Influence of Induced Mood on the Rating of Emotional Valence and Intensity of Facial Expressions

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Abstract. The current study investigates the influence of mood (sad, happy, or neutral) on the valence/intensity ratings of facial expressions of sad, happy, and neutral emotions. The study uses video clips for mood induction and color photographs of emotional facial expressions. Under these conditions, the results show that participants give more extreme ratings to the emotion displayed (happy or sad) when in happy or sad mood without mood-congruence effects. This effect supports the conclusion that arousal alone may play a role in emotion valence/intensity rating (in contrast to results showing mood congruence in other tasks like emotion recognition and detection of emotional expression change). The explanation proposed in the paper is that experienced arousal might guide judgments about the intensity of emotions expressed by other people – when in a more aroused state, a person tends judge that other people also experience more intense emotions.

Keywords: emotions, mood induction, emotional facial expressions, evaluation of emotions.

1 Introduction

In everyday life, we constantly judge the emotions experienced by other people. One of the most informative cues in such judgments is the emotional facial expression. There is a great interest in studying how the information about the emotions in facial expressions is acquired – which facial features are most informative, what is the pattern of looking at these features, etc.

There is a lot of research demonstrating that mood influences human cognitive processing. Affective states have an effect on judgments, decision, perception, and thinking [1-4]. This research has shown that affective states influence judgments by shifting them towards the experienced emotion (e.g. when participants feel happy, they give more favorable judgments). Positive mood also influences memory, reasoning, and visual perception: people tend to use more global processing when in happy mood (global processing is demonstrated by greater reliance on heuristics, scripts, and holistic strategies). On the other hand, people use more local features when they are sad. Schmid et al. [5] investigated the influence of the mood in emotion recognition tasks using eye-movement recordings. For the purpose, they induced either happy or

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sad mood and after that presented photos for emotion recognition task (happiness, sadness, anger, and fear). Results showed that participants in happy mood used more global processing styles than participants in negative mood.

There are also studies with a special focus on the influence of mood on emotion recognition. Some of them [6, 7] have found that depressed patients demonstrate impaired emotion recognition and also tend to provide more negative ratings. Schmid & Mast [8] manipulated the mood of healthy participants and studied how that manipulation changes emotion recognition. They found that the induced mood impaired the recognition of the mood-incongruent facial expressions. Other research [9] has demonstrated that participants with induced sad mood tend to perceive more sadness and less happiness in sad and happy faces, respectively. Also, sad and happy participants were more sensitive to and detected earlier changes in sad and happy facial expressions, respectively, when they were gradually changed from sad and happy to neutral or from sad to happy and happy to sad [10, 11]. In the present study, we wanted to explore the influence of induced mood on emotion recognition in a new task – emotion rating – in experimental settings similar to the previously used in this type of research. We used mood induction using short movie episodes following successful and well established procedures [12, 13]. Next, the task of the participants was to rate the valence/intensity of expressed emotion of human faces taken from the FACES database [14]. The induced mood and the selected facial expressions were happy, neutral, and sad. The human faces were presented in relatively natural settings (in color, with hair and background) to make the task as close as possible to real situations. In our opinion, this is a promising way of addressing directly some issues of interest like mood-congruity in emotion rating and like stronger ecological validity related to the presence of non-relevant features like hair and background. As will be discussed below, our results give evidence that the influence of mood on emotion rating may be due to arousal and not to mood-congruence as research using other tasks (e.g. emotional expression change) has previously suggested.

2 Goals and Hypothesis

In the present study, the influence of the mood experienced by participants on their valence/intensity ratings of facial emotional expressions is explored.

In this field of research, as the discussion in the previous section has shown, emotion recognition is naturally a central task of interest due to its importance in social interactions and its evolutionary value. On the other hand, in our opinion, the evaluation of the expressed emotion valence/intensity cannot be underestimated as not only the perceived emotion but also its intensity is an important factor for action and decision making in a larger social context.

While [8] and [5] used black and white photos and only the faces were presented (the stimuli were oval-shaped with hair and background removed), in the current study, we used color photographs without removal of any information (hair or background). This is done in order to explore the emotion recognition in more natural

settings. As emotion recognition is a process that takes place in everyday life and its study in natural settings seems important to us.

Therefore, our main goal is to look for possible congruency effects of the induced mood and valence/intensity rating of facial emotional expressions in relatively natural settings. More precisely, the study aims at exploring how participants' ratings of emotional valence/intensity are affected by their mood. The hypothesis, based on research on emotion recognition discussed in the preceding section, is that valence/intensity ratings will be shifted towards the experienced mood, e.g. neutral emotional expressions will be rated as more negative in negative mood compared to positive mood.

The second goal is to study how the mood influences visual information acquisition. We hypothesize that negative mood will provoke more elaborate processing than positive mood which will lead to longer observation times in sad induced mood compared to happy induced mood, based on the differences in processing information discussed previously.

3 Method

3.1 Stimuli

In the current study, the mood of the participants was manipulated between-subjects on 3 levels – happy, neutral, and sad.

Short video-clips were used for mood induction. Meta-reviews demonstrate that this is one of the most effective techniques for inducing emotional states [15, 16]. Clips, shown to elicit the target moods, are used based on [12, 13]. Video-clips from the following movies were selected: from 'When Harry met Sally' (duration 2' 35'') for happy mood induction; from 'Return to me' (3'36'') for sad mood induction; and from 'Hannah and her sisters' (1'30'') for neutral mood induction. All video-clips are taken from movies with actors in English with Bulgarian subtitles.

Three types of emotional facial expressions are used – happy, neutral, and sad – taken from the FACES database [14]. Photographs from 9 female (IDs 20, 48, 54, 63, 71, 90, 115, 152, and 182) and 9 male (IDs 8, 13, 37, 57, 109, 114, 127, 147, and 153) actors are used, each actor presenting each of the emotional expressions. The stimuli were presented in 3 pseudo-randomized sequences, each consisting of 18 photographs, with an equal number of faces with happy, neutral, and sad emotional expressions. A photograph of a given actor was used only once in a given sequence. In order to get the participants accustomed to the experimental procedure, in the beginning of each list, 2 additional photographs (1 with a male and 1 with a female actor) with neutral expressions are included (IDs 10 and 89). Each of these 3 presentation sequences is preceded by a happy, neutral, or sad mood induction resulting in a total of 9 presentation conditions.

3.2 Design and Procedure

The study employs a 3×3 factorial design with induced mood ('happy' vs 'neutral' vs 'sad') as a between-subjects factor and facial emotion expression ('happy' vs 'neutral' vs 'sad') as a within-subjects factor.

The video-clips were presented with the instruction to watch them for subsequent rating of liking. After the end of the video-clip, the participants were asked to rate their mood on a 9-point Likert scale ranging from '−4' = 'extremely sad' to '+4' = 'extremely happy'. In order to avoid reactivity in the subsequent mood induction ratings, no specific instruction with regard to the mood induction was given before watching the video-clips.

After the mood induction phase, each participant was presented with color photographs of human faces with sad, neutral, or happy expressions in a self-paced presentation. For each stimulus the participant had to rate the emotional expression of the face in the photo on a 7-point Likert scale ranging from '−3' = 'very sad' to '+3' = 'very happy'. The duration of the presentation of the emotional expressions was self-paced. The observation time was taken to be the time during which participants looked at each photograph. It was measured from the beginning of the stimulus presentation to the mouse click after which a screen with the rating scale appeared.

Thus, in order to answer the main questions addressed in the paper, namely whether there are differences in valence/intensity ratings depending on the induced mood and how the induced mood influences the observation time needed for making the rating, the following metrics are used:

- mean emotional valence/intensity rating for the facial expression;
- mean observation time.

3.3 Participants

93 participants (34 male, 59 female) took part in the experiment: 32 in the happy mood condition; 30 in the neutral mood condition; and 31 in the sad mood condition. Participants' age ranged from 18 to 44 years (average 24 years). The participants were university students taking part in the study for partial fulfillment of course requirements or voluntarily.

4 Results

4.1 Mood Induction

First, a manipulation check was performed. The results demonstrate that the mood manipulation was successful (see Table 1) the average ratings given by the participants about their mood for happy, neutral, and sad moods differ significantly ($F(2, 90) = 87.99$, $p < .001$). Bonferoni post-hoc test shows that all differences are statistically significant at .001 level.

Table 1. Mood rating after the manipulation on a 9-point Likert scale (from '–4' = 'very sad' to '+4' = 'very happy')

Target Mood	Mean	SD
Happy	2.8	1.2
Neutral	0.5	1.0
Sad	−1.1	1.3

4.2 Face Emotion Ratings

In Fig. 1, the ratings of facial emotion expression intensity depending on the induced mood are shown. Mean valence/intensity ratings are analyzed in a repeated-measures ANOVA with facial emotional expression ('happy' vs 'neutral' vs 'sad') as a within-subjects factor and 'induced mood' ('happy' vs 'neutral' vs 'sad') as a between-subjects factors.

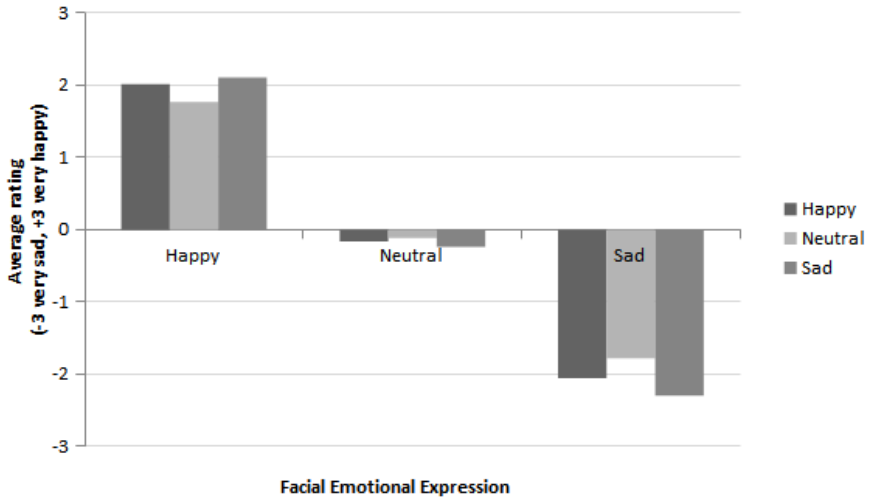

Fig. 1. Face emotion ratings with respect to induced participants' mood.

There is a main effect of the facial emotional expression ($F(2, 180) = 699.94$, $p < .001$): the mean ratings are 1.96 for happy emotional expressions, −0.18 for neutral emotional expressions, and −2.05 for sad emotional expressions, respectively (post =-hoc tests show that all differences are significant at .001 level, Bonferoni correction applied). There is no main effect of induced mood on valence/intensity ratings (p =.98). There is an interaction between induced mood and facial emotional expression ($F(4, 180) = 13.3$, $p < .001$). To explore the interaction found, additional analyses were performed separately for happy and for sad faces.

For the ratings of happy faces, there is a main effect of induced mood ($F(2, 90) = 19.19$, $p < .001$). Bonferoni post-hoc test shows that there are significant differences between happy and neutral ($p < .001$) and neutral and sad ($p < .001$) moods,

respectively. Happy faces are rated as more happy by the participants in happy or sad mood compared to the participants in neutral mood (see Fig. 1).

Similarly, for the ratings of sad faces, there is a main effect of induced mood ($F(2, 90) = 7.95$, $p < .001$) and the ratings in neutral mood are significantly higher (less negative) than the ratings in happy ($p < .001$) or sad mood ($p < .004$). Sad faces are rated as more sad by the participants in happy or sad mood compared to the participants in neutral mood.

4.3 Observation Times

The stimuli observation time is measured from the time of appearance of the picture until its disappearance after participants had pressed the mouse left button. The data was not normally distributed and a logarithmic transformation was applied.

Mean observation times were analyzed with repeated-measures ANOVA with facial emotional expression (happy vs. neutral vs. sad) as a within-subjects factor and 'induced mood' (happy vs. neutral vs. sad) as a between-subjects factors. When needed, Bonferoni correction for multiple comparisons was applied.

There is a main effect of the facial emotional expression ($F(2, 180) = 10.92$, $p < .001$). The observation times for the happy faces are shorter than the ones for neutral and sad faces ($p < .001$ and $p = .002$, respectively). It takes less time for the participants to rate a happy facial expression. The means of the observation times for each facial expression are shown in Fig. 2.

There are no significant differences between the observation times with respect to induced mood, nor any interaction between induced mood and the emotional facial expressions of the photographs. Thus, no conclusion about differences in processing depending on induced mood can be drawn for valence/intensity rating.

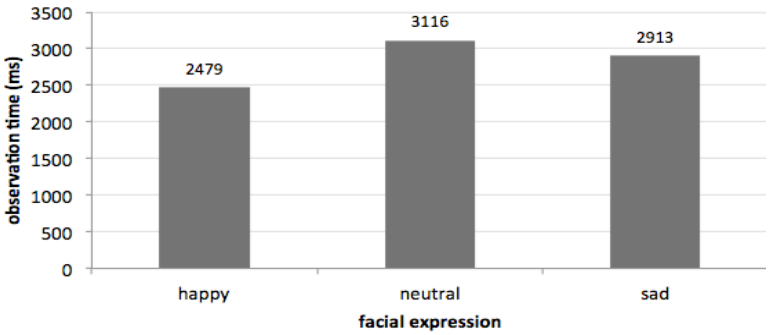

Fig. 2. Comparison of observation times for happy, neutral, and sad faces.

5 Discussion and Conclusion

In the present study, the influence of induced mood on valence/intensity ratings of facial emotional expressions is studied. Based on the previous studies on emotion

recognition, the expectation was that mood-congruency effects will be observed. However, such effects were not found. Instead, higher valence/intensity ratings are obtained for both sad and happy emotional expressions for participants in both happy and sad induced mood.

This led us to conclude that when rating emotional valence/intensity, participants are influenced by the arousal associated to the induced mood without depending on its specific type – happy or sad. As this is a novel effect, not reported in the literature to our knowledge, it requires a deeper and more systematic analysis. It might be the case that the specific settings of our experiment have led to lower sensitivity to the specific mood or emotion expression. One possibility could be that the emotions expressed by the actors in the photographs are too extreme and do not allow for noticeable influences from the mood of the perceivers. But, this cannot explain the difference between the ratings in neutral vs non-neutral mood. In order to understand better the observed effects, stimuli with more graded emotional expression should be used. Moreover, the valence/intensity rating scale used should be split in the usual valence, arousal, and dominance scales in order to be able to identify and measure finer effects and their origin.

However, there are also good reasons to consider that the effect found is due to the influence of the arousal experienced by the participants. As the now classical study of Schachter & Singer [17] showed, physiological arousal is interpreted in the light of the environmental context in order determine the experienced emotion by the person herself. In our view, experienced arousal could influence the judgments not only about the emotions experienced by the subject, but also the judgments of emotions experienced by others. For instance, when in a more aroused state, a person tends to perceive and judge that other people also experience more intense emotions. This is a novel explanation, which has not been proposed previously and deserves further experimental efforts.

Our expectations about observation times, related to previous research, were not met either. They were based on the hypothesis of selective influence of the induced mood on information processing relating information acquisition in a happy mood to more global (fast) processing and in a sad mood to more local feature based (slow) one, respectively. In our experiment, the observation times in all moods were not significantly different with respect to the mood induced. The only significant result was that happy face expressions require shorter observation time. To draw more general conclusions about the dependence of processing on mood, more data is needed.

In summary, the current study contributes to the field of perception of facial expressions of emotions by using a new task – valence/intensity rating. An effect of the induced mood is found, namely, an increase in valence/intensity ratings when the induced mood is different from neutral independent of the non-neutral mood type (sad or happy). This new experimental finding and its theoretical implications need to be explored in experiments manipulating the level of arousal and its dependence on a variety of tasks related to emotion recognition.

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