

A Hierarchical Interaction in Musical Ensemble Performance: Analysis of 1-bar Rhythm and Respiration Rhythm

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Chapter Overview. In recent years, music therapy has been focused on as a method to cure patients who have a physical or mental illness. Music therapy is a kind of musical communication between a patient and a therapist. Clarifying the mechanism of musical communication is the effective way to conduct this type of therapy. In this study, an ensemble performance was analyzed with musical and respiration rhythms using a dual task method to clarify the mechanism. The results showed that there was no effect of a subtask on musical and respiration rhythms in playing simple music. However, when playing complex music, musical and respiration rhythms were changed by a subtask. From these results, we proposed a hierarchal communication model of an ensemble performance.

Key Words. Communication, Music, Cognitive system, and Respiration.

1. Introduction

In recent years, music therapy has been focused on as a method to cure patients who has physical or metal illness. Music therapy is a kind of musical communication between a patient and a therapist. For example, in improvisational music therapy, patients move their body to a sound, while the therapist makes sounds that are synchronized to the patient's movement.

Although effectiveness of such therapy is often reported, the mechanism of musical communication is not analyzed enough. To clarify the mechanism, it is effective to conduct therapy more efficiently. In this study, we clarify the mechanism by analyzing a musical ensemble performance. Based on the result, we propose a musical communication model between players.

Musical performance is divided into two types. One is a solo performance, and the other is an ensemble performance. Although there is a lot of research about a solo musical performance, there is little research concerning an ensemble performance. One of a few examples of the research on an ensemble performance is an analysis of synchronization between players [1]. That research has revealed that a player of melody part precedes the ones who take other musical parts by 10msec on average and that there is always 30-50msec asynchrony when the musicians play simultaneously.

Research that clarifies the mechanism of a solo musical performance analyzes the musical tempo (speed of musical performance), ago-gics (temporal development of musical rhythm) and so on. Of these elements, ago-gics have most often been analyzed. Representative research about ago-gics illustrates that ago-gics are not changed when the players play the same music [2] [3], or players use more ago-gics as a musical expression than other musical techniques [4].

In addition to such research about ago-gics, there is some research that investigates player's physiological aspects [5]. In this research, the relationship between 1-bar rhythm and respiration rhythm was analyzed when pianists played the same music in different meters. The results showed that the pianists' respiration period during a performance was shorter than that in normal breathing circumstances, and the coupling between 1-bar and respiration rhythm while playing in an unconventional meter of 7/4 and 5/4 was stronger than that while playing in a conventional meter of 3/4 and 4/4. The relationship between respiration and listening to music has often been analyzed [6, 7]. Such research has showed that human respiration was changed when listening to music and the difference depended on musical rhythm. The fact that the respiration changes depending on musical rhythm suggests that respiration have relation with the musical cognitive system, which is an effective element to analyze.

The research reviewed suggests that a temporal development of musical rhythm is an important element for an analysis of musical performance, and that it has relation with the respiratory rhythm. As for musical communication between players, only synchronization of musical ensemble performance has been analyzed. This study has analyzed an ensemble performance with a musical and respiration rhythm, and also investigates the cognitive aspect of ensemble performance by using a dual task method.