romantic works in present-day style! This feeling of young players to eliminate as many shifts as possible can do much harm. Remember that the violin is a singing instrument and the tones must be connected. There is an unhealthy trend to study works with the idea of elimination of as many shifts as possible. When a singer slides beautifully from one note to another it is permissible. Why then object when a violinist does it! I have heard fine young players who in an attempt to avoid emotion and in anxiety to avoid warmth on the eighth notes have played these eighth notes faster. (as cited in Applebaum, 1972, p. 19)

Roth (1987) also claimed that the anonymity of the computer age has contributed to dim the splendor of romanticism by old masters, such as Kreisler. Even though this phenomenon of avoiding musical shifting in the violin playing is criticized for being devoid of expressional quality by many authors and performers (e.g., Elman, as cited in Applebaum, 1972; Galamian, 1962; Lawrence, 1989; Neumann, 1969; Roth, 1987; Steinhardt, as cited in Blum, 1986), it could be seen a the reflection of a new trend in which contemporary violinists pursue "pure" sound. However, interestingly enough, Perlman, one of today's most famous violinists, has commented:

> Evolution in the style of playing between contemporary violinists and violinists in 40's…. I think it has to do with what they do within music. Something to do with shifting or with slides [musical shifting] …. There were different slides. Some of those old fiddlers slide back and forth, back and forth and these days, you know, it's taboo. You don't slide back and forth because you would be called "old-fashioned." And I wish I had more of those old-fashioned things. (as cited in Bardet & Wright, 2001)

Indeed, Perlman has reintroduced slides [musical shifting] in a lyrical context, using them quite freely, as have the prominent cellists Lynn Harrell and Yo Yo Ma (Roth, 1989).

When shifting technique is used for musical interpretation as an expressive device, the styles of shifting become controversial, and in order to meet the needs of new mode of expression, styles in shifting practice have changed. True, an exaggerated and dragged manner with excessive use of shifting used for musicality was regarded as appealing

at one time. However, today almost the entire young generation of violinists tends to avoid musical shifting, deeming it passé. In this regard, Auer (1921/1980) pointed out that there could be no one established method of

playing as there was no absolute aesthetic standard with which to evaluate a performance of a violinistic art-work. A lavishly admired method of playing, cultivated in one period, may be rejected in another.

PURPOSE

The purpose of this study was to examine the practice of violin portamento by master violinists in comparable recordings of the first movement of particular concerti. The research considered music- and artist-based influences for using portamento.

Through the analysis of various shifting styles in real cases, using sound files and acoustical analysis, this study focused on comparative descriptions of musical shifting styles of great artists. Shifting used for musical purpose is believed to be one of the most difficult and abstract aspects of violin playing because of its individualistic aspect. Providing an image record of sound in time allows this abstract phenomenon to become more accessible for both scientific inquiry and instructional conversation. With greater informed choices of shifting styles offered as reference resources, performers are able to enrich their musicality, and teachers can assist students in developing their personal styles more effectively.

DEFINITIONS OF TERMS USED IN THE STUDY

Shifting is categorized into two broad types: technical shifting and musical shifting. Technical shifting means literally the change of position for technical convenience. It should be executed as unobtrusively as possible so that the sound of the shifting movement is not heard. On the other hand, musical shifting is often used in melodic passages to enhance expressiveness. The sound of the gliding is emphasized to heighten the emotion of the passage. This audible shift is usually called “portamento.” Portamento comes from the Italian word meaning “the act of carrying” (*Merriam-Webster’s Collegiate Dictionary*, 1993, p. 905). Musically speaking, the word “portamento” is defined as: “a continuous movement from one pitch to another through all of the intervening pitches, without, however, sounding these discretely” (*The New Harvard Dictionary*, 1986, p. 649).

In this study, the word “musical shifting” was used to describe shifting used for musical expression while “technical shifting” will be applied to shifting executed for technical reasons. The term “portamento” also indicates the use of musical shifting, as the meaning of “portamento” seems to be agreed upon in spite of the confusion among additional terms such as “glissando,” “glide,” and “slide.” When speaking of “portamento”

without further qualification, it will always refer to the audible and expressive shift used for musical purpose. The term “glissando” was not used because of its ambiguity.

In general, most references indicate an inaudible shift as a technical shift and an audible shift as a musical shift. Inaudible shifting used for musical purposes to “hide” the portamento sound, which is itself based on individual musical reasons, was excluded from this study. This matter of aesthetics of musical interpretation goes beyond the scope of this study.

B-Portamento, L-Portamento, Combination of B- and L-portamento, and Portamento with the Same Finger

Theoretical discussions about the manner in which portamenti should be executed have been impossible because no proper terminology existed in the field of violin technique. Since Flesch introduced the portamenti terms, it has became possible to describe, pedagogically, the approach to executing a certain type of portamento. He coined the terms, B-portamento and L-portamento, meaning the portamento executed by the finger playing the beginning note and the one executed by the finger playing the last note, respectively (Flesch, 1960/1978). He also introduced the combination of B- and L-portamento as one of the most important of the portamenti, which “are used by important violinists as vehicles for their highly personal mode of expression” (Flesch, 1924/2000, p. 19). This study also included portamento with the same finger because this type of portamento is often used in portamento practice in addition to B-portamento, L-portamento, and the combination of B- and L-portamento.

These are explained in the following examples. Figure 1 indicates that the distance from B4 to D5 is covered by the first finger in the shifting from first to third position. As soon as the first finger arrives in the third position on D5, the third finger drops on F#5. This shifting is called “B-portamento.”

On the other hand, Figure 2 indicates that the distance from D5 to F#5 is covered by the third finger in the shifting from first to third position. The third finger slides from D5 to F#5. This shifting is called “L-portamento.”

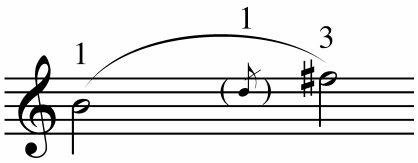

Figure 1. B-portamento.

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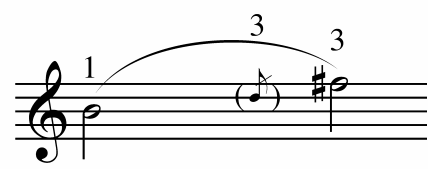

Figure 2. L-portamento.

Figure 3 indicates the use of the combination of B- and L-portamento. It is hard to notate this portamento because the intermediate notes in the combination of B- and L-portamento are usually not heard in real practice. With this in mind, the combination of B- and L-portamento could be notated in the following manner in Figure 3. The distance between B4 and E5 is covered by the first finger in the shifting from first to fourth position, and the distance between F#5 and A5 is covered by the second finger in shifting from fourth to sixth position. The first finger slides from B4 to E5, and the second finger slides from F#5 to A5. As soon as the first finger arrives in the fourth position on E5, the second finger starts to shift to the sixth position. This shifting is called "the combination of B- and L-portamento."

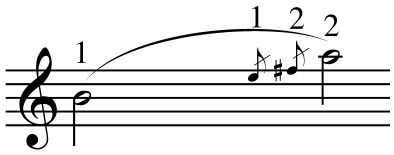

Figure 3. Combination of the B- and L-portamento.

Figure 4 indicates that the distance from B4 to F#5 is covered by the first finger in the shifting from first to fifth position without an intermediate note. The first finger alone slides from B4 to F#5. This shifting is called "portamento with the same finger."

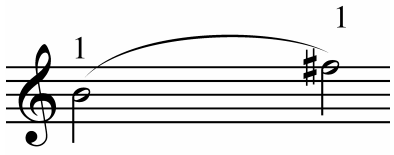

Figure 4. Portamento with the same finger.

Many violinists, such as Babitz (1959) and Neumann (1969) borrowed Flesch's terms, but others invented their own terms for what Flesch had described. For instance, Dounis (as cited in Costantakos, 1988), referred to "the shifting with the last finger used" to indicate B-portamento while "the shifting with the finger about to be played' indicates L-portamento" (p. 67). Moreover, Gerle (1983) described B-portamento as "Lead-shift" and L-portamento as "End-shift" (p. 97). Galamian (1962) called the B-portamento "overside" and the L-portamento "underside" (p. 27). He emphasized that the former style was favored by the French school, while

the latter was frequently played by the Russian school. Such a distinction is commonly used these days.

Flesh (1924/2000) characterized the combination of B- and L-portamento as "a happy medium between the 'resigned' character of the B-portamento and the 'sensuous' character of the L-portamento" (p. 19). Yampolsky (1967) stated that the B-portamento produced "a clear, well-defined, and rather objective sound" while the L-portamento had "a more sensual, soft and rather subjective sound" (p. 121).

The Intermediate Note

In general, one finger makes the bridge in shifting to the next position. Flesch (1924/2000) named this the "bridge-finger" (Neumann, 1969, p. 92), which actually carries out the shift, as an "intermediate note" (p. 14). The D5, which is shown above in Figure 1 and Figure 2, is called the intermediate note.

Accuracy, which is a goal in shifting, is seen as the skill required in traversing a distance. The extent of the arm movement must be accurately determined. This is accomplished by means of the intermediate note. The theoretically determined position of the intermediate note does not always agree with its actual position. In determining the actual intermediary note in higher positions, a player must lower the finger at the point that is physically natural. Intermediate notes help master a difficult shift, such as using intermediary notes while practicing. In terms of tone and musical expression in concert performance, appropriate use of the intermediate note is a factor in evaluation (Flesch, 1960/1978).

METHOD

Data Collection and Procedure

Selection of Performers

Eight master violinists—Heifetz, Huberman, Kreisler, Mutter, D. Oistrakh, Perlman, Shaham, and Vengerov—were selected for the study, covering the period from early twentieth century to the present. Particular selections were made based on the greatest number of recordings that each performer made, the variety of their available repertoire, the acknowledged reputation of each as a master violinist, and a wide range of individual style.

Selection of Repertoires

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Four violin concerti—Brahms's *Violin Concerto in D major Op. 77,* Lalo's *Symphonie Espagnole Op. 21*, Mendelssohn's *Violin Concerto in E minor Op. 64*, and Tchaikovsky's *Violin Concerto in D major Op. 35*—were selected for acoustical analysis. There were three major reasons for these particular selections. First, these concerti are in the standard repertoire, making them the best known and most performed of violin works (Applebaum, 1972; Sadie et al., 2001; Swalin, 1941). Second, orchestral works were chosen over solo pieces due to the acoustical complexity of piano overtones; the shifting movements of the violin solo sections with orchestra accompaniment are more easily detected as compared to those of short violin pieces with piano accompaniment. Finally, all four concerti have been associated with portamento as they were composed in the nineteenth century, a time defined by the prevalent use of intensive portamento (see Table 1).

Table 1. List of recordings used in study

Composer	Performer	Recording Date	Conductor	Orchestra
Brahms	Heifetz	Feb 21 & 22, 1955**	Fritz Reiner	Chicago Symphony Orchestra
Brahms	Huberman	Jan 23, 1944** Live performance	Artur Rodzinski	Philharmonic-Symphony
Brahms	Kreisler	Nov 21, 23& 25, 1927**	Leo Blech	Berlin State Opera Orchestra
Brahms	Kreisler*	1936**	John Babirolli	London Philharmonic
Brahms	Mutter	July 1997 Live performance	Kurt Masur	New York Philharmonic
Brahms	Mutter*	Sep, 1981	Herbert Von Karajan	Berlin Philharmonic
Brahms	Oistrakh	1950**	Kyrill Kondrashin	USSR Large Radio Symphony Orchestra
Brahms	Oistrakh	1952**	Kyrill Kondrashin	Orchestra Sinfonica di Stato dell'Unione Sovietica
Brahms	Oistrakh	Feb 1954**	Franz Konwitschny	Staatskapelle Dresden
Brahms	Oistrakh	Feb 26, 1961** Live performance	Sir Malcom Sargent	London Philharmonic Orchestra
Brahms	Oistrakh	Nov 6, 1961** Live performance	Otmar Nussio	Orchestra della Svizzera Italiana
Brahms	Oistrakh	May 13&16, 1969**	George Szell	Cleveland Orchestra
Brahms	Oistrakh	Oct 10, 1969** Live performance	Witold Rowicki	Warsaw Philharmonic
Brahms	Perlman	Feb 29& Mar 1, 1992 Live recording	Daniel Barenboim	Berlin Philharmonic
Brahms	Shaham	May, 2000 Live recording	Claudio Abbado	Berlin Philharmonic
Brahms	Vengerov	Oct, 1997 Live recording	Daniel Barenboim	Chicago Symphony

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Lalo	Heifetz	June, 1951**	William Steinberg	RCA Victor Symphony
Lalo	Huberman	1934**	Georg Szell	Vienna Philharmonic
Lalo	Mutter	May, 1984	Seiji Ozawa	Orchestre National de France
Lalo	Oistrakh	Nov 13& 14, 1954**	Jean Martinon	Philharmonia Orchestra
Lalo	Perlman	Oct, 1980	Daniel Barenboim	Orchestre de Paris
Lalo	Vengerov	May, 2003	Antonio Pappano	Philharmonia Orchestra
Mendelssohn	Heifetz*	Feb 23 & 25, 1959**	Charles Munch	Boston Symphony Orchestra
Mendelssohn	Kreisler	Dec 9& 10, 1929**	Leo Blech	Berlin State Opera Orchestra
Mendelssohn	Kreisler	1935**	Sir Landon Ronald	London Philharmonic
Mendelssohn	Kreisler*	Jul 17, 1944** Live performance	Donald Voorhees	NA
Mendelssohn	Mutter	Sep, 1980	Herbert Von Karajan	Berlin Philharmonic
Mendelssohn	Oistrakh	1949**	Kiril Kondrashin	USSR State Symphony
Mendelssohn	Perlman	Nov 27 &28, 1972**	André Previn	London Symphony
Composer	**Performer**	**Recording Date**	**Conductor**	**Orchestra**
Mendelssohn	Shaham	Aug, 1988	Guiseppe Sinopoli	Philharmonia Orchestra
Mendelssohn	Vengerov	Sep, 1993	Kurt Masur	Gewandhausorchester Leipzig
Tchaikovsky	Heifetz	Mar 25, 1937**	John Barbirolli	London Philharmonic
Tchaikovsky	Heifetz*	April 19, 1957**	Fritz Reiner	Chicago Symphony
Tchaikovsky	Huberman	1929**	William Steinberg	Orchestra of the Berliner Staatskapelle
Tchaikovsky	Huberman	Mar 1946** Live performance	Eugene Ormandy	Philharmonia Orchestra
Tchaikovsky	Mutter	Aug 15, 1988 Live performance	Herbert Von Karajan	Vienna Philharmonic
Tchaikovsky	Oistrakh	1939**	Alexander Gauk	All-Union Radio Orchestra
Tchaikovsky	Oistrakh	Feb, 1954**	Franz Konwitschny	StaatskapelleDresden
Tchaikovsky	Oistrakh*	Jan 19, 1960** Live performance	Norman Del Mar	Royal Philharmonic
Tchaikovsky	Perlman	April 18&19, 1967**	Alfred Wallenstein	London Symphony
Tchaikovsky	Perlman	1968**	Erich Leinsdorf	Boston Symphony
Tchaikovsky	Perlman*	Nov 11& 13, 1978**	Eugene Ormandy	Philadelphia Orchestra
Tchaikovsky	Shaham	1993	Giuseppe Sinopoli	Philharmonia Orchestra
Tchaikovsky	Vengerov	May, 1995	Claudio Abbado	Berlin Philharmonic

Note. * These are the latest recordings and selected for comparison among individual performers.

** Re-mastered CD version of original recording. Live performance refers to a formal concert with an audience while live recording refers to recording process without editing, though it may occasionally take place in public.

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The first movement of each concerto was chosen for analysis as it tends to have lyrical as well as dramatic elements, both of which are associated with portamento. Samples were selected mainly from the exposition of the first movement. Shifting in the development section, consisting mainly of fast passages, often tends to be technical in nature with an effort to hide the shifting sound. Therefore, in the development section, there were few examples of intervals utilizing musical shifting. Recapitulation sections in the first movement were excluded for reasons of repetition.

Selecting Samples: Target Intervals

Based on identifying the consistent use of portamento (multiple types) in the score in the same passage among all the recordings, intervals were selected if at least one performer used portamento for a musical purpose when the shifting was technically unnecessary. Each selected interval from the four repertoires that focused on the use of portamento is called a Target Interval (TI). Each TI was numbered with the initial of the composer and the sequence in which it appears. For example, B–TI 5 indicates Brahms, fifth instance of TI in the movement. Twenty-seven TIs from Brahms's *Violin Concerto in D major Op.* 77; 28 TIs from Lalo's *Symphonie Espagnole Op. 21*; 31 TIs from Mendelssohn's *Violin Concerto in E minor Op. 64*; and 28 TIs from Tchaikovsky's *Violin Concerto in D major Op. 35* were selected for analysis. There was no effort made to balance the numbers of TIs from each repertoire, and the number of TIs was not weighted toward any repertoire. Each of the 114 TIs represents an interval of two notes, the beginning note and the last note, respectively.

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Transferring Recorded Materials to CDs

The recording industry has seen remarkable technical advancements in the twentieth century. Most musical performances from early twentieth century were recorded on 78 rpm[1] discs without editing. However, in the late 1940s, as 45 rpm discs and 33.3 rpm LP discs were introduced, a few performers such as Heifetz re-recorded major concerti. Compared to the 78 rpm discs for which performers had to play entire movements without a break, 45 rpm or 33.3 rpm recordings enabled performers to edit sections (www.answers.com/topic/lp-abbreviation?method=6). In particular, Heifetz enjoyed exploring this technique of editing and expressed strong preference for editing certain sections of the piece (Rooney, 1996).

The introduction of compact disc (CD) technology in the 1980s revolutionized the recording industry as well as performance practice. Audio CD appeared in the U.S. in 1983, and eventually sales of CDs exceeded those of LPs (see Table 2). Since the sounds of a performance on a CD are digitalized into binary digits and electrical sounds, performers working on CDs have been able to edit their performance sound more easily than was possible in analog recordings. Digital sound is cleaner, and the CD accommodates a wider range of volume than the LP—if an LP were used for such a dynamic range, the needle of the LP disc would literally jump out of the groove (www.answers.com/topic/cd-abbreviation?method=6). However, "some audiophiles still prefer what they perceive as the warmer and more detailed sounds of LPs over the harsher and glazed sounds of CDs" (http://explanation-guide.Info/meaning/Vinyl-record.html).

Table 2. Comparison of types of recordings in the twentieth century

Type of recording	**78 rpm disc**	**45 rpm disc**	**LP**	**CD**
Description	A disc which rotates 78 times per minute	A disc which rotates 45 times per minute	A long-playing phonograph record, usually refers to 33. 3 rpm disc	Compact disc Digital audio disc
Time of introduction	Start of the 20th century	Late 1940s	Mono LP (late 1940s) Stereo LP (1958)	1983 in the U.S.
Material	Shellac resin	Vinyl	Vinyl	Plastic
Common format	10" and 12" format	7" single format	12" long-playing (LP) format	4.75" format

[1] The abbreviation rpm refers to revolution per minute. This unit of frequency, commonly used to measure rotational speed (1 rpm= 1r/min=1/60 Hz). The slower rotation increased the recording time per side (Explanation-guide.Info/meaning/Vinyl-record.html).

For old master performers who did not make recordings on CD, most of their old 78, 45 or 33.3 rpm discs have been transferred to CD—they have not been re-recorded but re-mastered. In the process of transferring original LP recordings to CDs, it has been pointed out that the edgy quality associated with the original recordings has been softened by the presence of a slight reverb (Wen, 1995).

There may be some issues in terms of sound quality as a result of transferring analog recordings to other forms such as CDs. However, since portamento performance in this study deal with patterns of pitch and speed of shifting movement and the dynamics between two notes at selected intervals, the issue of sound quality during the process of transferring recorded materials does not in essence affect this study (see Table 1, in which the recordings re-mastered to CDs are indicated with **).

Extracting, Editing and Converting Samples

Audio CDs of the master violinists mentioned above were extracted into digital data, using the computer software program Easy CD-DA Extractor (http://www.poikosoft.com) and saved as audio files. The digital data obtained were cut and saved using the software program Audacity (http://audacity.sourceforge.net) to make recording samples of specific sections—Target Intervals (TIs). A frequency analysis [spectrograph] was conducted on the samples of TIs with the software program SIA Smaart Acoustic Tools (http://www.siasoft.com). The given time-series frame was transformed into the frequency domain through 1K (1024) to 8K (8192) point Fast Fourier Transform (FFT). The spectrograph illustrated the change of frequency components of sound over time; the progression of change of pitch was documented. The results of each analysis were then compared with the other samples in terms of magnitude, type, and patterns of pitch and speed during shifting movement to demonstrate the extent of variation between and within performers.

PLAN OF ANALYSIS

Research Questions

The focus of this study was to examine the characteristics of Target Intervals (TIs) that drive unanimity or variation in the choice of portamento, and how each performer used a particular type of portamento as well as patterns of portamento as unique aspects of his/her performance style. The following specific questions were explored.

A. What musical factors of TIs in terms of pitch direction, interval size, bow technique and articulation determined the choice of the particular type of portamento?

- TIs in which there was either unanimity or variation in the performer's choice of type of portamento were isolated.
- Musical factors of the isolated TIs were examined in terms of pitch direction, interval size, bow technique and articulation.

B. What are the specific characteristics of each performer's individual style with regard to portamento?

(a) Are personal portamento styles uniquely different among performers in terms of the type of portamento?

- The percentage of each performer's use of a particular type of portamento was examined and compared.

(b) What are individual portamento styles in terms of patterns of pitch, speed and dynamics as a distinguishing performance style?

- The similarities in terms of particular patterns of portamento as a performance style for an individual performer were examined and compared.
- For A and B above, recordings of the first movement of four selected concerti as performed by all or most of the violinists were used for the analysis. Some pieces were not recorded by all the performers. In cases in which a performer made more than one recording of the same piece, the latest recording was selected, based on the assumption that it would represent more mature musicianship (see Table 1, in which the more recent recording is indicated with *). For example, Kreisler's 1936 recording of Brahm's *Violin Concerto* with the London Philharmonic Orchestra conducted by John Babirolli was selected over the earlier recording of 1927 with the Berlin State Opera Orchestra conducted by Leo Blech.

(c) How does a violinist who performed the same work (TIs) at different time periods of his/her career play those same TIs in different recordings?

- Performance of the same TIs played by the same performer in his/her multiple recordings of the same piece were examined
- Differences in terms of type and patterns of portamento in the multiple recordings were focused on and compared. For example, differences in seven recordings by Oistrakh of Brahms' *Violin Concerto* were discussed.

Description of Sample Spectrograph

The primary method of analysis involved interpreting the spectrographs. In a spectrograph, the horizontal axis (X) represents the time indicated in seconds, and the vertical axis (Y) represents frequency indicated in Hertz. All frequency-based displays of spectrographs regard the highest magnitude (or intensity) value as 0 dB, which is represented in red, and the magnitude value for all other frequency data points is calculated and displayed relative to the 0 dB point. The magnitude of each spectrograph is represented by 16 distinct colors, from red (0 dB) to black (-60 dB), with the scale bar located at the bottom of the window. The following is an example of a spectrograph indicating the use of ascending B-portamento in Target Interval 17 in Brahms (B–TI 17)—the interval between A5 (the beginning note) and F6 (the last note) in bar 231 of the first movement of Brahms's *Violin Concerto in D major Op. 77* (see Figure 5 and 6).

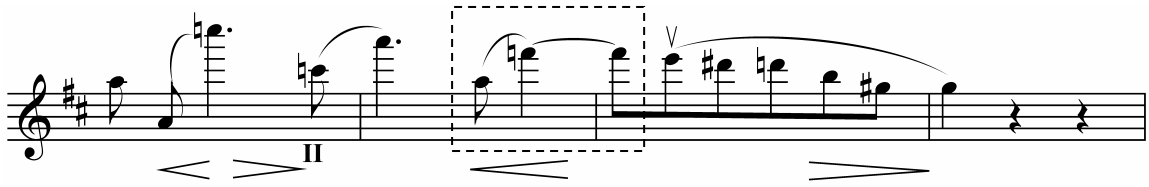

Figure 5. B–TI 17 in the first movement of Brahms' violin concerto: Bars 230–232.

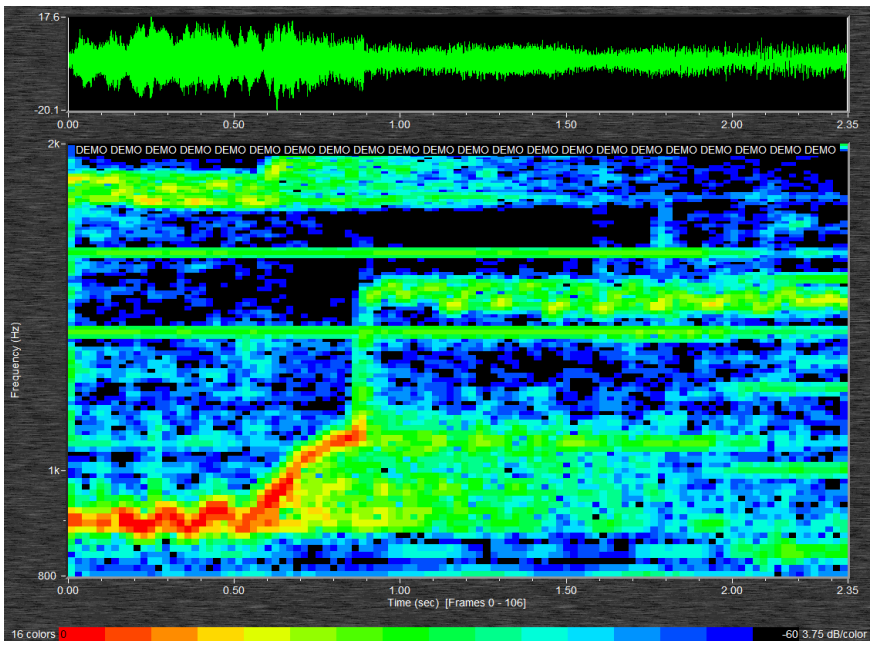

Figure 6. Performance of ascending B-portamento in B–TI 17.

- Pitch pattern.
    1. Overall contour. A contour line determines whether portamento exists and which type of portamento is used. In Figure 6, the gradual ascending line on the beginning pitch and a horizontal

line on the last pitch indicate the use of ascending B-portamento. If the contour line consists of two horizontal lines, it indicates the absence of portamento. If the contour line consists of one line without a break, it indicates the portamento with the same finger.

2. Vertical break. A vertical break within the contour lines indicates a shift in pitch, and the wider the break, the shorter the range of portamento.
3. Range of portamento. Range of portamento refers to the range of pitch within the interval of the portamento. A line with an ascending curve as shown in Figure 6 indicates an actual physical sliding motion of portamento. It is important to measure the range of pitch of the ascending curve because it reflects a musically meaningful point of comparison. Since only approximate frequency is measurable in the spectrograph, the range of portamento was indicated with approximate Hz. For example, in the spectrograph shown in Figure 6, the range of portamento is from approximately 880 Hz to approximately 1100 Hz. A small discrepancy in frequency between 880 Hz and 884 Hz in playing A5 could not be precisely detected on the spectrograph, and even if it were measurable, an individual performer might play A5 with slightly different Hz.[2] The pitch index based on the equal temperament system of tuning was used to refer the nearest pitch to each frequency (see Table 3 in Appendix).

- Type of portamento. The pitch pattern shown in Figure 6 determined the use of ascending B-portamento.
- Dynamic pattern. Even though the score in bar 231 indicates *crescendo* (see Figure 5), the color of the spectrographs of Figure 6 shows that the beginning note (A5) was played with the greatest intensity (red indicates a magnitude value of 0 dB) and the last note (F6) with much less intensity.
- Speed pattern. Where the curve of a contour line and vertical break are placed indicates the speed pattern of the shifting movement. In the spectrograph of Figure 6, the speed pattern is slow-fast. The speed of the sliding motion of the portamento, indicated by an ascending curve in the spectrograph, is much slower than the speed of the pitch leap of the left-finger movement, indicated by a vertical break (see Figure 6). Only a relative speed pattern (either slow-fast or fast-slow) between two notes was discussed since it is associated with gesture of the left finger during shifting action. Speed patterns were

[2] A scientific study on violinists' individual styles of intonation confirmed that when different violinists played the same passages, they played the same notes with slightly different frequencies within the extent of maintaining the intonational integrity of the musical piece (Garbuzov, as cited in Yampolsky, 1967). For instance, compared to piano performance, in which pitch of A4 is fixed with 440Hz, the frequency of A4 in violin performance may slightly differ, depending upon the performer. Some violinists would play A4 with 440Hz while others might prefer to play A4 with 444 Hz—a slightly higher frequency. Such subtle discrepancies in frequency as indicated with Hz were not covered in this analysis. This matter of violin intonation as a means of bringing out artistic individuality was also beyond the scope of this study.

not discussed in cases of no portamento, portamento with the same finger, or a combination of the B- and L-portamento because there was not enough variation to compare. Subtle discrepancies in speed pattern found in the use of the three types of portamenti are not applicable to teaching.

RESULTS

The results derived from the acoustical analysis focused on the following: (a) musical factors of Target Intervals (TIs); (b) individual performers with respect to a type of portamento, indicated as a percentage, and patterns of portamento; and (c) individual performers at different time periods of his/her career in regard to portamento.

1. Focusing on musical factors of TIs—pitch direction, interval size, bow technique and articulation, the study results suggested that only the pitch direction of the interval, whether ascending or descending, may have affected either unanimity or variation in the choice of portamento. Performers tended to agree more on the type of portamento in descending intervals than in ascending intervals. The bow change and articulation played on the last note seemed to affect the choice of B- or L-portamento rather than unanimity or variation in the use of portamento because of the timing of a bow change and of the placement of a leap of pitch, respectively. Articulation seemed to be associated with musical interpretation.

2. Individual portamento styles in terms of type of portamento—indicated by percentage of use of each type—showed the following: (a) the percentage of the total number of each performer's use of portamento indicated that the older generation tended to use portamento more frequently than the later violinists in the study; (b) B-portamento was used the most by all the performers and, in particular, Kreisler used B-portamenti not only more than any other type of portamento but also more than any other performer in this study; (c) the use of ascending L-portamento was exclusively associated with Heifetz, but not with other violinists from the Russian school such as Oistrakh and Vengerov; and (d) the use of L-portamento in a descending interval, which had been restricted in violin performance, was to be found only in Mutter's performances.

3. Looking at individual portamento styles in terms of patterns of portamento, some similarities were found in the volume of the intermediate note and the range of portamento. Such patterns could be regarded as the artist's distinctive performance style. As related to the intermediate note, Kreisler and Shaham used the loudest and most vividly heard intermediate notes while Mutter and Oistrakh played the intermediate notes with the softest volume. As to the range of portamento, Huberman showed an extraordinarily wide range of portamento

whereas Kreisler, Perlman, Shaham, and Vengerov each performed a much shorter range in the use of B-portamenti.

4. Looking at the results of the analysis in regard to multiple performances by a violinist at different periods of the musician's career, the same type of portamento for the most part was employed. In general, it was noted that the use of B-portamento was replaced by the use of the combination of B- and L-portamento. It was also interesting to observe the contrasts between the use of portamento and the absence of portamento (in 21 TIs out of 224 instances of TIs), and differences between studio recordings and live performances.

CONCLUSIONS

It was clear that master performers had a tendency to use portamento as a highly personalized device to exhibit their musicianship, a way to differentiate their performance style from others. Each individual artist's performance style could be identified with portamento in terms of type and patterns. Specifically, a certain type of portamento accompanied with a particular pattern of portamento may indicate the individual performer's portamento style. This was demonstrated in the case of both Kreisler and Heifetz. Heifetz in particular used much more use of L-portamento than any other performer in this study. His use of L-portamento with a soft intermediate note clearly identified his portamento style. Kreisler used portamenti more than any other performer in this study. His dominant use of B-portamento with a short range of portamento and distinctly heard intermediate note differentiated Kreisler from the other performers. With regard to multiple performances of same work, performers had a tendency to retain their portamento style during their performance careers. However, few changes in the use of portamento imply that they might have made intentional efforts to develop their performance style, modifying the use of portamento occasionally. In addition, differences between a studio recording and a live performance are significant findings, as the performers seemed to be influenced by the performing environment, trying different portamenti.

It was confirmed that portamento practice indicates the sprit of an era. In particular, it was extraordinary that the older generation of violinists used more portamenti than the younger generation, reflecting contemporary trends in violin performance. Also, the finding that performers tended to choose a greater variety of portamenti in ascending intervals may be because performers might not be traditionally restricted in ascending intervals as much as in descending intervals, most particularly, for the use of L-portamento. In violin performance history, the L-portamento in descending intervals was not accepted in the nineteenth century and has been regarded as a bad taste (Babitz, 1959; Flesch, 1924/2000).

This study clarified the use of complex portamento by demonstrating real examples of the diverse styles of portamenti of master performers. By seeing each visualized acoustical analysis (spectrograph) and listening to portamento sound corresponding to each spectrograph reflecting a particular master performer's artistry of violin portamento, violin students, teachers, and performers can understand the concept of shifting movement more correctly. By acknowledging and exploring a variety of portamenti in diverse musical situation with such visual aids, performers will have the potential of enriching their musicianship, and teachers can more systematically facilitate students in developing their personal styles.

IMPLICATION FOR MUSIC EDUCATION

Guidance in developing a personal style is an important aspect of educating performing musicians. Personal style is usually a combination of consistency within a performer as well as responsiveness to different musical situations. The advice of many well-known violinist-pedagogues on how to guide students to find that unique style, in particular regarding portamento, has involved one of two strategies. Typically, such instruction focused either on technical aspects or on the vague pedagogical practice of following a teacher's direction regarding decisions about portamento playing until a student's musical taste is sufficiently refined to be trusted (Auer, 1921/1980; Flesch, 1924/2000; Galamian, 1962; Robjohns, 1930).

Learning the distinctive portamento styles of each master performer, distinguishing available approaches, and experimenting with a variety of portamenti in various musical situations, are strategies that help the student lay a foundation for a personal style. Using specific parameters in studying master violinists can be a great tool to help students in developing their own portamento styles. One such parameter might be providing students with visualized images of the sound, as demonstrated in this study, to reinforce the learning process. Such visualization could engender accurate understanding of the process of portamento execution.

Visualization establishes a basis for effective pedagogical strategy because the students and teachers are able to communicate with precise terminology rather than to merely observe or verbalize thoughts without common ground. The detailed patterns of portamento execution seen on each spectrograph make the artistry of master violinists accessible. This is particularly beneficial for advanced students. In order to simplify for the purpose of interpretation, a teacher can draw the contour of only the violin line. A student is then more readily able to grasp the concept of portamento execution and to distinguish various portamento styles. Figure 7 indicates the simplified version of the spectrograph in Figure 6.

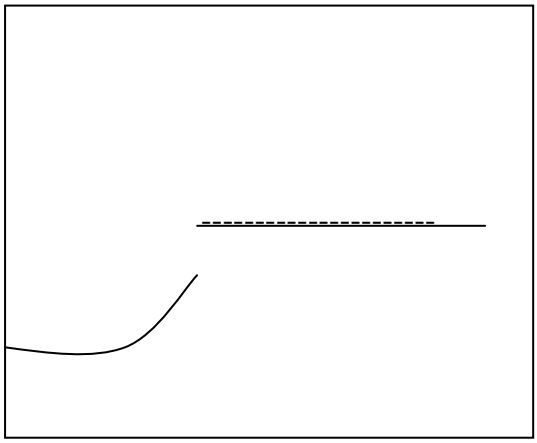

Figure 7. Simplified line drawing of spectrograph of Figure 6.

Young students have been warned about emulating sounds from listening to recordings played by master performers because of their negative influence (Galamian, as cited in Applebaum, 1972). Seeing these visual presentations of sounds, coupled with listening to particular portamenti rather than only listening to CD recordings, can dissuade students from imitating a sound with only a vague or erroneous conception of how the sound is produced.

Acknowledging various approaches and exceptions in violin portamento practice by master performers can lead to delving into new possibilities, in particular, teaching L-portamento in descending interval. It should be recalled that the result of the acoustical analysis in this study indicated Mutter's use of L-portamento in three descending TIs.

Neumann (1969) asserted that there is no single correct way of playing the violin, although various violin schools insist upon their own rigid rules on violin playing, claiming it as their right, based on a believed superiority over other schools. Auer (1921/1980) also mentioned that "there is no one definitely established way of playing a given work by a master, for there is no absolute standard of beauty by which the presentation of a violinistic art-work can be judged" (p. 76). Flesch (as cited in Neumann, 1969) exemplified cases in which even incorrect principles of violin playing by Kreisler and Szigetti resulted in beautiful tone production. Flesch (1924/2000) mentioned:

> [Regarding portamento], we are facing number of traditional prejudice which are, however, studiously and widely ignored by active performers…. the expressive connection between two notes should be the consequence of the heightened need for personal expression. That is why our best violinists permit themselves absolute freedom in the matter of the type of portamento. (p. 15)

However, he contradicts himself when he refers to the L-portamento used in a descending interval as "distinctly lacking in beauty" (1924/2000, p. 18). Despite this contradictory opinion, he goes on to imbue the performer

with the freedom to break certain rules in terms of portamento. “When the taste of the student has thus become refined, he can be allowed complete freedom in the use of portamenti and the teacher should be delighted with any instance of genuine individuality and avoidance of ‘formula’” (1924/2000).

On the question of whether to teach descending L-portamento, it is important for both students and teachers to acknowledge that it has been traditionally restricted in performance practice. With opportunities for informed choice, the decision on the use of descending L-portamento can be ultimately made by the students themselves. As fashion and approval for the use of particular portamento have evolved in the history of violin performance, so might the use of L-portamento in a descending interval become more acceptable in the future.

A FINAL NOTE: THE AFFIRMATION OF INTUITION

Before undertaking this study, I realized that I, as a violinist, had a certain set of assumptions about violin playing. When I listened to the performances of violinists from the older generation, such as Heifetz, Huberman, Kreisler, and D. Oistrakh, I noticed distinct differences between their playing and the performances of young, contemporary violinists. The most distinguishing factor was in the way they shifted. The older generation employed abundant portamenti whereas contemporary players tended to avoid the use of portamento. Many references I discovered remarked on the current performance trend of avoiding portamento altogether. Besides, specific names of violin schools and performers were referred to indicate particular types of portamenti. For instance, the terms French slide, occasionally called the Kreisler slide, and the Russian slide, also known as the Heifetz slide, were used in performance practice to indicate B- and L-portamento, respectively.

I became curious as to whether the information gained through my listening, by studying the references as well as through my experiences in performance practice as a violinist could be proven in actual performances of the master violinists of yesterday and today. I was particularly interested in the visualization of portamento sound. This study, I felt, could confirm my assumptions about violin portamento.

Using computer software, the aural sound of portamento could be visualized into acoustical analysis, called spectrographs. Each visualized spectrograph clarified how portamento was produced, showing type and patterns of portamento. The results based on the analyses of spectrographs turned out to be very similar to what I expected. It was found that violinists from the older generation used much more portamenti than contemporary players, reflecting the current fashion of violin performance, and Kreisler and Heifetz were exclusively associated with B- and L-portamento, respectively.

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The spectrographs actually reflected what I had heard and supported most of what I had found in the literatures regarding violin performance. This research confirmed intuitive thoughts with scientific evidence of master violinists' performance through visually demonstrating different portamento styles and validate the terms in referring to a particular portamento from actual practices. This approach allowed subjective interpretation of musical performances to be demonstrated and proved in a different medium.

Most of all, this study extended my creative boundaries by allowing me to have multiple perspectives regarding musical performance. This research provided me with critical awareness of what is desirable in great performances by master performers when they employ portamento as a powerful, expressive tool to showcase their inventive artistry. These performers, in all their diversity and mastery, are an inspiration to me as a musician and a teacher.

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APPENDIX

Table 3. Frequency in Cycles per Second (Hz) of Musical Pitches (The Equal Temperament System of Tuning)

Pitch	Frequency (Hz)
C3	130.813
C#3	138.591
D3	146.832
D#3	155.563
E3	164.841
F3	174.614
F#3	184.997
G3	195.998
G#3	207.652
A3	220.000
A#3	233.082
B3	246.942
Middle C4	261.626
C#4	277.183
D4	293.665
D#4	311.127
E4	329.628
F4	349.228
F#4	369.994
G4	391.995
G#4	415.305
A4	440.000
A#4	466.164
B4	493.883
C5	523.251
C#5	554.366
D5	587.330
D#5	622.254
E5	659.256
F5	698.456
F#5	739.988
G5	783.990
G#5	830.610
A5	880.000
A#5	932.328
B5	987.466
C6	1046.502
C#6	1108.732
D6	1174.660
D#6	1244.508
E6	1318.512
F6	1396.912
F#6	1479.976
G6	1567.980
G#6	1661.328
A6	1760.000
A#6	1864.650
B6	1974.932