

10.

ABSTRACT

An extended description of this work was published in “Papadelis, G. and Papanikolaou, G. (2004). The Perceptual Space Between and Within Musical Rhythm Categories. In: Davidson, J. (ed.). *The Music Practitioner: Research for the Music Performer, Teacher and Listener* (pp. 117-129). Aldershot: Ashgate Publishing Ltd”.

On the Perception of Musical Rhythm: Theoretical Issues, Empirical Findings

I. RHYTHM PERCEPTION AND THE CATEGORIZATION PROBLEM

Musical rhythm patterns are mainly characterized by durational relationships between their different time levels. Actual durational proportions acquired by the listener, constitute one of the major underlying factors in the perception of musical rhythm. From a cognitive point of view, it is important to focus on the strategies used by the human mind for the encoding of the huge number of all possible durational proportions, that characterize real musical events, which lead to their classification into a limited number of discrete rhythm categories. According to Clarke (1987), an initial stage of rhythmic categorization involves a process of correlating every acquired durational pattern with a “best fitting” mental rhythmic schema, whose structure is characterized by small, hole number durational ratios (e.g. 1:2, 1:3, 1:2:3 etc.). Any deviations from that accurate-timing pattern is considered as a part of a non-categorical piece of information and is perceived, either as musical expressivity or just as inaccurate performance of rhythm.

Categorical perception of note durations and musical rhythm in general, is closely related to two fundamental aspects of modern western musical notation: a) The limited number of rhythmic values and b) The procedure of dividing each rhythmic value into small-integer fractions (usually two or three), in order to produce smaller rhythmic values. In addition, temporal analysis of any musical performance reveals that different interpretations of the same musical score is a very common practice among musicians. These different interpretations include two kinds of deviations from accurate metronomic timing: non-intended motor noise and intended expressive timing. The second kind of deviations seems to follow certain rules, which depend on various physical and perceptual parameters (Desain & Honing 1992).

The process of categorization plays a critical role in various perceptual domains. It was first observed and investigated with color perception and the perception of speech sounds (Harnad, 1987). The most common experimental approach to categorical perception stems from the field of Psychophysics. According to that approach, the perceptual response to various physical continua, which is characterized by a discrete (categorical) recoding of the incoming stimulus's range, is investigated through the use of identification and discrimination experimental tasks (Macmillan, 1987; Pastore, 1987).

Research on the perceptual categorization of musical continua is limited to a small number of cases (Cutting & Rosner 1974; Siegel & Siegel, 1977; Zatorre & Halpern, 1979; Rosen & Howell, 1981; Rosen & Howell, 1983; Howard et al., 1992; Nakajima et al., 1992). Even less is the number of cases concerning the categorical perception of rhythm parameters (Clarke,

1987; Schulze, 1989; Windsor, 1993) and their results enhance both opposite directions: categorical and non-categorical.

II. THE PRESENT INVESTIGATION

The starting point of the present study stems from previous psycho-linguistic research on the categorical perception of phonemes (Macmillan, 1987; Schouten & van Helsen, 1992; Remez, 1994;) as well as, from earlier investigations on certain aspects of the categorical perception of rhythm patterns. The main purpose was a mapping of the perceptual space within and between adjacent rhythm categories, as well as the investigation of the “perceptual magnet effect” (Iverson & Kuhl, 1995). Although the above problem is multidimensional, in respect to the major parameters that affect rhythm perception, the present study focuses on timing variations, especially on small deviations from accurate metronomic timing, at different musical tempi.

According to the psychophysical experimental methodology for the detection and exploration of categorical perception, a systematic timing variation was introduced to a prototypical rhythm pattern (Figure 6.2, p 78), so as to produce a set of rhythm variations between two adjacent rhythm categories. These variations are characterized by slightly different durational ratios (at the level of JND), which divide the equivalent ratios’ continuum into discrete equal fragments (Figures 6.6-6.8, pp 89, 91 & 93).

All subjects, that participated to the experimental procedure, were students at a University Music Department. All of them were passed through an introductory training stage and they were assigned to two experimental groups, with respect to their acuity on rhythm detection.

The existence and the relative strength of a prototype, within each category, was investigated, for each experimental group separately, through an identification task. Their durational ratios were finally compared to the nearest exact hole-number ratio for each combination of category and tempo. A summary of these results led to certain conclusions about the perception of temporal symmetries.

Further exploration and mapping of the perceptual space between and within categories was performed through the use of a same-different discrimination task. That procedure included presentation of pairs of neighboring rhythm patterns, as well as, an equal number of placebo ones. Subjects’ task was to decide whether the two patterns within each pair were same or different. The results provide a discrimination function along the continuum, which demonstrates discrimination peaks and regions where discrimination is better than chance.

Comparative analysis of identification and discrimination results was finally employed, by examining discrimination function at the region of category boundaries, as these were obtained by identification task. In this way, peaks in discriminative acuity at the transition region between adjacent categories (boundary effect), provide an indication of categorical perception.

In conclusion, comparative analyses between the two experimental groups demonstrated significant differences in the structure of perceived rhythm categories and that can be attributed to differences in their mental representations.

III. PERSPECTIVES FOR FURTHER RESEARCH

Planning of further research in the above field may include:

- a) Cross-cultural investigation of the perception of rhythm categories, since there is evidence from other domains, that structure of perceptual categories is culturally dependent.
- b) Developmental research for the exploration of the way, in which rhythm categories are formed during childhood and improved through acculturation and musical education.

Results of that body of research provide valuable insights for the improvement of educational methods, which aim at the development of students’ rhythmical skills.