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Background

Synchronization is assumed to be one of the important musical behaviors. It has been argued that the relationship between self-vs-others might become understood after 4 years old. This self-other concept can be assumed to be a background of the synchronization. Therefore, the characteristics of the synchronizing behavior would change around the age of 4 to 6 years.

Aims

This study examined the development of the perception of the musical beat by analyzing hand clapping to musical pieces for Japanese young children whose age ranged from 4 to 6 years.

Method

Three age groups of children, i.e., 4-, 5-, and 6-years participated in the experiment at their kindergarten.

A pianist played Twelve Variations on “Twinkle, twinkle, little star” by Mozart to each age group. The children were required to beat time with their hands in rhythm with each of the variations. They wore gloves with electrode that could sense each occurrence of the hand claps, and the time stamp of each clap was recorded by a computer.

Results

The data were analyzed for each variations. At first, the number of children who clapped was counted for each beat of the theme for each age group, and it was normalized by the total number of children of each group. This normalized number of children had “dips” at the multiple of 8 beats for all the age groups.

A one-dimensional ANOVA was performed for the normalized number of the children providing the clap to the beat excluding these dip values. It revealed that the synchronous behavior differed depending on the age group. The Tukey-Kramer’s HSD test revealed that there were significant differences between 4-year-olds and 5-year-olds, 5-year-olds and 6-year-olds. It was suggested that synchrony with a musical beat increased as age (4-6-year-olds).

The standard deviations of the clap timing relative to each target beat were calculated to compare the degree of concentration of the claps. An ANOVA revealed only a significant difference between 5-year-olds and 6-year-olds. This suggests that the degree of synchrony started increasing at the age of 6 years.

The 5-year-old children provided the inter-clap interval much shorter than the beat interval for the variation I, II, VI which could be characterized by having many note values shorter than the metrical beat. To provide a feature quantity to characterize this tendency, the inter-clap ratios were obtained by dividing the inter-clap intervals by the beat intervals.

The clapping rate of 5-year-olds was the highest, and exceeded 1 in average. Contrastively, the average was lower than 1 for the 4-year-old group, and it was the closest to 1 for the 6-year-old group. This suggests that division levels of a series of sixteenth notes might function as an energizer stimulus for 5-year-olds, but that the 6-year group refrained this “hyper-activation” by becoming more conscious to the metrical structure.

Conclusions

The degree of synchrony for musical beats by the young children increased reflecting the development of the cognition for the rhythmic structure of music. This development proceeds rapidly around the age of 5-6 years.

Keywords

Musical meter; musical rhythm; Degree of synchrony; Young children; Development

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