A Psychological Addendum to *Takadimi: A Beat-Oriented System of Rhythm Pedagogy*

Justin London

In the previous article Hoffman, Pelto, and White address the various problems involved in designing and using systems of rhythmic solfège. As they rightly note, the designer(s) of such systems are first and foremost faced with a choice between "those that emphasize counting within the measure and those that emphasize pattern or beat." After surveying various approaches (Kodály, McHose/Tibbs, Gordon) the authors recognize that "all systems value the recognition and labeling of rhythmic patterns but choose to emphasize or facilitate one aspect of the rhythm learning process at the expense of another. . . . All have weaknesses when applied across the broad spectrum of rhythmic study." Not only is this assessment quite true; it in fact runs deeper than the authors had perhaps intended. For this choice impinges upon one of the most basic dichotomies of human perception and cognition.

In psychological studies of perception researchers have long made a distinction between "serial" and "hierarchical" organization of stimuli (as well as patterned behavior—see the References citations of Lashley 1951, Restle 1970, Martin 1972, Divenyi and Hirsh 1978, and others). This body of research covers a wide variety of human activities, not only musical perception and performance, but also dynamic visual perception, auditory and/or speech recognition (and production), and complex behaviors such as touch-typing and juggling. A specific example will help make the serial versus hierarchical distinction clearer in a musical context. Consider the following durational sequence:  . When construed in terms of its serial organization we may regard it as a string of five events which can be encoded in various ways—as a series of specific durations (200ms, 100ms, 100ms, 200ms, 200ms), or as a series of relative durations (such as N, .5N, .5N, N, N), or as a sequence of

positions on a timeline (e.g., 0, 1, 1.5, 2, 3...). Note that if the timeline is maintained by some type of clock (and thus counts in modular arithmetic) the result is a serial pattern that is functionally equivalent to placing the pattern in a metric context (i.e., "one-and-a-two-and..."). Alternatively, we can regard  in terms of its hierarchical organization, that is, as a pattern whose notes are grouped in a certain way: (Long+short+short), (Long+Long). Indeed, these two groups cohere into a larger structure: [(Long+short+short)+(Long+Long)], and it is on account of this nesting that the term "hierarchical" is used to describe such patterned relationships. As Restle has pointed out, while a computer is perfectly happy to deal with information sequences in a serial fashion (since each event is simply put in a successive memory location), humans are less happy with purely serial approaches to cognition, given the limitations of our perception and memory (Restle, 483). It is for this reason that hierarchical patterns are also known as "rhythmic" or "figural" patterns in the psychological literature. The memorability of such patterns is what gives them a sense of shape (hence "figural"), while the regularities of their substructure give them a sense of predictability as they unfold (hence "rhythmic").

What the previous example illustrates of course is that most musical passages can be understood in both serial as well as hierarchical terms. Small wonder, then, that Hoffman et al., as well as their pedagogical forebears, have had to struggle to devise a system which tries to capture *both* the serial as well as the figural aspects of rhythmic patterns as they occur in a metric context. The Takadimi system is particularly admirable in that it steers a middle ground between figural and serial encoding of rhythmic sequences. The serial structure of beat subdivisions is encoded by the various syllables. The two choices for subdivision syllables (Taka-dimi for simple meters, Tava-kidi-dama for compound) are, in effect, two different "clocks" which give a unique location to articulations which occur below the level of the beat. Moreover, as the student learns how to both recognize and declaim various syllable patterns, they become less like serial descriptions and more like rhythmic figures; one learns particular "words" (i.e., strings of syllables) which demark characteristic durational patterns. In so doing the student learns to

hear particular rhythmic shapes in terms of an archetypal rhythmic category.[1]

In their explanation of how a student may use different strategies to declaim a single, complex rhythm (such as the 4-within-3/3-within-4 patterns in Figure 13 or the composite rhythms in Figure 14), Hoffman, Pelto, and White note that "while the resulting composites are, in a purely temporal sense, identical, the patterns are vastly different musically and metrically." In so doing, the authors have broached another area of temporal perception and cognition relevant to musical pedagogy, and that is the problem(s) of figure/ground perception (and switching) within complex visual or auditory patterns. As perceptual studies have shown, when confronted with such composite auditory patterns we tend to hear one part as the dominant shape or figure while the other articulations are heard as subordinate or background (see, for example, Handel and Oshinsky 1981). And while the phenomenon of figure-ground switching is well known, we almost never see or hear "both at the same time," but rather perceive one OR the other. While the Takadimi system allows students to "hear both sides" of a composite pattern, it does not ask the students to hear and/or declaim two independent streams at once. Rather, in learning the various strategies for declaiming a single complex pattern the student learns different aggregate patterns, aggregates which each embody different figure/ground relationships.

Finally, and perhaps most important, Takadimi is psychologically proper in the primacy it gives to the beat level of the metric hierarchy. Numerous studies have investigated (though it would not be fair to say that they have "proven") the special salience of beats (as well as the relations between beats and beat subdivisions) in rhythmic perception.[2] When we listen to a rhythmic pattern we first and foremost identify a particular level of periodic articulations within it as the level of tactus or beat, most often within the

---

[1]For background on the categorical nature of rhythmic perception see, for example, Povel 1981, Sloboda 1983, Balzano 1986, Clarke 1987, Schulze 1989, Collyer et al. 1992, and Raffman 1993. The strength of any syllable system is its ability to create equivalence-classes among different rhythmic sequences; any series that one would articulate with the same set of syllables is, by definition, an instance of a particular figural pattern or type.

range of 70-120 attacks per minute. It is this level which gives the musical surface its sense of tempo, and it is in terms of this level that both shorter and longer durations are understood. Indeed, Jones and Boltz speak of the need for a particular level to serve as a "referent" for the construction of both higher and lower levels of rhythmic structure (Jones and Boltz, 470). Thus by marking beats with the "TA" in each "Taka-dimi"/"Tava-kidi-dama" declamation, students use the beat level as the point of entry into the overall rhythmic/metric structure of a particular passage. Moreover, given that one can mark downbeats with the dynamic emphasis of a particular syllable (e.g., TA-ka-di-mi, ta-ka-di-mi, TA-ka-di-mi, ta-ka-di-mi, etc., for running 16ths in a 2/4 meter), Takadimi is perhaps not quite so metrically neutral as the authors imply.

In the music theory classroom the usual pedagogical goal in teaching solfège, rhythmic declamation, harmonic and melodic dictation, and so forth is to enhance the students' overall level of musicianship. Rhythmic reading and performance skills are especially important; Yee et al. (1994) have documented how counting subdivisions greatly enhances a subject's ability in rhythmic judgment and performance tasks. But along with its practical value there is another lesson to be taught here as well. As these skills all involve the perception and memory of musical patterns, time spent in the aural skills lab can also be used to demonstrate the way the ear and mind organize musical sound. Because the Takadimi system is consonant with a number of basic attributes of our perceptual faculties, one can use Takadimi as a means of contrasting "easy" and "difficult" patterns (that is to say, those which one can readily declaim versus those which one cannot), not only in terms of their musical complexity but in terms of their cognitive complexity. In so doing our students not only gain a musically useful skill; they also learn how music theory can provide a unique window onto the workings of the human mind.

---

[2]See, for example, Clynes and Walker 1982, Fraisse 1982, ten Hoopen et al. 1982, Shaffer et al. 1985, Dowling and Harwood 1986, Clarke 1987, Halpern 1988, Jones and Boltz 1989, Drake et al. 1991, Parncutt 1992, Drake and Palmer 1993, and London 1995.

REFERENCES

Balzano, Gerald J. "Music Perception as Detection of Pitch-Time Constraints." In *Event Cognition: An Ecological Perspective*, ed. Viki McCabe and Gerald J. Balzano, 217-233. Hillsdale, NJ: Lawrence Erlbaum, 1986.

Clarke, Eric F. "Categorical Rhythmic Perception: An Ecological Perspective." In *Action and Perception in Rhythm and Music*, ed. Alf Gabrielsson, 19-33. Stockholm: Royal Swedish Academy of Music, 1987.

Clynes, Manfred, and Janice Walker. "Neurobiologic Functions of Rhythm, Time, and Pulse in Music." In *Music, Mind, and Brain*, ed. Manfred Clynes, 171-216. New York: Plenum Press, 1982.

Collyer, Charles E., Hilary A. Broadbent, and Russell M. Church. "Categorical Time Production: Evidence for Discrete Timing in Motor Control." *Perception and Psychophysics* 51/2 (1992): 134-144.

Divenyi, P.L., and I.J. Hirsh. "Some Figural Properties of Auditory Patterns." *Journal of the Acoustical Society of America* 64/5 (1978): 1369-1385.

Dowling, W. Jay, and Dane L. Harwood. *Music Cognition*. Orlando: Academic Press, 1986.

Drake, Carolyn, W. Jay Dowling, and Caroline Palmer. "Accent Structures in the Reproduction of Simple Tunes by Children and Adult Pianists." *Music Perception* 8/3 (1991): 315-334.

Drake, Carolyn, and Caroline Palmer. "Accent Structures in Music Performance." *Music Perception* 10/3 (1993): 343-378.

Fraisse, Paul. "Rhythm and Tempo." In *The Psychology of Music*, ed. D. Deutsch, 149-180. New York: Academic Press, 1982.

Halpern, Andrea R. "Perceived and Imagined Tempos of Familiar Songs." *Music Perception* 6/2 (1988): 193-202.

Handel, Stephen, and James S. Oshinsky. "The Meter of Syncopated Auditory Patterns." *Perception and Psychophysics* 30/1 (1981): 1-9.

Jones, Mari Riess, and Marilyn Boltz. "Dynamic Attending and Responses to Time." *Psychological Review* 96/3 (1989): 459-491.

Lashley, Karl S. "The Problem of Serial Order in Behavior." In *Cerebral Mechanisms in Behavior*, ed. Lloyd A. Jeffress. New York: Wiley and Sons, 1951.

London, Justin M. "Some Examples of Complex Meters and Their Implications for Models of Metric Perception." *Music Perception* 13/1 (1995): 59-78.

Martin, James G. "Rhythmic (Hierarchical) versus Serial Structure in Speech and Other Behavior." *Psychological Review* 79/6 (1972): 487-509.

Parncutt, Richard. "Quantifying Agogic Accent, Pulse Salience, and Metric Accent: Experiments and a Sensory Model." Paper presented at the Second International Conference on Music Perception and Cognition, Los Angeles, 1992.

Povel, Dirk-Jan. "Internal Representation of Simple Temporal Patterns." *Journal of Experimental Psychology: Human Perception and Performance* 7/1 (1981): 3-18.

Raffman, Diana. *Language, Music, and Mind.* Cambridge, MA: MIT Press, 1993.

Restle, Frank. "Theories of Serial Pattern Learning: Structural Trees." *Psychological Review* 77/6 (1970): 481-495.

Schulze, Hans-Henning. "Categorical Perception of Rhythmic Patterns." *Psychological Research* 51 (1989): 10-15.

Shaffer, L.H., Eric F. Clarke, and Neil P. Todd. "Metre and Rhythm in Piano Playing." *Cognition* 20 (1985): 61-77.

Sloboda, John A. "The Communication of Musical Metre in Piano Performance." *Quarterly Journal of Experimental Psychology* 35A (1983): 377-396.

ten Hoopen, Gert, Joos Vos, and John Dispa. "Interaural and Monaural Clicks and Clocks: Tempo Difference Versus Attention Switching." *Journal of Experimental Psychology: Human Perception and Performance* 8/3 (1982): 422-434.

Yee, William, Susan Holleran, and Mari Riess Jones. "Sensitivity to Event Timing in Regular and Irregular Sequences: Influences of Musical Skill." *Perception and Psychophysics* 56/4 (1994): 461-471.