Continuous Rating of Experienced Affect while Watching Emotional Film Clips

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Introduction

Subjective rating on the two dimensions of valence and arousal is common for all kind of affective stimulus material. To evoke specific emotions, dynamic stimuli like film clips appear particularly suitable. Here, rating subsequent to presentation alone might be insufficient (Rottenberg et al., 2007).

We modified an existing software to continuously rate musical stimuli (*EMuJoy – Emotion measurement while listening to Music using a Joystick*, Nagel et al., 2007) such that the axes of valence and arousal were superimposed as thin crosshairs on a playing movie clip and rating could be done while watching with a PC mouse. Figure 1 shows an exemplary setup.

Figure 1: The original EMuJoy interface (left) from Nagel et al. (2007) adopted for movie presentation showing a scene from *The Godfather* (middle & right) recommended by Hewig et al. (2005) to evoke disgust.

Methods

Subjects: n=60 students (35 female, mean age 25+/-4.8 years participated). The data of 3 subjects had to be discarded due to recording problems or low signal quality.

Stimulus material: 14 previously validated excerpts (Hewig et al., 2005) from popular movies lasting 31-205 seconds and inducing the emotions amusement, sadness, disgust, anger and fear as well as one neutral film clip (train ride) that served as a baseline.

Task: subjects were told to watch the clips and rate their own feelings while watching it. Subsequent to each clip they were asked to describe the feeling they just experienced in their own words.

Procedure: The experiment started with the neutral *train ride* film clip. Clips were presented in a randomized order ensuring that no consecutive emotional clips depicted the same emotion.
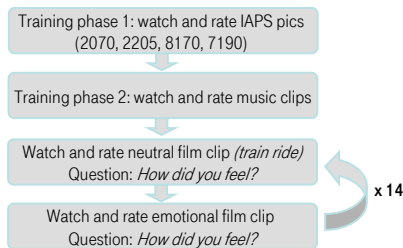
Data collection: Facial EMG (corrugator, orbicularis, zygomaticus), ECG and electrodermal activity (EDA) were recorded using the Varioport system (Becker Meditec, Karlsruhe).

Data processing: Signals were manually checked for artifacts and affected segments removed. Relevant events were identified semi-automatically in the raw signal, parameterized and then expressed as *percent baseline activity*, where the preceding neutral film clip was used as a baseline.
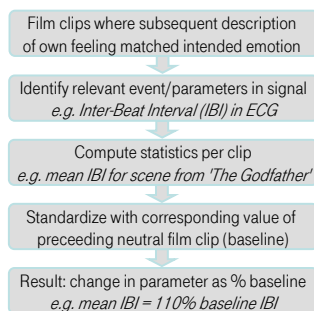
Analysis:

• **without regard of temporal course:** values first aggregated for complete clip, then for target emotion (2-3 clips per emotion), leading to 1 value per person per emotion.

• **with regard to temporal course:** for each emotion, signals during the most effective clip (determined by frequency of matching self-descriptions subsequent to presentation) were analysed in 10-second time windows.
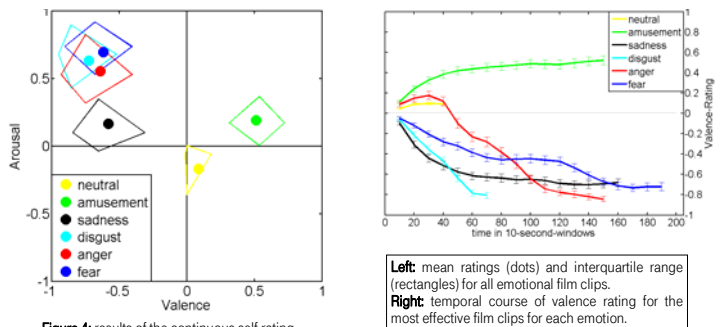
References

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Hewig, J., Hagemann, D., Seifert, J., Gollwitzer, M., Naumann, E., & Bartussek, D. (2005). A revised film set for the induction of basic emotions. *Cognition & Emotion, 19(7),* 1095-1109.

Nagel, F., Grewe, O., Kopiez, R., & Altenmüller, E. (2007). EMuJoy – Software for continuous measurement of perceived emotions in music: Basic aspects of data recording and interface features. *Behavior Research Methods, 39,* 283-290.

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Results

A repeated measurements MANOVA showed a significant effect of the within-subject factor *emotion* (of film clips) for all signals ($p<0.05$ in all cases). Thus, only the results of pairwise comparisons (Sidak-adjusted) between particular emotions are reported here.

Continuous Rating

• Valence differentiated amusement from the neutral clip and both from all negative emotions.
• Speed of increase in negative valence is highest for disgust and less pronounced for fear or sadness.
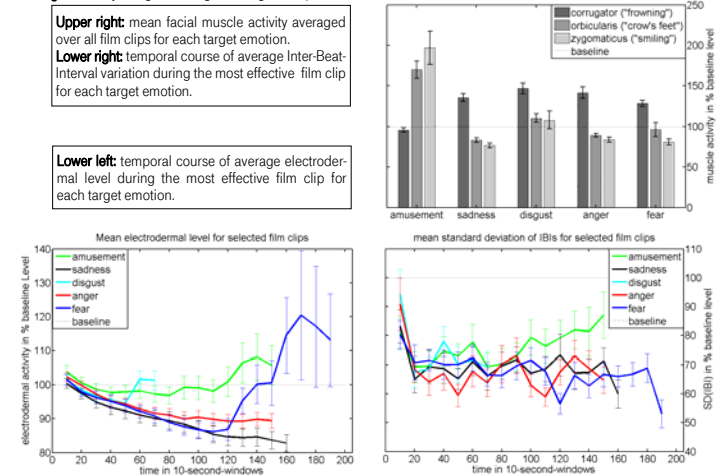• Sadness lead to significantly lower arousal ratings than disgust, anger and fear.

Figure 4: results of the continuous self-rating.

Left: mean ratings (dots) and interquartile range (rectangles) for all emotional film clips.
Right: temporal course of valence rating for the most effective film clips for each emotion.

Physiology

• Activity of the musculus corrugator supercilii and zygomaticus major distinguished positive from negative emotions.
• Orbicularis oculi was only active during amusement and disgust, thereby differentiating the latter from sadness, anger and fear.
• Electrodermal level (EDL) initially decreased stronger for negative than for positive film clips.
• Only sudden, unexpected changes as in the disgust and fear clip lead to a strong increase of EDL, but not general increase in subjective arousal (which also occured for the anger clip).
• Standard deviation of IBIs strongly decreased in the beginning of all film clips and only re-increased for amusement.

Figure 5: Physiological changes during film clips

Upper right: mean facial muscle activity averaged over all film clips for each target emotion.
Lower right: temporal course of average Inter-Beat-Interval variation during the most effective film clip for each target emotion.

Lower left: temporal course of average electrodermal level during the most effective film clip for each target emotion.

Summary and Conclusion

• Continuous rating with overlayed coordinate axes of valence and arousal is feasible and gives detailed insight in the temporal development of emotional episodes.
• Usage of validated film clips (Hewig et al., 2005) allowed us to reliably induce specific basic emotions (87% accordance of free description subsequent to clip with intended emotion).
• Facial muscle activity distinguished best between positive and negative emotions and disgust from all other negative ones.
• Electrodermal level decreased stronger for negative emotions and only re-increased for sudden, unexpected changes in plot, not with general subjective arousal alone.
• Standard deviation of inter-beat-intervals only re-increased for amusement.
• Analyzing the temporal course of psychophysiological changes may allow for better differentiation of specific emotions than time-averaged values.

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