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The effects of musical syntax on perception of music performance

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The focus of this study is to examine the effects of social interaction and musical syntax in a music performance with emphasis on emotion perceptions. The syntactical elements that were analyzed during the course of these experiments included pitch, tuning, and timing. Two experiments were conducted to examine the relationship of syntax and performance. In the first experiment, subjects were asked to state preference between altered stimuli with higher levels of expressivity and unaltered stimuli with lower levels of performer expressivity. In the second experiment, subjects were asked to sing familiar or traditional songs in social and individual settings. Results confirm that participants demonstrated a definitive preference toward social interaction when actively engaged in embodied musical performance. However, the outcome was less definitive in passive listening environment of the first experiment.

Keywords: music perception; syntax; musical embodiment; music performance; social interaction

Musical performance situations provide opportunities for social interaction and joint attention (Baldwin 1995). Musical enjoyment in a performance setting often relies on the communicative interaction of participants and the transmission of the musical messages may impact the enjoyment of the participants. According to the "shared affective motion experience" (SAME) model developed by Overy and Molnar-Szakacs (2009), music perception is a process of interactive social communication involving neural processing of pitch and time dimensions that result in complex action sequences involving the perception and/or agency of another person, whose actions are interpreted, imitated, and predicted. While accuracy of musical syntax is generally considered a critical feature of emotional perception of music, in many performance situations the quality of syntax may be secondary to social interac-

tion and group attuning (Leman 2008). De Bruyn *et al.* (2009) found that social interaction between music listeners affected music perception and musical meaning formation processes. Participants in a social setting were better able to synchronize with music and responded with increased intensity of corporeal articulations in social conditions.

The purpose of the present study was to explore the settings in which the importance of syntax is undermined by the context in which the music is performed. The first experiment measured the effect of changes in syntax of the music on listener's preferences and perceptions. The second experiment measured the effect of changes in syntax of the music on subjects' preferences in musical performance environments. In both experimental settings, we examined methods to measure the elements involved in embodied music cognition when syntactical elements are altered.

METHOD

Participants

Thirty-two subjects, aged 20-26 years, participated in each experiment. Participants were from different sample populations. Background data regarding the participants' musical experience were collected through the use of pre-surveys and groups were divided to include musically experienced participants and less musically experienced participants.

Materials

In the first experiment, video/audio segments of approximately one minute in length were recorded with singer and piano. Syntax alteration was introduced through audio software and included tonal changes varying the sharpness or flatness of pitch of approximately 0.67 semitones and timing changes to the piano accompaniment gradually increased through the duration of the musical piece. Survey data was used to collect participant responses after each two excerpts.

In the second experiment, four songs were recorded approximately two minutes in length (two Dutch, two English). Audiovisual excerpts were then altered to include syntactical alteration in timing and pitch. Pitch was gradually altered to -6 semitones. Sliders, which consisted of a scale of 1-10, recorded participant responses while stimulus was played and were interconnected to collect data for both group and individual settings through an *Arduino* interface. A *Max Patch* allowed for data to be recorded along a timeline for each song. Participants were asked to reflect their musical en-

joyment using the slider as part of the experimental task, allowing for the collection of data that reflected changing musical preference during active participation in the performance. Data were analyzed according to a timeline corresponding with video data.

Procedure

In Experiment 1, all participants listened to stimuli with and without syntactical alteration, together in a group setting. Subjects were then divided into two groups based on musical experience. Each group was presented a set of four musical excerpts performed in two modes of expressivity. Group A was presented stimuli in the original syntax. Group B was presented all stimuli with an altered syntax. Subjects were asked to state their musical preferences through the use of a survey. Responses were compared in all listening conditions.

In Experiment 2, all participants performed stimuli together in a group setting and individually. Lyrics of the songs were presented simultaneously with visual stimuli and participants were asked to sing along. Stimuli consisted of the same pieces in both performance situations. Subjects were asked to state their musical enjoyment simultaneously while performing experimental tasks. This data was collected through the use of multiple sliders (scaled 1-10) connected through an *Arduino* interface and through the use of a post-survey.

RESULTS

Experiment 1

In Group A, stimuli were presented with unaltered syntax. According to data based in participant responses, the majority of subjects preferred the more expressive performance (see Figure 1). Of the musically experienced participants, 66.7% on average preferred the more expressive performance throughout the musical excerpts. Of the less musically experienced participants, 85.7% preferred the more expressive performance on average throughout the excerpts. This data confirmed that a more expressive performance is preferred when syntax is unaltered.

Group B was presented stimuli with altered syntax. The majority of participants preferred the less expressive performance (see Figure 2). Of the musically experienced participants, 70.8% preferred the less expressive performances throughout the excerpts on average. Of the less musically experienced participants, 72.5%preferred the less expressive performance on

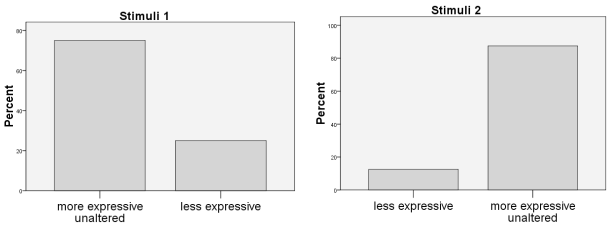

Figure 1. Statistical analysis of syntax perception Group A.

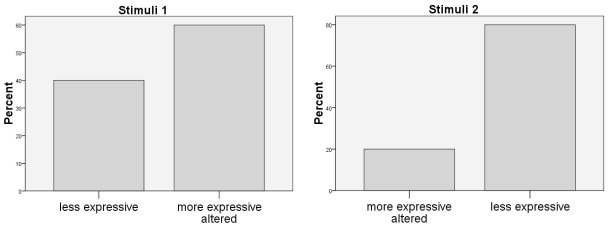

Figure 2. Statistical analysis of syntax perception Group B.

average throughout the musical excerpts. These data demonstrated that a less expressive performance is preferred when syntax is altered in a passive listening situation.

Experiment 2

Subject responses demonstrate a significant preference toward group performance over individual performance. Sixty-six percent of participants responded that the group performance situation appealed to them more than the individual performance situation. Fifty-six percent of respondents mentioned they were most comfortable when singing together in the independent responses. When describing the group experimental setting, 47% of participants responses could be organized into two categories specifying the appealing aspects of the group situation: the social interaction (including “not singing alone,” “listening to each other,” “feeling supported,” and “group/social feeling”) and that the atmosphere was more enjoyable or “fun.” Of our subjects, 70% said that singing in the group setting was easier because of appreciable differences between their individual and group performance.

In the group setting, subjects responded that it was easier to keep the right tone, there was more fun of singing together and the combination of the voices was more aesthetically pleasing. The altered syntax was not mentioned as a factor in responses for the group singing evaluations. Seventy-five percent felt uncomfortable in their individual performance. In addition, sharing difficulties when performing music increased the enjoyment of some 19% of participants, who stated that sharing of the experience made them "happy" and "comfortable."

Slider data confirmed the overall preference for the group setting when syntax was altered in a musical performance setting. Fifty-nine percent of participants had a greater number of increases in "enjoyment" along the scale when performing stimuli in the group setting. Twenty-two percent had more increases of "enjoyment" in the individual setting. Instances where the degree with which increases in enjoyment were more substantial than decreases in enjoyment occurred for 46% of participants in the group setting and 15% of participants in the individual setting. Instances where the degree with which decreases in enjoyment were more substantial than increases in enjoyment occurred for 12% of participants in the group setting and overall 38% of participants in the individual setting. Fifty percent of participants spent more time at higher levels of enjoyment in the group, as opposed to 9% who spent more time at higher levels of enjoyment in the individual setting.

DISCUSSION

Analysis of data facilitated the observation of the cultural and social dynamics influencing music performance. In Experiment I, participants preferred the more expressive performance overall when syntax was unaltered. However, fewer participants with musical experience preferred more expressive performances than those without musical experience. In situations where the syntax was altered, the majority of participants selected the less expressive performance. The introduction of an additional level of expressivity may influence experimental results. In Experiment 2, participants preferred social interaction in the group setting, as it allowed them to form a common understanding regarding music perception. In future research, it may be possible to integrate syntax alteration through a more ecological approach. Ideally syntax change would be introduced through the performance of participants or performers themselves. A more nuanced distinction between corporeal and cerebral understanding of music and an implementation of a taxonomy of structural cues to analyze movement data in relation to syntactical change

may assist researchers to further understand the impact of behavioral resonance with corporeal articulations.

The study effectively quantified subjective musical understanding in social and individual environments. The majority of participants also indicated that a social interaction condition was preferred. Participants' responses demonstrated that they actively attempt to construct an understanding of each other's intentional actions when performing musical stimuli in a group setting. Results may indicate the effect of corporeal articulations in influencing musical and syntactical perception. In support of the findings of Overy and Molnar-Szakacs (2009), music functioned as social activity where perceptual activities of participants were integrated and interdependent.

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