

# Underlying Mechanisms of Biased Emotional Processing: The Influence of Emotional Intelligence and Nationality on Emotional Picture Processing

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## ABSTRACT

In many psychological disorders, one of the underlying issues is biased appraisal of emotional situations. In an attempt to unravel the underlying mechanisms of this phenomenon at a more fundamental level, the present study attempted to shed light on two individual characteristics, nationality and emotional intelligence, that may play a role in the processing of emotional pictures in three-dimensional emotion space. It was hypothesized that emotional intelligence and nationality would affect one's rating of emotional images. However, results showed no effects of either. The search for mechanisms that result in biased emotional processing continues. Directions for future research are suggested.

## Keywords

Emotional appraisal, Nationality, Emotional intelligence.

## INTRODUCTION

In today's society, we as humans are exposed to emotional images everywhere and every day. Considering that the appraisal of images as being emotional is evolutionarily adaptive (Güntekin & Başar, 2014), it is widely assumed that we all emotionally appraise images to some extent, and that the degree to which we accurately manage to do so depends on our individual characteristics. In some people, the appraisal process is biased, e.g. in people suffering from depression, anxiety, psychopathy, and addiction (e.g. Gotlib, 1983). The question that remains is which factors underlie the development of such emotional biases.

### Three-dimensional emotion space

Emotional processing can be scientifically investigated on multiple levels in attempts to unravel the underlying mechanisms. Possibly the most fundamental level is the assessment of emotional images, e.g. by evaluating pictures from the International Affective Picture System (IAPS) database in three-dimensional emotion space. According to the paradigm of three-dimensional emotion space, to adequately define emotional states, there are three independent and bipolar dimensions that require acknowledgement. These are pleasure-displeasure, degree of arousal, and dominance-submissiveness, also known as the valence, arousal and dominance scales respectively (Russell & Mehrabian, 1977). However, because the dominance scale is a more recent addition, many IAPS studies still only use the valence and arousal scales.

### Nationality

As was mentioned, the degree to which we possess the skill of emotional picture processing greatly depends on various individual characteristics. One of the thoroughly investigated characteristics is nationality. Although mainly aimed at examining whether the US norms of

IAPS images could be generalized to other countries, this line of research tells us plenty about distinctions that can be made with respect to emotional picture assessment based on nationality. Considering that the prevalence of the previously mentioned psychological disorders marked by emotional biases varies greatly worldwide (e.g. Steel et al., 2014), nationality is likely to (at least partially) explain differences in the appraisal of situations. According to Barke, Stahl, and Kröner-Herwig (2012), German participants differed significantly from the US norms in terms of their rating on the valence and arousal scales, with German subjects rating the images as more positive and more arousing than their US counterparts did. However, the IAPS ratings obtained from both a Turkish (Tok, Koyuncu, Dural, & Carikkas, 2010) and a Brazilian sample (Ribeiro, Pompéia, & Bueno, 2005) did seem to be comparable with those same US norms. This suggests that the differences between countries may not be merely a matter of cultural variation, as Germany and the US both represent Western cultures, while Turkey and Brazil do not. However, great gaps are extant as the empirical evidence is still ambiguous and results with regards to the dominance scale are completely lacking.

### Personality

In addition to nationality, personality also affects the way we assess emotional images. The most frequently studied model in this field is by far the Five-Factor Model (FFM), which states that the broad range of normal personality traits in adults can be captured by five major factors: openness to experience, conscientiousness, extraversion, agreeableness and neuroticism (Goldberg, 1990). According to a study conducted by Berenbaum and Williams (1995) that examined people's display of facial expressions, neuroticism is among the strongest to be associated with reactivity to emotional stimuli, with participants scoring high on this trait exhibiting less reactivity than participants who score low on neuroticism. Walter et al. (2011) suggested that this might be owed to highly neurotic people generally rating emotional images as more negative on the valence scale than less neurotic people. Consequently, they may not find positive images as positive, which results in a limited range of positive facial expressions. Walter et al. also concluded that highly neurotic people rate images as higher in arousal and lower in dominance than less neurotic people.

Alongside its relation with emotional picture perception, neuroticism is significantly and negatively associated with another, but far less researched personality trait; namely emotional intelligence (Saklofske, Austin, & Petrides, 2003). This relation was recently confirmed by Siegling, Furnham, and Petrides (2015), who found an even stronger correlation. Despite its recent debut, there are a number of competing definitions and accompanying

assessment suggestions for emotional intelligence (EI). In the present study, the trait model introduced by Petrides and Furnham (2001) is used, which states that EI is a personality trait, consisting of a constellation of emotion-related self-perceptions and behavioral dispositions, that should be assessed using self-report measures.

### Relation between EI and nationality

EI and nationality are also related. Abe and colleagues (2013) showed that Japanese students have a significantly lower EI than non-Japanese, Asian students do. This association has so far not been verified, as most studies focus on ethnicity rather than nationality. Despite many attempts, however, the evidence for an effect of ethnicity on EI is limited. Therefore, similar to the endeavors of Abe et al., focus should shift towards nationality instead.

### Objectives

Based on the aforementioned findings, the present study includes three objectives. First, with regards to the effect of nationality on emotional picture perception there have been mixed results in the field so far. This study aims to shed light on this debate by assessing the influence of nationality on ratings in three-dimensional emotion space. Instead of comparing one nationality to the existing US norms and in attempts to verify the assumption of emotional picture assessment as being culture-free, but not independent of nationality, the present study compares two nationalities with similar cultures, namely Dutch and German. Based on the results by Barke et al. (2012), it is expected for the German sample to rate images as significantly more positive and arousing than the Dutch sample. Due to lack of evidence regarding the dominance scale, a non-directional hypothesis, solely suggesting a significant difference in dominance scores for the Dutch and German groups, upholds.

Second, although we know how emotional picture perception is related to neuroticism and how neuroticism is in turn related to emotional intelligence, no studies have investigated the direct relation between emotional picture assessment and emotional intelligence. In an attempt to fill this scientific gap, the present study examines the relation between EI and the valence, arousal and dominance dimensions of emotional picture perception directly. Based on previous findings, people scoring high on EI are expected to rate emotional images as significantly more positive, lower in arousal and higher in dominance than people who score low on this trait.

Lastly, research has found relations between nationality and EI, and between nationality and emotional picture assessment. Still, no study has yet examined the interaction effect of nationality and EI on the perception of emotional pictures. As nationality seems to affect EI (see Abe et al.) and EI is assumed to affect emotional picture perception, it is hypothesized that the effect of EI on emotional picture perception is significantly different for Dutch and German participants. As there is not much known regarding the relation between nationality and emotional intelligence, no specific direction for the effect is expected. Confirming this hypothesis would suggest for the effect of EI on emotional appraisal to vary depending on nationality, meaning that EI could function as either a risk or a protective factor in developing emotional biases, depending on one's nationality.

In conclusion, the goal of the present study is to acquire a better understanding of the underlying mechanisms that may affect emotional processing. This could eventually lead to practical implications, such as prevention campaigns directed towards at-risk people or the development of individualized therapies.

## METHOD

### Participants

The participants of this study ( $N = 67$ ) were recruited through the research participation system of the Radboud University. Participation points were used to reimburse subjects for their time and effort. Excluding incomplete cases and outliers lead to a final sample size of 61 used in the analyses. They consisted of male ( $n = 18$ ) and female ( $n = 43$ ) students with either the Dutch ( $n = 33$ ) or German ( $n = 28$ ) nationality. Their age ranged from 18 years to 31 years, with a mean age of 21.62 years ( $SD = 2.192$ ).

### Materials

All measures used in this study were presented and filled out digitally.

### Stimuli

Emotional picture perception was measured using a carefully pre-selected collection of 208 pictures from the IAPS database as stimuli. The pictures were presented on a 24-inch computer screen with a resolution of 1920\*1080 and a refresh rate of 120 Hz.

### Ratings

A 5-point pictorial system called Self-Assessment Manikin (SAM; see Figure 1) was used to assess the emotional content of the pictures in terms of three dimensions. The first of which is valence, which ranged from 1 (*feeling pleasant*) to 5 (*feeling unpleasant*). Secondly, arousal ranged from 1 (*feeling active*) to 5 (*feeling quiet*). Lastly, the ratings on dominance ranged from 1 (*controlled*) to 5 (*controlling*; Bradley & Lang, 1994).

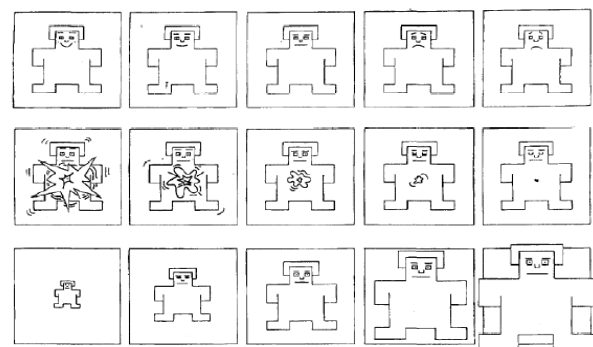


Figure 1. The Self-Assessment Manikin (SAM) used to rate the affective dimensions of valence (top panel), arousal (middle panel), and dominance (bottom panel). From Bradley and Lang (1994).

### Questionnaire

Emotional intelligence was measured using the Trait Emotional Intelligence Questionnaire-Short Form (TEIQue-SF), a self-report measure of EI that is derived from the full form of the Trait Emotional Intelligence Questionnaire (TEIQue) and that consists of 30 statements that subjects respond to using a 7-point Likert-style response option format that ranges from 1 (*completely disagree*) to 7 (*completely agree*; Petrides & Furnham, 2006). Subjects were also asked for demographic information, including age, gender and nationality.

### Procedure

Upon arrival, subjects were given verbal instructions about the experiment, after which they were asked to sign a consent form. The experiment started with the picture categorization task that consisted of three blocks, one for

each of the three dimensions. Each image, along with a fixation cross, was presented until button press for a maximum of seven seconds, in which the participants needed to rate the picture on one of the dimensions using the SAM scale that appeared on the screen. After following this procedure for all the pictures, it was repeated for the other two dimensions. The order of the SAM scales and the pictures were both pseudo-randomized for each subject.

After completing all blocks, the participants filled out the earlier mentioned questionnaires, of which the order was randomized. Ensuing the experiment, subjects were debriefed and thanked for their participation. The procedure took approximately one and a half hour per participant.

### Data-analysis

To prepare the data for the analyses, some items of the TEIQue-SF were reverse-scored. An average EI score, as well as average scores for the three SAM scales were computed and used in the analyses. The present study used a between-subject design with nationality as the between-subjects factor (Dutch/German), emotional intelligence as a quantitative independent variable, and valence, arousal and dominance as quantitative dependent variables. To analyze the influence of nationality and EI on emotional picture perception overall and on each of the three dimensions individually, a one-way Multivariate Analysis of Covariance (MANCOVA) was conducted. The assumptions underlying this analysis were checked beforehand, and a post hoc power analysis was conducted.

### RESULTS

A one-way MANCOVA with  $\alpha = .05$  as the a priori criterion for significance was used to examine the influence of nationality and EI on the valence, arousal and dominance dimensions of emotional picture perception. Prior to conducting this analysis, the assumptions of homogeneity of variance-covariance matrices, multicollinearity, and normality were checked. Aside from two outliers, which were subsequently excluded from the analysis, no significant anomalies were found in the data.

Results from the MANCOVA showed a statistically non-significant multivariate main effect for nationality, according to Wilks'  $\lambda = .95$ ,  $F(3,55) = 1.02$ ,  $p = .392$ ,  $\eta^2 = .05$ . A statistically non-significant interaction effect for nationality and EI, Wilks'  $\lambda = .97$ ,  $F(3,55) = .66$ ,  $p = .580$ ,  $\eta^2 = .04$ . The sizes of these non-significant effects were considered small in accordance with Cohen's (1992) convention for small effect sizes ( $\eta^2 < .06$ ). Figure 2 depicts the means per nationality for all three dependent variables, and for EI.

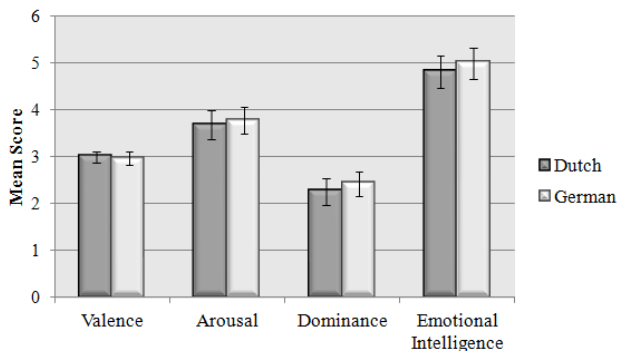


Figure 2. Means per nationality.

Finally, a post hoc power analysis revealed that on the basis of the between-groups comparison effect size ( $\eta^2 = .05$ ), a sample size of approximately 125 would be necessary to obtain statistical power at the recommended .80 level (Cohen, 1988).

### DISCUSSION

The goal of the present study was to examine whether nationality and emotional intelligence are some of the underlying mechanisms that differentiate among people with regards to emotional picture processing. Contrary to what was hypothesized, the present study shows that nationality and emotional intelligence do not have a statistically significant influence on the ratings of emotional images from the IAPS database on the valence, arousal and dominance scales.

#### Nationality

These results suggest in the first place that the present study fails to reject the null hypothesis that states that Dutch and German people rate emotional pictures similarly. This is contrary to the study by Barke et al. (2012), but in accordance with Tok et al. (2010) and Ribeiro et al. (2005) who had also not found any differences between nationalities. This concurrency suggests that rating the IAPS pictures may not only be culture-free, but may also be universal and therefore independent of nationality.

It is important to note that, using an independent samples  $t$ -test, a significant difference in age ( $p = .015$ ) was found between the two groups of our sample, with the mean age of the German group being significantly higher than that of the Dutch group. According to Grünh and Scheibe (2008), age affects emotional picture perception, with older adults rating negative images as more negative and more arousing, and positive images as more positive and less arousing than younger adults. By conducting a chi-square goodness of fit test, a difference in gender distribution in the Dutch group ( $p = .016$ ) was also found, with this group containing significantly more female versus male participants. No difference was found in the German sample. Gender also affects emotional picture perception (Barke et al., 2012), with men rating images as more positive and less arousing than women. Based on this literature, the detected differences in age and gender distribution should not be ignored, as these factors may have biased the results through alteration of the effects of nationality on emotional picture assessment.

#### Emotional Intelligence

The data also provide no reason to reject the null hypothesis that states that people with all levels of EI rate emotional picture similarly. This is inconsistent with our attempt to find a direct relation for what is currently a theoretically indirect relation between EI and the three scales via the trait neuroticism. Based on the strong, negative correlation found between neuroticism and EI (e.g., Siegling et al., 2015), and the results concerning the influence neuroticism has on emotional picture processing (Walter et al., 2011), we expected there to be differences between people with a high and a low EI level. Based on the results, we conclude that the existence of such a link may be purely theoretical and may not endure in practice.

Something worth noting is that different stimuli were used for the present study and for the study by Walter et al. (2011). Despite both having used pictures from the IAPS database, different compositions were used, which may explain the difference in results.

#### Nationality x Emotional Intelligence

Lastly, the results lead to a failure to reject the null hypothesis stating that the effect of EI on emotional picture processing does not depend on nationality. An explanation for this could be that nationality does not affect emotional intelligence in the present study, in contrast to the results found by Abe et al. (2013). However, the present study used an European sample, while Abe et al. (2013) used an Asian sample. Despite the effect of nationality on

emotional picture assessment seeming culture-free in this study, the effect of nationality on emotional intelligence level seems not to be, and continental and/or cultural differences may have contributed.

### Limitations & Suggestions for future research

As in any experiment, our study holds some limitations that are worth mentioning. First, limited statistical power because of the modest sample size in the present study ( $N = 61$ ) may have played a role in limiting the significance of some of the statistical comparisons conducted. In addition, our sample mainly consisted of people with a higher education level and represented a relatively narrow range of age, which reduces the generalization potential of the results. Lastly, the present study interpreted EI according to the definition from the trait model by Petrides and Furnham (2001) and used a self-report measure in accordance with this definition. Emotional intelligence, however, can also be interpreted using the ability model by Salovey and Mayer (1990), which focuses on the individual's skill to process emotional information and use it to operate in social settings. This model assesses EI using a performance-based measure. This difference in definition, and therefore in measure, may have affected the results. By improving on these limitations, further research needs to verify the lack of an effect of nationality and emotional intelligence on emotional picture processing.

### In Conclusion

The present study attempted to acquire more insight in individual characteristics that might affect the evolutionary advantageous skill of emotional picture processing. Our results suggest that nationality and trait emotional intelligence are not factors that influence the way we perceive emotional images. By this means, the present study forms a great addition to the scientific discussion on individual differences. Moreover, this study succeeded at being an extension to the small amount of studies assessing emotional picture perception in three-dimensional emotion space by including the dominance scale.

In sum, emotional intelligence and nationality might not affect the assessment of emotional pictures, which is why the question remains: When and for whom does emotional processing become pathological? With the use of more research in this field, we might unravel what underlies these differences and eventually be able to utilize this knowledge for practical implications, such as the development of prevention and treatment strategies.

### ROLE OF THE STUDENT

Mandy Spaltman was an undergraduate working under the supervision of Lisa Luther, alongside three other undergraduate students, when this research was performed. The topic was proposed by the supervisor, but each student had an individual research question and wrote an individual research report. Data collection was executed collectively.

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