

Suzuki Rhythm Mnemonics in Pedagogical Theory and Actual Realization

Zachary Ebin and Jay Rahn

York University, Toronto

ABSTRACT

The *Suzuki Violin School* volumes begin with variations on “Twinkle, Twinkle, Little Star.” Each variation consists of a repeated rhythmic figure. Suzuki teachers use mnemonics to teach these rhythmic figures. Two of these variations are pedagogically problematic. Both comprise six onsets: one consists of two triplets; the other repeats a figure comprising an eighth note and two sixteenths. Teachers have been observed using mnemonics for one variation that others use for the other variation.

This study examines the rhythms produced and identified on reading 9 mnemonics that Suzuki teachers commonly employ. Thirty participants were asked to speak the mnemonics and their responses were recorded and measured with *Audacity*TM software. Twenty participants who were either Suzuki teachers or trained musicians were also asked which notated rhythm each mnemonic corresponded to. Interonset intervals in the recordings were measured to determine the timing of the syllables in the spoken mnemonics. These timings were compared with the notated rhythms that had been identified by Suzuki teachers and the other trained musicians.

Among the results, some mnemonics that Suzuki teachers have regarded as representing one rhythm were actually recited in a manner that more closely corresponded to the other. Two of the mnemonics were rendered closer to “swing” rhythm, and one of the mnemonics was often realized as five syllables rather than the anticipated six. This study has implications for Suzuki pedagogy, as well as music education more generally, as using verbal mnemonics to teach rhythms is a widespread teaching technique.

1. BACKGROUND

The Suzuki Method, also known as the Mother Tongue method or Talent Education, has become a very popular pedagogy for teaching musical instruments, especially the violin. For example, the Suzuki Association of Ontario's directory lists 48 Suzuki teachers in Toronto, and many more in the surrounding regions (Blecha 2010). As well, violin teachers who do not subscribe to the methodology or philosophy Shin'ichi Suzuki advocated frequently use Suzuki publications as repertoire for their students.

Distinctive features of the Suzuki Method include the following (International Suzuki Association 2005):

- a) children ideally begin instruction before they are 5 years old;
- b) parents attend their children's classes and help them between classes;
- c) all instruction during the first several years is aural (i.e., no musical notation is employed);

- d) rather than scores, children and their parents rely on memory of what transpired in lessons.

Additionally parents typically take notes during the lessons, and children listen to a reference recording of the repertoire on a regular basis. Suzuki teachers recommend that regular listening to the reference recordings begin before the child starts to come for lessons. Whereas all Suzuki teachers and some parents are musically literate, other parents and all beginning students rely entirely on aural musical instruction.

Clapping games, bowing exercises, and other activities (Slone 1985), prepare Suzuki students to execute the rhythms of the first pieces they perform. Their first group of pieces is a set of variations on the melody of the children's nursery song ‘Twinkle, Twinkle, Little Star.’ In each variation, each tone of the original melody is played using a single rhythm that consists of 1 to 4 tones. To teach students how to perform the rhythmic figures accurately, Suzuki teachers have employed certain spoken mnemonics.

Suzuki (1981) called the rhythm consisting of 4 sixteenths and 2 eighths ‘Taka taka ta ta,’ and according to Starr (1976), Suzuki termed the rhythm comprising 8 sixteenths ‘One ta ta ta two ta ta ta’ because students had difficulty counting to 8 while playing. Although Jewell (2010) has recounted that at the Talent Education Research Institute, Suzuki's school in Japan, students used Japanese words rather than numbers or abstract syllables (Jewell 2010), Slone (2010) recalls that during lessons with Suzuki from 6 years old until his death, words, numbers, or nonsense syllables were not used to teach particular rhythms. Instead, ‘yokat’ta’ (‘good’) and ‘jyozumi’ (‘to do well’) were employed as approbation for variations B and C. Nevertheless, a widespread practice in North America has been the use of mnemonics consisting of English-language words.

Termed ‘Twinkle rhythm words,’ such mnemonics are introduced by Suzuki teachers in their classes. Also, as a basis for their children's practice between classes, parents write down these words and, in some cases, are given written copies of the mnemonics.

In the original edition of the *Suzuki Violin School* (Suzuki 1978), there were four Twinkle Variations. One of these, Variation C was based on a three-note rhythm consisting of an eighth note followed by two sixteenths. In 2007, the International Suzuki Association began to revise the *Suzuki Violin School* volumes. Included in the revision of Volume 1 is an additional Twinkle Variation. This variation, Variation D in the 2007 edition, also uses a three-note rhythm: specifically, a triplet-eighth rhythm.

Among Suzuki teachers, the use of mnemonics has varied considerably (e.g., Suzuki Association of America 2006; Monica

2008-09). Some Suzuki teachers have merely chosen Twinkle words that consist of the same number of syllables as a target rhythm, with little regard to the rhythms that result when these mnemonics are actually spoken.

Choosing a mnemonic only on the basis of how many syllables it comprises has become especially problematic with the addition of Twinkle Variation D, for the rhythms of Variations C and D both have 3 onsets (or 6 when immediately repeated) and differ only slightly in their timing. Indeed, this study is a result of having observed one teacher using a particular mnemonic to teach the rhythm of Variation C and another teacher using the same mnemonic to teach the rhythm of Variation D (cf., e.g., Fig. 2, below).

2. AIMS AND METHOD

The purpose of this study was a) to analyze ways in which 9 widespread Twinkle rhythm words for Suzuki Variations C and D are actually recited by Suzuki teachers and by other adults who would correspond to parents of Suzuki students, both musically literate and non-literate, and b) to compare these recitations with the musical rhythms to which the Twinkle rhythm words have been assumed to correspond.

2.1 Participants

The participants were 10 registered Suzuki teachers (Teachers), all of whom had completed at least 6 units of Suzuki Teacher Training Courses and 5 of whom were Registered Suzuki Teacher Trainers; 10 other musically literate adults, each of whom had at least 5 years of musical training and professional practice and none of whom was familiar with the Suzuki Method (Musicians: all of whom were undergraduates, graduate students, or faculty members in York University's Music programs); and 10 musically non-literate adults (Non-Musicians), also unfamiliar with the Suzuki Method.

2.2 Materials, Design, and Procedure

To ensure that they qualified for the study, the participants were first asked to specify their level of musical literacy and any involvement they might have had in the Suzuki Method. The 10 Teachers were also asked which mnemonics they have used to teach the rhythms of Variations C and D (Figure 2).

After the initial interview, participants read from a piece of paper on which each of the 9 mnemonics was printed 4 times, one mnemonic per line, the order of the mnemonics randomized among the 30 participants. Each participant read the mnemonics three times without pause: first at a 'moderate speaking tempo,' then at a 'slow tempo,' and finally at 'fast tempo,' the tempo in each instance being determined by the participant. The participants' readings were recorded by a microphone connected to a laptop computer running Audacity™ software (Mazzoni 2010) in real time.

Following their readings, the Musicians and Teachers were asked to fill in a chart. On the vertical axis were written the 9

mnemonics; on the horizontal axis, 3 rhythms in standard musical notation: those for Variations C and D as well as a sixteenth-eighth-sixteenth-figure. A fourth column was headed 'None.' Participants were instructed to place a checkmark beneath the rhythm they felt the mnemonic conveyed; if they felt the mnemonic conveyed none of the rhythms, they could indicate 'None.'

Measurement of the syllables' durations proved to be somewhat challenging. As Ladefoged (1975) has observed, there is no satisfactory definition of a syllable, and as Treiman (1989) has noted, there is no clear way to determine precisely a syllable's boundaries. For the purposes of this study, the following syllabifications were assumed:

Cho-co-late lol-li-pop.
Down, po-ny! Up, po-ny!
Hi, Mom-my! Hi, Dad-dy!
I prac-tise each mor-ning.
Marsh-mal-low, marsh-mal-low.
Pop-si-cle, Pop-si-cle.
Straw-ber-ry, straw-ber-ry.
Sym-pho-ny or-ches-tra.
Walk, run-ning; walk, run-ning.

Each syllable's duration was considered to be the amount of time from its onset to the onset of the next syllable, except for the last of the 6 syllables, whose duration was measured from its onset to the following silence. The 6 segments in Figure 1 show the boundaries for such durations, i.e., IOIs (interonset intervals) in one recording of the mnemonic 'Popsicle, Popsicle.'

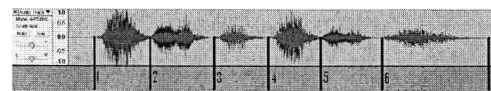


Figure 1: Segmentation of syllables in graphic display of Audacity™ recording of 'Popsicle, Popsicle.'

For each participant, two of the four readings were measured to the nearest 10 milliseconds. Usually, the first two were chosen. Rarely, the reader stumbled, laughed, breathed, or stopped in the middle of a mnemonic. Though rare, such interruptions occurred most often while reading 'Walk, running; walk, running,' which a few participants considered a 'tongue twister' at the fast tempo. In such instances, the first two recitations without obvious flaws were selected for measurement.

3. RESULTS

Figure 2 displays the mnemonics that the 10 Teachers identified before the main part of the experiment as the Twinkle rhythm words they employ for variations C and D. As highlighted in Figure 2, two Teachers said they use 'Strawberry, strawberry' for Variation D, and one for Variation C.

Ideally, for a triplet figure i) the 1st and 4th IOIs would be 1/3 as long as the sums of, respectively, the 1st to 3rd IOIs and the 4th to 6th IOIs, and ii) the 2nd and 5th IOIs would be 1/2 as long as the 2nd and 3rd, and the 5th and 6th. Ideally, for an eighth-sixteenth-sixteenth figure iii) the 1st and 4th would be 1/2 as long as the 1st to

3rd and the 4th to 6th, and iv) the 2nd and 5th would be 1/2 as long as the 2nd and 3rd, and the 5th and 6th.

Variation C	Variation D
1 Stop, pony; stop, pony.	Chocolate, chocolate.
2 Run, pony; run, pony.	<i>Strawberry, strawberry.</i>
Run, puppy, run, puppy.	
3 Down, wiggle; up, wiggle.	Pineapple, pineapple.
4 Popsicle, Popsicle.	Tripole, tripole.
5 Run, pony; run, pony.	Takita, takita.
6 Run, pony; run, pony.	Symphony orchestra.
	Jonathan, Jonathan.
	Washington, Washington.
7 Stop, titi; stop, titi.	<i>Strawberry, strawberry.</i>
8 <i>Strawberry, strawberry.</i>	n.a.
Run, pony; run, pony.	
Long, short, short; long, short, short.	
9 Down, pony; up, pony.	Beautiful violin.
10 Down, wiggle; up, wiggle.	Cracker Jack, Cracker Jack

Figure 2: Mnemonics that the 10 Teachers said they employ for Variations C and D. Twinkle words cited for both variations are highlighted. 'Tripole' might be an adaptation of the French word 'triolet,' which has circulated beyond francophone settings as a mnemonic for triplet rhythms. 'Takita' could be a variant rendering of 'takida,' which has been used as an abstract group of syllables for triplet eighths in the broadly disseminated Takadimi System of rhythm solfège (Hoffman et al. 1996). The abstract syllable-pair 'titi' has been employed in, e.g., the Kodály pedagogy (Choksy 1988).

and 3rd, and the 5th and 6th. Ideally, for an eighth-sixteenth-sixteenth figure iii) the 1st and 4th would be 1/2 as long as the 1st to 3rd and the 4th to 6th, and iv) the 2nd and 5th would be 1/2 as long as the 2nd and 3rd, and the 5th and 6th.

To assess how closely a mnemonic's readings matched these ideal ratios, the ratios of the actual IOIs as well as the (geometric/logarithmic) means and standard deviations were calculated. A mnemonic can be considered to match a particular rhythm to the extent that its (geometric/logarithmic) mean ratios are close to the ideal ratios and its standard deviations are relatively small.

As a basis of comparison, the official exemplary violin recording of Variations C and D by William Preucil, Jr. (2007) can be compared with the participants' readings. As Table 1 shows, Preucil's average IOI-ratios, calculated according to a geometric/logarithmic scale of measurement, are very close to the ideal values and the variance around these values, also calculated as a geometric/logarithmic standard deviation, is quite small.

	1 st /(1 st to 3 rd) and 4 th /(4 th to 6 th)	2 nd /(2 nd & 3 rd) and 5 th /(5 th & 6 th)
Variation C	.53 (5)	.51 (8)
Variation D	.32 (5)	.49 (8)

Table 1: Average ratios for eighth notes in Variation C, first eighths of triplet eighths in Variation D, sixteenth notes in Variation C and second eighths in Variation D in performances by Preucil (2007); percentage values for (geometric/logarithmic) standard deviations are parenthesized.

3.1 Tempo Tendencies

Table 2 shows the (geometric/logarithmic) values for the average slow, moderate, and fast tempos of the 3 groups of participants.

These values are based on the durations of the 1st to 3rd and 4th to 6th syllables, i.e., 'quarter notes.'

Notwithstanding considerable variance, especially at the slow tempo, the 3 groups of participants—especially the Suzuki teachers and the other musically literate adults—were quite similar in their rates of reading. The 'moderate' rates were not only similar for all 3 groups; as well, the tempos of Preucil's exemplary violin recordings were close to these moderate values: on average, 669 ms (3% standard deviation). That such tempos coincide with the range of values specified for 'preferred beat rate' by advocates of a sensory-motor formulation of rhythm (e.g., Todd et al. 2007) is consistent with the observation that syllable production and violin performance are motor activities.

	Teachers	Musicians	Non-Musicians
slow	1016 (40)	1011 (38)	793 (25)
moderate	668 (20)	690 (20)	603 (20)
fast	518 (20)	502 (20)	443 (15)

Table 2: Average (geometric/logarithmic) durations of 'quarter notes' (i.e., 1st to 3rd and 4th to 6th syllables) in readings by the 3 groups of participants (Teachers, N=10; Musicians, N=10; Non-Musicians, N=10), in milliseconds at 3 self-selected tempos; (geometric/logarithmic) percentages for standard deviations are parenthesized.

As a related aspect of tempo, Table 3 compares the ratios of the first quarter note's duration to the second quarter's duration. In general, the 'tempo' of each reading changed relatively little between the 1st and 2nd quarter. At slow tempos, variances were greater and the 'pace' quickened from the first half of a mnemonic to the second. But notwithstanding such tempo variation and the dispersion of relative tempo values, the readings were clearly pulsatile at the level of a quarter note.

	Teachers	Musicians	Non-Musicians
slow	1.10 (23)	1.02 (19)	0.95 (16)
moderate	1.10 (30)	0.98 (20)	0.96 (19)
fast	1.05 (23)	0.94 (16)	0.95 (18)

Table 3: Average ratios of 1st quarter-note duration to 2nd quarter-note duration, i.e., 1st to 3rd syllables' duration divided by 4th to 6th syllables' duration in readings by the 3 groups of participants at 3 self-selected tempos; (geometric/logarithmic) percentages for standard deviations are parenthesized.

3.2 Durational Tendencies

As Tables 4 and 5 show, IOI-ratios in the readings of each mnemonic were quite similar among the Teachers, Musicians, and Non-Musicians. The average IOI-ratios of 'Popsicle, Popsicle' and 'I practise each morning' were closest to the ideal triplet rhythm, and their standard deviations were relatively small. The average IOI-ratios of 'Walk, running; walk running,' 'Down, pony! Up, pony!' and 'Marshmallow, marshmallow' were closest to the ideal eighth- sixteenth-sixteenth rhythm and their standard deviations, too, were relatively small.

Although the recitations of 'I practise each morning' were quite close to the ideal triplet rhythm, this mnemonic would be of questionable pedagogical value. In Standard English intonation (e.g., Cruttenden 1997), this mnemonic's 2nd and 5th syllables are accented (I prác-tise each mór-ning); by contrast, in Variation D, the 1st and 4th tones are musically accented (i.e., on the beat).

'Chocolate lollipop' was problematic, for the word 'chocolate' was pronounced as 3 syllables by 6 Teachers and 3 Musicians and as 2 syllables, i.e., 'choc'late' by the rest of the Teachers and Musicians and all the Non-Musicians.

	Teachers	Musicians	Non-Musicians
Popsicle	.32 (17)	.33 (24)	.33 (17)
I practise	.35 (25)	.34 (22)	.33 (26)
Hi, Mommy!	.38 (42)	.39 (22)	.37 (15)
Chocolate	.39 (25)	.41 (40)	.41 (17)
Symphony	.41 (24)	.42 (26)	.42 (12)
Marshmallow	.48 (14)	.48 (18)	.47 (27)
Down, pony!	.49 (15)	.49 (15)	.48 (20)
Walk, running	.50 (12)	.50 (15)	.49 (15)
Strawberry	.55 (16)	.56 (17)	.57 (13)

Table 4: Averages and standard deviations (%) of IOI-ratios for measured durations of 1st/(1st+2nd+3rd) syllables and 4th/(4th+5th+6th) syllables for readings of 9 mnemonics (see Table 1, above) by 3 groups of adults.

	Teachers	Musicians	Non-Musicians
Symphony	.43 (39)	.44 (34)	.46 (29)
Walk, running	.44 (27)	.40 (33)	.44 (23)
Marshmallow	.47 (22)	.45 (25)	.45 (24)
Down, pony!	.49 (20)	.48 (21)	.47 (18)
Strawberry	.49 (21)	.50 (24)	.49 (23)
Popsicle	.50 (18)	.47 (28)	.46 (25)
I practise	.52 (17)	.53 (18)	.52 (16)
Hi, Mommy!	.52 (15)	.60 (32)	.58 (18)
Chocolate	n.a.	n.a.	n.a.

Table 5: Averages and standard deviations (%) of IOI-ratios for measured durations of 2nd/(2nd+3rd) syllables and 5th/(5th+6th) syllables for readings of 9 mnemonics by 3 groups of adults. N.B.: values for 'Chocolate lollipop' are not included because some participants pronounced 'chocolate' as 3 syllables and others as 2 ('choc'late').

Although the average 1st and 4th IOI-ratios for 'Marshmallow, marshmallow' and 'Walk, running; walk, running' were close to the eighth-sixteenth-sixteenth ideal, their average 2nd and 5th IOI-ratios were quite small and their standard deviations relatively large. Conversely, the 2nd and 5th IOI-ratios for 'Strawberry, strawberry' were close to the triplet-eighth ideal but not their 1st and 4th IOI-ratios.

Finally, 'Hi, Mommy! Hi, Daddy!' and 'Symphony orchestra' were, on the whole, rendered in what might be termed 'swing' or 'reverse-swing' rhythms, insofar as the 1st and 4th IOI-ratios of both tended to be closer to 2:5 than to 1:3 or 1:2, and the 2nd and 5th IOI-ratios were closer to 2:5 or 3:5.

3.3 Notational Classification of Verbal Mnemonics

As mentioned above, the Musicians were asked to classify the mnemonics according to 3 categories (eighth-sixteenth-sixteenth, triplet-eighth, sixteenth-eighth-sixteenth) or 'None.' One could reasonably expect that the mnemonics for which there was greater agreement among the Musicians' classifications would be the mnemonics whose implicit rhythms were most certain for the Musicians and that, as a consequence, the dispersions around the average values for the Musicians' readings of these mnemonics would be smaller.

Table 6 shows that the Musicians' agreement concerning the mnemonics' rhythmic categories was greatest for 'Down, pony!' and 'Walk, running' and least for 'Chocolate'—as one would expect, because, as indicated above, in Standard English there are two ways of syllabifying the word 'chocolate.' Whereas these mnemonics also resulted in, respectively, the smallest and largest standard deviations, the relationship between the Musicians' agreement or 'certainty' and the amount of variance in their readings was mixed for the other mnemonics.

	s.d.(%)	ess	eee	ses	none
Down, pony!	15	9	1	0	0
Walk, running	15	9	0	0	1
Strawberry	17	5	4	0	1
Marshmallow	18	6	3	0	1
Hi, Mommy!	22	8	2	0	0
I practise	22	2	0	3	5
Popsicle	24	3	7	0	0
Symphony	26	0	9	1	0
Chocolate	40	0	1	1	8

Table 6: Standard deviations (expressed as percentages calculated logarithmically) around the average values for the 1st and 4th IOI-ratios in the Musicians' readings of the 9 mnemonics (cf. Table 4, above) and the Musicians' classifications of the 9 mnemonics: ess = eighth-sixteenth-sixteenth; eee = eighth-eighth-eighth; ses = sixteenth-eighth-sixteenth; none = none of these 3 categories.

From another vantage point, Table 7 shows that the relationship between the Musicians' classifications of the mnemonics and the tendencies and dispersions of their readings was not simple. As compared with all 10 Musicians' readings of all 9 mnemonics in Table 4, Musicians' classifications of mnemonics did not correspond to enhanced precision in their readings of the mnemonics they identified for the eighth-sixteenth-sixteenth and triplet-eighth rhythms. As well, those who classified certain mnemonics as corresponding to a sixteenth-eighth-sixteenth rhythm did not tend to employ an IOI-ratio close to .25 for the 1st and 4th syllables when they actually read these mnemonics.

	average	standard deviation
ess	.47	22%
eee	.39	36%
ses	.36	36%

Table 7: Average 1st and 4th IOI-ratios and respective standard deviations for Musicians' readings of mnemonics they identified as belonging to the 3 categories in Table 6, above.

	s.d.(%)	ess	eee	ses	none
Down, pony!	15	10	0	0	0
Walk, running	12	9	0	0	1
Strawberry	16	2	6	0	2
Marshmallow	14	4	5	0	1
Hi, Mommy!	42	6	3	0	1
I practise	25	2	2	1	5
Popsicle	17	2	6	0	2
Symphony	24	0	9	0	1
Chocolate	25	0	6	0	4

Table 8: Standard deviations (expressed as percentages calculated logarithmically) around the average values for the 1st and 4th IOI-ratios in the Teachers' readings of the 9 mnemonics (cf. Table 4, above) and the Teachers' classifications of the 9 mnemonics: ess=eighth-sixteenth-sixteenth; eee=eighth-eighth-eighth; ses=sixteenth-eighth-sixteenth; none=none of these 3 categories. Cf. also Table 6, above.

As for the Musicians, the Teachers' agreement was greatest for 'Down, pony!' and 'Walk, running' and least for 'Chocolate.' As well, the Teacher's agreement was comparably small for 'I practice' (Table 8). However, as in the instance of the Musicians, the relationship between agreement and dispersion was not simple among all the mnemonics for the Teachers (Table 9) and the readings by the single Teacher who indicated that a particular mnemonic, namely, 'I practice,' was most suitable for the sixteenth-eighth-sixteenth rhythm produced, on average, 1st and 4th IOI-ratios of .20, rather than .25, and with a relatively large variance.

	average	standard deviation
ess	.48	24%
eee	.37	28%
ses	.20	59%

Table 9: Average 1st and 4th IOI-ratios and respective standard deviations for the Teachers' readings of mnemonics they identified as belonging to the 3 categories in Table 8, above.

4. CONCLUSIONS

Of the 9 mnemonics, the Teachers, Musicians, and non-Musicians read 'Down, pony! Up, pony!' and 'Popsicle, Popsicle' with average durations closest to the ideal IOI-ratios for, respectively, eighth-sixteenth-sixteenth and triplet-eighth rhythms and with relatively small standard deviations. The 'Down, pony! Up, pony!' mnemonic was also identified by all the Teachers and all but one of the Musicians with the eighth-sixteenth-sixteenth rhythm. Least consistent with regard to reading and categorization was 'Chocolate, chocolate.'

That there was considerable agreement—or considerable agreement in their disagreement—on the part of the Teachers, Musicians, and non-Musicians suggests that the rhythmic values Teachers convey by means of mnemonics in Suzuki classes would be substantially sustained between classes by parents, especially by parents who are musically literate. To be sure, all groups manifested quite large dispersion around their average durational values. However, Suzuki instruction, like other kinds of teaching and learning, involves gradual shaping of behaviour towards specific norms, and the present study shows that what is done in class need not be undone to any great extent between classes.

Determining how mnemonics vary in their suitability for realizing particular rhythmic values has implications beyond the Suzuki Method. As noted above (Fig. 2), other musical pedagogies have employed syllables in teaching rhythmic skills. (See also, for example, Gordon's (1993) historical survey.) Of these, recent versions of the Suzuki Method, like Emile Jaques-Dalcroze's Eurhythmics (Abramson & reiser 1994) and Carl Orff's Schulwerk (Orff & Keetman 1958), have employed words that actually occur in a natural language—in general, the pupil's first language or 'Mother Tongue'—rather than numbers or meaningless syllables. As a consequence, it is of interest to discern what difference, if any, might obtain developmentally between the efficacies of the two kinds verbal behaviour in the acquisition of rhythmic skills.

In addition to their immediate applicability to music pedagogy, natural-language rhythm mnemonics are of potential consequence

to studies of musical prosody. As noted above, 'Down, pony! Up, pony!' was read with durations very close to the ideal eighth-sixteenth-sixteenth proportion 2:1:1 with relatively small variances among the 3 groups and it tended to be identified with this ideal proportion by both the Teachers and the Musicians. Further, 'Walk, running; walk, running,' 'Strawberry, strawberry, and 'Marshmallow, marshmallow' manifested these tendencies, but to a lesser extent.

Common to all four mnemonics is what might be termed a 'word boundary' or a "word" boundary' between the first and second syllables and a structure of immediate repetition or parallelism. Whereas 'Down, pony! Up, pony!' and 'Walk, running; walk, running' comprise such a 'word boundary' in the usual sense, 'marsh' and 'straw' are 'words' within words.

Conversely, 'Popsicle, Popsicle,' was read with durations very close to the ideal triplet-eighth proportion 1:1:1 with relatively small variances among the 3 groups and it tended to be identified with this ideal proportion by both the Teachers and Musicians, whereas 'Symphony orchestra,' whose structure is neither immediately repetitive nor immediately parallel, manifested these tendencies to a lesser extent. In both, as in the problematic mnemonic 'Chocolate, chocolate,' there is neither a word boundary nor a 'word' boundary between the 1st and 2nd syllables. Moreover, relative to its accentuation, there is a word boundary between the 2nd and 3rd syllables of 'I practice each morning,' i.e., after 'practice' and 'morning,' which, like 'Popsicle, Popsicle,' tended to be read as a triplet-eighth although its identification with any particular rhythmic figure was mixed. Nonetheless, despite its word boundary after the 1st and 4th syllables, 'Hi! Mommy; Hi! Daddy' tended to be read in a manner quite different from both the eighth-sixteenth-sixteenth and triplet-eighth ideals and with mixed variances, though it was generally identified with the eighth-sixteenth-sixteenth rhythm.

Some of the tendencies in the participants' readings might be explained by such concepts as pre-boundary lengthening and syllable ratio equalization (reviewed by Turk & Shattuck-Hufnagel 2000). However, natural-language rhythm mnemonics for musical instruction occupy a region at what List (1963) has termed the 'boundaries of speech and song.' Though fluent and continuous like the usual productions analyzed in phonetic studies, a substantial feature of the mnemonics' fluency and continuity is the relative precision with which the level of the pulse or beat is realized, as evidenced by Tables 2 and 3, above.

The mixture of linguistic and musical factors that might enter into an account of mnemonic production could suggest an explanatory framework along the lines of SMARs, i.e., Similarity Metric Assignment Rules (Halle & Lerdahl 1993). However, the problem such mnemonics pose is, in an important respect, opposite to the kind of question dealt with by SMARs or by Hayes' (2009) application of Prince and Smolensky's Optimality Theory. Among important differences, the latter take duple and triple subdivisions of the beat as given, whereas such subdivisions are a central issue in analyzing the effectiveness of mnemonic production.

As those who employ natural-language mnemonics in their teaching and learning await a more finished account of the ways in which musical durations mesh with linguistic prosody,

improvement can be sought empirically. Selection of mnemonics can be informed by measurements of actual performances and, as has already become normative in Suzuki pedagogy, recordings of exemplary performances can be incorporated into regular practice—not a difficult undertaking with recording technology that is now readily available.

5. REFERENCES

- Abramson, R. & J. Reiser. (1994). *Music as a Second Language*. New York: Music and Movement Press.
- Blecha, Vicki, ed. (2010). Revised Membership List. *SAO Newsletter* 20/4, insert.
- Choksy, L. (1988). *The Kodály Method*. 2d ed. Englewood Cliffs, NJ: Prentice-Hall.
- Cruttenden, A. (1997). *Intonation*. Cambridge, UK.: Cambridge University Press.
- Gordon, E. (1993). *Learning Sequences in Music*. Chicago: GIA Publications.
- Halle, J. & F. Lerdahl. (1993). A Generative Textsetting Model. *Current Musicology* 55: 3-23.
- Hayes, B. (2009). Textsetting as Constraint Conflict in J.-L. Aroui & A. Arleo, eds., *Towards a Typology of Poetic Form: From Language to Metrics and Beyond*. Amsterdam: John Benjamins Publishing, 43-62.
- Hoffman, R., W. Pelto, & J. W. White. (1996). Takadimi: A Beat-Oriented System of Rhythm Pedagogy. *Journal of Music Theory Pedagogy* 10: 7-30.
- International Suzuki Association. (2005). *The Suzuki Method*: <http://www.internationalsuzuki.org/method.htm>.
- Jewell, M. (2010). Personal communication, April 27.
- Ladefoged, P. (1975). *A Course in Phonetics*. Orlando: Harcourt Brace.
- List, G. (1963). The Boundaries of Speech and Song. *Ethnomusicology* 7/1: 1-16.
- Mazzoni, D. (2010). *Audacity™*. SourceForge: <http://audacity.sourceforge.net/>
- Monica. (2008-09). *My Twinkle Mat™*. s.l.: Twinkle Mat.com. <http://twinklemat.bigcartel.co/product/my-twinkle-mat>
- Orff, C. & G. Keetman. (1958). *Music for Children: English Version adapted from Orff-Schulwerk by Margaret Murray*. London: Schott.
- Preucil, W., violin (2007). *Suzuki Violin School CD, Volume 1*. Alfred Publishing. CD 2826-D.
- Slone, K. C. (1985). *They're Rarely Too Young ... and Never Too Old 'To Twinkle': Teaching Insights into the World of Beginning Suzuki Violin*. Ann Arbor, MI: Shar Products.
- Slone, D. (2010). Personal communication, April 28.
- Starr. (1976). *The Suzuki Violinist*. Knoxville: Kingston Ellis Press.
- Suzuki, S. (1978). *Suzuki Violin School: Violin Part*. 10 vols. [Tokyo]: Zen- On Music.
- Suzuki Association of America. (2006). Twinkle Rhythm Words in *General Suzuki Forum* 03/25-07/20: <http://suzukiassociation.org/forum/viewtopic.php?f=1&t=1175&hilit=twinkle+words>
- Todd, N. P. M., R. Cousins, & C. S. Lee. (2007). The Contribution of Anthropometric Factors to Individual Differences in the Perception of Rhythm. *Empirical Musicology Review* 1/1: 1-13: <https://kb.osu.edu/dspace/bitstream/1811/24478/1/EMR000021a-Todd-et-al.pdf>
- Treiman, R. (1989). The Internal Structure of the Syllable. in G. Carlson & M. Tanenhaus, eds., *Linguistic Structure in Language Processing*. Dordrecht, The Netherlands: Kluwer, 27-52.
- Turk, A. E. & S. Shattuck-Hufnagel. (2000). Word-boundary-related duration patterns in English. *Journal of Phonetics* 28/4: 397-440.