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THE EFFECTS OF MOOD ON EMOTION RECOGNITION AND ITS RELATIONSHIP WITH THE GLOBAL VS LOCAL INFORMATION PROCESSING STYLES

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THE EFFECTS OF MOOD ON EMOTION RECOGNITION AND ITS RELATIONSHIP WITH THE GLOBAL VS LOCAL INFORMATION PROCESSING STYLES[2]

This study examines the effect of mood on emotion recognition and the relationship of mood, emotion recognition and information processing styles. This study hypothesized that a positive mood promotes a global processing style, associated with more efficient emotion recognition.

In this study, subjects' eye movements were analyzed to measure global versus local processing styles. The results suggest that people in a positive mood recognize happiness expression more slowly than those in a neutral mood. Participants' processing styles were not related to emotion recognition speed. The findings clarify mechanisms of efficient emotion recognition.

Keywords: emotion recognition, mood induction, congruency effect, global and local information processing styles, eye movements

JEL Classification: Z

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Introduction

Emotion recognition is a complex process and is the one of the key components of social cognition and communication. It has been widely studied in psychology, and researchers have demonstrated great interest in the factors that influence different aspects of emotion recognition. Gender, personal traits and abilities, and the properties of the stimulus have all been studied in this connection (Rusting, 1998; Austin, 2005). Another important factor is the emotional state or mood of a person. A large number of studies have examined the question of how emotional state affects cognitive processes and behavior.

The main theoretical bases of research are the “affect as information” theory (Clore and Tamir, 2002; Schwarz and Clore, 1983), the “network theory of affect” (Bower, 1981), as well as the “affect infusion model” (Forgas, 1995).

Forgas (2011), summarizing the results of existing studies, has distinguished between two cognitive mechanisms which underlie mood effects on information processing and behavior, namely: 1) informational or content effects, and 2) processing effects (i.e., effects that influence the process of cognition).

Informational, or content, effects may allow a person’s mood to influence access to information stored in the long-term memory. It is important to note that representations which correspond to a person’s mood are easier for a person to process. Thus a positive mood should facilitate the processing of more positive information, and a negative mood should assist the processing of more negative information. This pattern of relationships has been called the mood congruency effect (Bower, 1981; Forgas, 1995).

A large number of studies have investigated this congruency effect (Rusting, 1998; Voelkle et al., 2014). It is not always possible to trace this effect in empirical research; in addition, results may be limited to certain categories of emotions (mostly happiness and sadness). The study by Schmid and Schmid Mast (2010) examined the effect of different moods (happy, sad, neutral) on facial emotion recognition. Moods were induced by the use of short film scenes, and after viewing these scenes participants (n = 93) completed an emotion recognition task with images of facial expression used as stimuli. The hypothesis was that a happy mood in the participant should produce more accurate recognition of happy expression, while a sad mood should produce a more accurate recognition of sad expressions. A congruency effect was found for a sad mood, i.e. sad participants recognized sad facial expressions better than they did happy expressions. Recognition of happy facial expressions was also impaired in a sad mood when compared to a neutral mood. The hypothesis was not confirmed for a happy mood.

A study by Chepenik et al. (2007) indicated that the effect of a sad mood on emotional processing depends on the type of the cognitive task. A sad mood affected memory of emotional words and facial emotion recognition. The study demonstrated general impairment of facial emotion recognition for individuals in a sad mood compared to the control group individuals in a neutral mood. Conversely, the participants memorized more sad words when they were in a sad mood than participants in a neutral mood.

Comparing the results of different studies that have examined the congruency effect in emotion recognition is difficult, as studies have focused on different emotional recognition tasks, analyzed different recognition indices, and applied different emotion induction methods.

Mood processing effects may also have an effect on the stylistic aspects of information processing, and provide insight into how information is processed. It has been hypothesized that a positive mood contributes to a more holistic, assimilative, and top–down processing style, while a negative mood promotes more detailed, stimulus-driven processing. There are empirical findings to support these hypotheses (Fredrickson and Branigan, 2005; Forgas and East, 2008; Gasper and Clore, 2002).

Evidence has also been found that associates global (holistic) or local processing styles with emotion recognition. Srinivasan and Hanif (2010) have found that a global focus of attention facilitates identification of happy faces, and a local focus facilitates identification of sad faces. Martin et al. (2012) have shown that emotion recognition performance is more accurate and faster under conditions oriented towards local processing than under conditions oriented to global processing.

The results of a study by Schmid et al. (2011) have also suggested a relationship between positive mood and a holistic processing style of emotion recognition. When study participants were in a happy mood, they processed information more globally than they did when they were in a sad mood. The accuracy of emotion recognition was related with processing style only when participants were in a sad mood, i.e. global processing was positively related to emotion recognition, and local processing was negatively related to emotion recognition.

The Present Study

The present study investigates the effect of emotional state on the effectiveness of emotion recognition and its relationship with global and local information processing styles. The study tested whether a positive mood promotes a global processing style, which, in turn is associated with more efficient recognition of emotions (measured by speed of recognition for the purposes of this study). The study also analyzed whether it is possible to consider the effect of positive mood on emotion recognition as a congruency effect.

The objective of this research was to examine the effect of positive mood (as compared with a neutral mood) on emotion recognition, taking into account information processing styles (defined as either global or local). We tested the following hypotheses:

1) That a positive mood increases the speed of positive emotion recognition (i.e., faces expressing happiness) and does not affect the speed of negative emotion recognition (i.e., faces expressing anger, sadness or fear);

2) that mood affects the use of processing style, so that participants in a positive mood use a global processing style more often than participants in a neutral mood, and that participants in a positive mood use a local processing style less often than participants in a neutral mood;

3) that there is a relationship between the use of global information processing style and the effectiveness of emotion recognition (i.e., a more global information processing style corresponds to higher speeds of emotion recognition).

Following Schmid (2011), we registered eye movements during emotion recognition tasks to generate information about whether participants' information processing styles were global or local.

Method

Participants

Participants were 39 university students (82% female) between 17 and 22 years of age (average age of 18.6, SD = 1.0). All of them reported normal or corrected-to-normal vision.

Materials

Mood Induction

Positive and neutral moods were induced by means of short movies. This method is widely used in modern studies for the induction of emotions in laboratory settings (Westermann et al., 1996). To induce a positive mood, the movie “Oktapodi” was used (duration 2 minutes 25 seconds). Over the course of this cartoon, two octopi are involved in various amusing situations. In order to induce a neutral mood, a “neutral” video clip was presented to the participants, showing colored lines moving in different directions (duration is 2 minutes 50 seconds). The efficiency of these stimuli for emotion induction has been examined in a cross-cultural study by Chentsova-Dutton and Lyusin (2013), who found that, after watching these videos, a participant’s emotional state varied according to his or her emotional valence. We therefore employed these videos in the present study.

The Russian-adapted version of the PANAS (Osin, 2012) was used as a measure of the participant’s emotional state. This questionnaire consists of 20 adjectives, by means of which the subject evaluates his or her current mood on a scale from 1 (little or none) to 5 (very much). The assessment produces results on two scales, “Positive Affect” and “Negative Affect.”

Emotion Recognition Task

Images of emotional facial expressions selected from the ADRES database (Van der Schalk et al., 2011) were used as stimuli. We used facial expressions from the four emotion categories of anger, sadness, fear, and happiness, as well as neutral faces. Pictures of two male and two female faces represented each category. The stimulus set consisted of eight emotional and eight neutral expressions, or 16 pictures in total. The images were 14 × 21 cm in size, displayed at the centre of a screen covered a visual angle of approximately 13° × 20°. All photos were grey-scaled and were presented on the grey background.

For the presentation of stimuli, instructions, and registration of participants' responses, the OGAMA (“Open Gaze And Mouse Analyzer”) v. 5.0 program was used (Voßkühler et al., 2008).

Eye Tracking

Participants' eye movements were recorded during performance of the emotion recognition task. Eye movements were registered with the OGAMA v. 5.0 program. Only the left eye was recorded, at a sampling rate of 1250 Hz and with a spatial resolution of 0.01°.

Task and procedure

The experiment was performed in several stages. First, participants completed the PANAS questionnaire to assess their emotional state at the beginning of the study. After that, they completed a preliminary training segment for the emotion recognition task which included 5 trials. Face images used in the training series were not used in the main series of the emotion recognition task. In the training series participants were instructed how to perform the emotion identification task.

Participants were then assigned to one of the two mood induction groups, i.e. positive or neutral. The participants of the experimental group were shown the "happy" movie to induce a happy mood; the control group was shown the "neutral" movie to induce a neutral mood.

After viewing the emotion induction video, participants performed the emotion recognition task. Before the procedure started, a nine-point calibration was conducted. Each trial began with a fixation cross presented on the screen for 1.5 s. The cross was replaced by a stimulus face, which remained on the screen until the participant logged his or her response. Participants were asked to decide whether the facial expression displayed on the screen was emotional or not, and responded by pressing one of the two hand-held keys on the computer keyboard, "0" for "yes" and "1" for "no". Participants were instructed to respond as quickly and accurately as possible to each facial stimulus. A mask stimulus was shown for 2 s. after each separate stimulus to avoid afterimages. All 16 facial images were presented twice (a total of 32 trials) in a fixed sequence.

After the identification trials the participant once again assessed his or her emotional state via the PANAS questionnaire.

Each participant conducted the test individually, with the entire procedure taking about 40 minutes.

Data analysis

For the emotion recognition task, only reaction times from trials which produced correct responses were analyzed. Reaction times from incorrect trials (5% of all trials) were excluded. We also excluded the trials for which the reaction times were beyond three standard deviations from the mean reaction time (3% of all trials).

The mean response time for each type of facial emotional expression, including happy expressions, neutral expressions and all negative expressions (anger, fear, and sadness) was taken as a measure of emotion recognition effectiveness

Eye tracking data from three female participants was excluded from analysis due to calibration problems.

We analyzed eye movements performed in the trials for which a participant provided a correct identification of facial expression. Four separate elements of the face were defined as areas of interest (AOI's) for each facial stimulus: the right eye, the left eye, the nose, and the mouth.

We used two eye tracking measures that have been employed in earlier studies as measures of global and local face processing patterns (Bombari, Mast and Lobmaier, 2009; Schmid et al., 2011). The first was the interfeatural saccade ratio. Interfeatural saccades are rapid eye movements that are performed between two AOI's. This ratio was obtained by dividing the number of interfeatural saccades by the total number of saccades performed for each facial stimulus. The higher the ratio, the more global the style of information processing.

The second measure was feature gaze duration, calculated as the sum of all fixations that were performed within the same area of interest (feature). A mean of feature gaze duration for all features was also calculated. All fixations shorter than 100 ms were discarded. The longer the feature gaze duration, the more local the style of information processing.

Results

Mood Manipulation Check

First we tested the effectiveness of the emotion induction procedure. In case of successful mood induction, the second set of responses on the Positive Affect scale (provided after performance of the emotion recognition task) should be greater than the first set of Positive

Affect responses (provided before the emotion recognition task). Negative Affect ratings, on the contrary, would be expected to fall or remained unchanged.

Descriptive statistics for all Positive and Negative Affect scales from happy and neutral mood groups are presented in Table 1.

Table 1. Means (standard deviations in parentheses) for Positive Affect and Negative Affect scales from positive and neutral mood groups

	Positive mood induction group		Neutral mood induction group	
	Positive Affect	Negative Affect	Positive Affect	Negative Affect
Mood assessment 1	31.40 (5.13)	12.70 (2.83)	31.47 (6.03)	13.00 (2.89)
Mood assessment 2	31.65 (8.21)	12.00 (2.41)	31.26 (6.67)	11.68 (2.16)

The participants in the positive mood condition showed a significant decrease in the Negative Affect scale for the second mood assessment compared with the first assessment (Wilcoxon test, $Z = -2.305$, $p=0.021$). Positive Affect scale responses increased slightly, but not significantly ($p>0.05$). Control (neutral) group responses decreased insignificantly on both scales. Thus, because Negative Affect ratings decreased significantly after positive mood induction, and because Positive Affect ratings increased, the positive mood induction can be considered partially successful. The neutral mood of the control group was found to have been maintained.

Mood effects on emotion recognition

To test whether mood affects emotion recognition and whether this effect can be considered congruent, we ran two separate univariate analyses of variance (ANOVA), with mood condition (positive vs. neutral) as the independent variable and reaction times of positive (happy) or negative facial expression recognition as the dependent variable. Table 2 presents descriptive statistics for the speed of positive and negative expression recognition in happy and neutral mood conditions.

Table 2. Means (standard deviations in parentheses) for positive and negative expression recognition speed in happy and neutral moods

Measure/ Mood	Positive mood condition	Neutral mood condition
Reaction time for positive expression	839.25 (155.63)	745.11 (111.38)
Reaction time for negative expression	900.95 (193.48)	796.97 (174.26)

In the case of positive (happy) expression recognition, the effect of mood was significant, with $F(1,32) = 4.68$, $p = 0.037$, and $\eta^2 = 0.0034$. Individuals in a positive mood recognized happiness in faces more slowly than did those in a neutral mood. The effect of mood was not found to be significant ($p>0.05$) for negative expression recognition.

Mood effects on information processing styles

Table 3 presents descriptive statistics for the two measures of global/local information processing style for groups in happy and neutral moods.

Table 3. Means (standard deviations in parentheses) of interfeatural saccade ratio and fixture gaze duration in happy and neutral moods

Measure/ Mood	Positive mood condition	Neutral mood condition
Interfeatural saccade ratio	0.64 (0.19)	0.55 (0.24)
Fixture gaze duration	0.27 (0.21)	0.41 (0.14)

To test our hypothesis about the effect of mood on the use of a particular information processing style, two separate analyses of variance (ANOVA) were performed.

In the first ANOVA, the independent variable was mood condition (positive vs. neutral), and the dependent variable was interfeatural saccade ratio. The mean of the interfeatural saccade ratio was higher for participants in a positive mood that for those in a neutral mood (0.64 and 0.55, respectively). But the main effect of mood on interfeatural saccade ratio was not significant

($p > 0.05$). This means that people in a positive mood did not use a global information processing style to a greater extent than did people in a neutral mood.

In the second ANOVA, the independent variable was mood condition (positive vs. neutral), and the dependent variable was fixture gaze duration.

The effect of mood on fixture gaze duration was significant, with $F(1,32) = 4.68$, $p= 0.037$, and $\eta^2 = 0.0036$. The participants in a neutral mood had significantly higher values for fixture gaze duration than did participants in a positive mood (0.41 and 0.27, respectively). The result means that people in a neutral mood used a local information processing style to a greater extent than did people in a positive mood.

The correlations between the fixture gaze duration, interfeatural saccade ratio and emotion recognition reaction times were also calculated for groups in positive and neutral moods. There were no statistically significant correlations, with the exception of the relationship between the fixture gaze duration and interfeatural saccade ratio ($r = -0.679$, $p = 0.013$, $n=17$).

Discussion

In this study we investigated whether mood states and information processing styles affect the efficiency of emotion recognition. We tested the hypothesis that positive mood increases the speed of positive emotion recognition and does not affect the speed of negative emotion recognition. Significant differences were obtained for happiness recognition; namely, individuals in a positive mood recognized happiness in faces slower than did those in a neutral mood. This observed effect is in fact opposite to the congruency effect, by which we expected the processing of congruent information to be facilitated (accelerated). It should be noted that, if the effect of current mood is not taken into account, then this result is contrary to what has usually been obtained in other studies, which have shown acceleration in processing stimuli of positive valence (e.g., Calvo et al., 2010). So the results of this study provide partial support for the original hypothesis.

As mentioned in the introduction, the congruency effect is not always possible to reproduce in empirical research. The lack of consistency in the results of different studies may be explained by influence of other, uncontrolled factors. Factors that have been considered include, for example, the effects of stable personal traits (Rusting, 1998), differences in response formats in emotion recognition tasks (Schmid and Schmid Mast, 2010), stages of information processing

(Kozhukhova and Lyusin, 2016), and gender (Schmid et al., 2011). For example, the study by Schmid (2011) showed that men in a happy mood recognized emotions more accurately then those in a sad mood, but could not confirm this result for women.

It should also be noted that the Positive Affect scale of the PANAS questionnaire combines positive valence and excitement (arousal). In this regard, the positive mood induction procedure used in this study is likely to lead both to a bias in valence ratings and an increase in the level of arousal. Therefore, it remains an open question whether the resulting mood is due to the effect of valence or to a general increase in arousal.

Contrary to our assumption about the use of a global processing style by participants in a positive mood, the results showed that people in a positive mood do not use a global information processing style to a greater extent than do people in neutral mood. But the fact that people in a neutral mood were found to use a local information processing style more often than people in a positive mood suggests a partial confirmation of the hypothesis. This result is consistent with the results of several other studies (e.g., Isbell et al., 2013).

The study found no links between information processing style and emotion recognition performance. Thus the hypothesis about these relationships was not confirmed. Some of the same results were obtained in the study by Schmid et al. (2011), who showed that the processing style of participants in a happy mood was not related to their emotion recognition accuracy.

Our study faced several limitations. One of the most important was the absence of a group subjected to negative mood induction. Inclusion of another experimental group would have allowed further exploration of the congruency effect and broader analysis of information processing styles in connection with the recognition of negative emotional information. Another limitation of the study was related to the emotion induction procedure. Although the “correct” changes in Positive Affect ratings were obtained, emotion induction was not very effective in general. It should be noted that the efficiency of emotion induction procedure depends on the characteristics of the sample. In this case, the sample consisted of young people who were students, mostly female, whose initial Positive Affect scale responses were quite high. In fact, their ratings almost reached the ceiling of the scale. Even if the participants became “happier” after emotion induction, this could only lead to a slight shift in Positive Affect estimates. The congruency effect was therefore not very pronounced. Another limitation is the relatively small sample size. Increasing the sample size would allow collection of more reliable data for describing the desired effects.

In general this study contributes to studies of the congruency effect. The analysis of different categories of emotions (not only of happiness or sadness) is of particular importance. The findings clarify mechanisms of efficient emotion recognition. The drop in speed in happiness recognition was an unexpected result which requires further empirical testing. A theoretical analysis of other possible factors influencing emotion recognition is also needed.

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