

Cross-modal Effects of Musical Tempo Variation and on Musical Tempo in Audiovisual Media

Friedemann Lenz*¹

¹*Departement of Musicology and Music Education, University of Bremen, Germany*
lenz@uni-bremen.de

ABSTRACT

Background

Music is an acoustical phenomenon, which is mostly part of a complex multi-sensual setting. The kind of research, which focuses on these special issues, can be found in the fields of research on background music and music in different kinds of audio-visual media. Research of audiovisual interaction shows, that visual spatial motion can induce percepts of auditory movements (Mateef, Hohnsbein, & Noack, 1985) and that visual illusion can be induced by sound (Shams, Kamitani, & Shimijo, 2002). Studies on background music indicate, that the musical tempo can be a factor of crossmodal interaction (Kämpfe, Sedlmeier, & Renkewitz, 2011). A further question is the effect of music in movies as a source of emotions (Cohen, 2001).

Aims

In the present study three different effects of musical tempo variation in audiovisual media will be discussed. Firstly it is assumed, that musical tempo variation can influence the perception of the velocity of the visual objects in an audiovisual medium and vice versa. The second assumption refers to the thesis of Schneider (2009), which states that the perception of time intervals in movies depends on the variation of musical tempo. The third question concerns the influence of the musical tempo on the sensation of emotions felt by recipients while watching an audio-visual medium.

Method

To address these questions several computer-aided tests with audio-visual stimuli were conducted. The stimuli consisted of videos of a conveyor belt with moving boxes and a musical track with a melody accompanied by simple harmonies. The stimuli of the first two hypotheses (MUSVAR, VIDVAR) were presented in three fixed sequences and varied in three visual velocities and three musical tempos. In the pretest labelled MUSVAR the subjects were asked to rate the velocity of the conveyor belt and to guess how long in seconds the time interval was, both on a discrete scale from 1 to 15. In the other part of the pretest labelled VIDVAR the subjects were asked to rate the musical tempo on a discrete scale from 1 to 15. In this case no rating for time interval was requested. The stimuli differed in musical tempo, the visual velocity and the grade of abstraction. The differences in tempo/velocity were chosen so that the differences of the rated mode (e.g. visual velocity) was obvious and the differences of the mode (e.g. musical tempo), which hypothetically influences the other, were in the range of the threshold of perception. All items were presented two times and additional catch trials with

shorter and longer running time were added for the time perception task.

The stimuli for the experiment of inducing emotions by musical tempos (EMO) had constant visual velocity and five different musical tempi. For these ratings six of sixteen different scales, each consisting of three subscales, of the M-DAS (Modifizierte Differentielle Affekt Skala, Dagmar & Unz) were used. These were the scales for Vergnügen (amusement), Freude (enjoyment), Interesse (interest), Trauer (sorrow), Wut (anger) and Angst (fear).

Results

Three pretests on the interesting matters were conducted. In the pretest MUSVAR the induction of visual-velocity variation by musical tempo-variation and the effect on perception of time intervals (MUSVAR, n=11) were focussed. First regression analysis show a tendency of an effect of musical tempo variation on the perception of the visual velocity. Further regression analysis with two factors (visual velocity / musical tempo) shows, that an additional variance of 10% can be explained by musical tempo as predictor for the visual-velocity perception.

In the contrary case of the induction of musical tempo variation by the variation of visual velocity no effect could be identified (VIDVAR, n=8). The pretest on the emotional influence of musical tempo variation (EMO, n=10) indicate, that there is a strong influence of musical tempo variation on the sensation of emotions of amusement and enjoyment.

The main study focuses on the induction of velocity perception by the variation of musical tempo and the perception of time interval depending on the musical tempo (MUSVAR, n=74). The study on visually induced tempo variation was also repeated (VIDVAR, n=16). Statistical analysis is still in progress. Final results of the main study will be presented.

Conclusions

The first results show that there are cross-modal effects of musical tempo-variation. The problem of generalisation of studies with such isolated stimuli should be discussed and analogue studies in several visual contexts should be conducted.

Further studies are also required to support the hypotheses, that there is a musical induction of visual velocity variation, but no visual induction of musical tempo variation. Other effects of music in audio-visual media are assumed for pitch, timbre and loudness.

Keywords

tempo, audiovisual media, crossmodal perception, emotion

REFERENCES

- Cohen, A. (2001). Music as a Source of Emotion in Film. In A. J. Cohen, P. Juslin, & J. Sloboda, J. (Eds.), *Music and Emotion: Theory and Research*: (pp. 249-272), Oxford: Oxford University Press.
- Renaud, D. & Unz, D. (2006). Medienpsychologische Methoden. Die M-DAS – eine modifizierte Version der Differentiellen Affekt Skala zur Erfassung von Emotionen bei der Mediennutzung. *Zeitschrift für Medienpsychologie*, 18 (N.F. 6) (2), 70-75.
- Kämpfe, J.; Sedlmeier, P. & Renkewitz, F. (2011). The impact of background music on adult listeners: A meta-analysis. *Psychology of Music*, 39 (4), 424-448.
- Mateef, S., Hohnsbein, J., & Noack, T. (1985). Dynamic visual capture: apparent auditory motion induced by a moving visual target. *Perception*, 14 (6), 721–727.
- Shams, L., Kamitani, Y., & Shimijo, S. (2002). Visual illusion induced by Sound. *Cognitive Brain Research*, 14 (1), 147–152.
- Schneider (2009). Zeitstrukturen der Filmmusik, *Schnitt*, 56, 20–23.