

# Basic emotions and psychological distress: association between recognition of facial expressions and Symptom Checklist-90 subscales

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## Abstract

**Objective:** Cross-cultural studies have demonstrated universal similarity in the recognition and expression of basic emotions in facial expressions. The so-called mood congruency effect, observed primarily in clinical populations, implies that subjects with depressed mood tend to judge positive emotions as neutral and neutral faces as negative. The objective was to investigate whether a mood congruency effect can be detected in case of mild impairments among healthy subjects. First, it was hypothesized that subjects with mild psychiatric symptom distress have poorer performance in affective facial recognition in general. Second, it was also hypothesized that these subjects have poorer functioning in neutral face recognition and that they are prone to attribute negative emotions, for example, sadness and fear to neutral faces. Third, it was also assumed that people with mild psychiatric symptom distress have poor performance in recognizing positive emotions.

**Methods:** Pictures representing the basic emotions were used to examine the recognition of facial emotions; the Symptom Checklist-90 was obtained to quantify overall psychological distress and the severity of psychiatric symptoms on 9 primary symptom dimensions, including somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. One hundred seventeen healthy volunteers were recruited for the purpose of the study.

**Results:** Consistent with the first hypothesis, results indicated a significant negative association between the overall recognition rate of facial expressions and the level of psychiatric symptoms in a healthy population. Consistent with the second hypothesis, the level of psychiatric symptoms was related inversely with the neutral facial expression recognition and directly with the negative bias in neutral facial expressions. However, our data did not support the assumption that people with mild psychiatric symptom distress would have a poorer performance in recognizing positive emotions.

**Conclusions:** These findings support the notion that difficulties in emotion processing in general and in neutral face recognition, including a negative bias in particular, are strongly related to psychological distress and the severity of psychiatric symptoms in a healthy population.

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## 1. Introduction

Emotional facial expressions are an important part of social communication and play a crucial role in interpersonal interaction. Universal recognition of facial expressions of basic emotions has been demonstrated by the research group of Ekman et al [1-3] in several cross-cultural studies. In the past 20 years, numerous studies have highlighted the role that recognition of facial expressions plays in various psychiatric conditions.

Abnormal performance on facial emotion recognition tasks has been reported in schizophrenia [4-13]. Some studies report that facial expression recognition is impaired in schizophrenia, whereas face, age, and sex recognition is preserved, suggesting an abnormal processing of changeable facial features in schizophrenic patients compared to healthy control subjects and depressed groups of patients [14]. Other studies did not reveal a specific deficit for emotion recognition in schizophrenia. Overall, however, the aforementioned studies lend support to the notion that difficulties in emotion recognition occur in schizophrenia and that they are associated with key cognitive deficits rather than being stand-alone symptoms [15-18].

Patients with depression have consistently been found to have a negative bias in the judgment of facial expressions [6,19-21]. Most studies found a global deficit in facial

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judgment accuracy [22–24]. However, these findings are somewhat contradictory, with some of the studies reporting no such deficit [25]. There are various reasons for these discrepant findings, which include inconsistent methodology across studies and the use of small samples in some of the investigations.

From the perspective of methodological problems, we should note that the various studies used different facial stimulus sets, with different number of emotions ranging from 4 to 6, which place the subject into different task situations. In addition, one study [25] that failed to identify a global deficit applied an animated stimulus research paradigm. Such a paradigm may provide higher recognition rates, which in turn can lead to a statistical ceiling effect that decreases the possibility of discrimination among various diagnostic groups. With regard to sample size, it is important to note that most investigations used relatively small sample sizes (ranging from 16 to 25 per group), which not only provides poor statistical power but also increases the sampling variation.

The phenomenon that the literature refers to as “mood congruency” effect implies that subjects with depressed mood tend to judge positive emotions as neutral and neutral faces as negative. Correspondingly, patients with mania tend to judge sad facial expression as less intensive or neutral [26]. The finding that patients with depression were able to recognize both positive and negative stimuli, but could not recognize neutral emotions as neutral, can also be interpreted as a reflection of mood congruency [19].

Although much attention has been given to the characteristics of the judgment of facial expressions by patients with major depression and those with schizophrenia, to our knowledge, no attention has been given to the relationship between the psychiatric symptom distress observed in a healthy population and their judgment of emotional facial expressions. Our objective was to further investigate the possibility of mood congruency effect in case of mild impairments among healthy subjects. We chose the Symptom Checklist-90 (SCL-90)—Revised Form to quantify the level of psychiatric symptom distress [27].

Several studies demonstrated the clinical utility of the SCL-90 scale for measuring psychological status, quantifying change in outcome studies, or screening for mental disorders [28]. In addition, most of the studies concluded that the SCL-90 was able to differentiate between subjects known to have a given psychological disorder and those who do not and that this differentiation was mainly based on a primary global distress factor [29–32]. We could find only 2 studies where the relationship between emotion recognition and psychiatric symptom distress as indexed by the SCL-90 scale was examined. Bouhuys et al [33] found an anxiety-related mood-congruent bias with respect to the perception of facial expressions, whereas Kessler et al [34] could not find significant association between psychopathology and emotion recognition.

Based on the literature, the first hypothesis of this study was that subjects with mild psychiatric symptom distress would have poorer performance in affective facial recognition in general. The second hypothesis was that the same subjects would have poorer functioning especially in neutral face recognition and that they would be prone to attribute negative emotions, for example, sadness and fear to neutral faces. We also expected that such a negative bias would show the most pronounced association with symptoms of depression as compared with other symptom dimension. The third hypothesis was that people with mild psychiatric symptom distress would have a poorer performance in recognizing positive emotions and that they would have higher sensitivity for recognizing negative facial expressions. Although the literature that we reviewed above does not suggest a specific association regarding individual psychiatric symptom dimensions, we wanted to explore in this study whether the basic psychiatric symptom dimensions (in addition to the general psychiatric symptom distress) displayed the same association that we specified in hypotheses 1 to 3.

## 2. Methods

### 2.1. Subjects

Subjects included in the study were healthy volunteers, including staff members and students at an approximately equal proportion, recruited from Semmelweis University and Eötvös Loránd University (Budapest, Hungary) (N = 117). The mean age of the subjects was 25.3 years (SD, 11.4 years), the sex ratio (female-male) was 68:49, and the mean years of education was 14.2 (SD, 2.3 years). The subjects were free of history of psychiatric illness, and none of them took any psychotropic medication. Lack of psychiatric history was established based on a self-report questionnaire that was obtained in the format of a checklist and comprised 3 items including (1) history of psychiatric illnesses, (2) list of psychotropic medications, and (3) history of psychiatric (or psychotherapy) treatment. All subjects gave informed consent to participate in this study, and the design was approved by the local ethical committee.

### 2.2. Stimuli and material

For stimulus presentation, we used the Virtual Human Interface system (by Digital Elite Inc, Los Angeles, Calif), which produces computer-generated faces to express the 7 basic human emotions (happiness, surprise, anger, disgust, fear, sadness, and neutral) [35,36]. Using this tool, we generated 14 pictures, which included each of the 7 emotions in 2 alternative presentations (ie, repetitions). The SCL-90 was used as a self-report measure of psychiatric symptoms. It is designed primarily to assess symptom patterns in a broad spectrum of population, ranging from nonpatient healthy subjects to individuals with psychiatric disorders. This 90-item self-report symptom inventory is a cross-sectional

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