Universiteit Leiden

Faculteit der Sociale Wetenschappen

Individual differences in holistic face processing

Does trait anxiety or depression modulate holistic face processing?

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Master thesis Psychology, specialization Social and Organizational Psychology
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Date: 07-08-2015
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Abstract

In this study, we investigated individual differences in holistic face processing. We expected that individuals high on trait anxiety or depression would show less holistic face processing. Furthermore, we expected to find a relationship between social cognitive ability and holistic face processing, with a modulating effect of trait anxiety and depression. We used a part-whole task to measure holistic processing, while trait anxiety and depression was measured with self-report questionnaires. The results showed that there were no differences in holistic face processing for high trait individuals or depressed individuals in comparison with individuals low on trait anxiety or depression. Furthermore, the results showed that social cognitive ability does predict holistic face processing, however, trait anxiety and depression did not seem to modulate this relationship. Emotional state seems to be important in predicting individual differences in holistic face processing, this needs to be further explored.

Individual differences in holistic face processing

People's impressions of others are fundamental tools for social life. Recognizing human faces accurately is a crucial skill for human beings as a social species (Chen, 2014). The human face is of supreme importance for many aspects of social interaction and communication (Wilhelm et al., 2010): faces provide one of the primary means of discriminating between people, and the ability to recognize identity from the face facilitates social interactions (Davis et al., 2011). The face represents the identity of a person and makes each individual unique, and displays expressions of emotions (Chen, 2014). Therefore, human faces are a complex source of information. The human face conveys different social signals about people's gender, age, physical attractiveness and emotional state (Chen, 2014). For years, holistic processing has been used to explain what makes face recognition special (Richler, Palmeri, & Gauthier, 2012). Face-related research has been carried out broadly in the field of neuroscience and clinical psychology; however, far less is known about the social-cognitive component of face recognition (Chen, 2014). Therefore, it is interesting to explore individual differences in face processing.

Social cognitive ability

What makes people tick, how does a person form an impression of a stranger at work, why do we sometimes not understand the motives of other people? Social cognition is the study of how people make sense of each other and themselves. It focuses on how people think and feel about people (Fiske & Taylor, 2013). People are unavoidably complex because they have traits and intents hidden from view. One cannot study cognitions about people without making numerous choices to simplify (Fiske &

Taylor, 2013). We will focus on Theory of Mind (ToM) as a description of social cognitive ability. Theory of mind describes people's everyday understanding of the contents of another's mind, especially beliefs and knowledge. It focuses on ordinary people's perception that other people have beliefs, intentions, and personalities distinct from their own minds (Fiske & Taylor, 2013). Wilhelm and colleagues (2010) stated that face recognition ability was clearly distinct from people's general cognitive abilities. Therefore, Wilhelm and colleagues (2010) proposed that face recognition was not dependent on other cognitive abilities; on the contrary, it was an independent social-cognitive ability reflecting an individual's Emotional Intelligence (EI). Emotional Intelligence refers to a set of abilities that is key to competent social functioning, including being able to understand others' feelings (Wilhelm et al., 2010). More specifically, as a facet of EI, recognition of emotions or emotional faces in other people could influence and/or depend on an individual's face-processing ability (Chen, 2014).

Face recognition

Face recognition ability refers to a person's capacity to correctly and swiftly perceive and recognize different facial stimuli. According to a recent theoretical framework of face recognition ability (Wilhelm et al., 2010), it includes three components: face perception (perceptual capacity to discriminate and compare different facial stimuli), face memory (ability to remember various face stimuli) and speed of face recognition (how swiftly an individual will respond to face stimuli correctly; Chen, 2014). Evidence from neuropsychology and neuroimaging certainly bolsters the view that face processing is special in comparison with other objects (Norman & Tokarev, 2014). The existence of such dedicated brain systems for face processing is supported by clinical studies of brain-damaged patients with double dissociation between the perception and memory of faces and other visual objects (Wilhelm et al., 2010).

When people see a face, pictorial codes are derived from the retinal input; these codes are relatively raw images, following the derivation of pictorial codes, viewpoint and expression-independent descriptions (Wilhelm et al., 2010). The most basic attributes that are repeated in every face (i.e., two eyes, above a nose, above a mouth) provide ‘‘first-order information’’ and this can be used to distinguish faces from other visual objects (face detection; Taubert, Apthorp, Aagten-Murphy, & Alais, 2011; Wilhelm et al., 2010). Considering all faces share the same first-order configuration, the identification of an individual face requires information about the ways that one face differs from any other (Taubert et al., 2011). The spatial relationship between first-order features, such as the distance between the nose and mouth, constitute second order or configurational features (Wilhelm et al., 2010; Taubert et al., 2011). Our expert ability to discriminate between faces, therefore, reflects a high sensitivity to second-order information (Taubert et al., 2011).

Human faces share common features arranged in very similar configurations, posing a unique and difficult task for any facial recognition system. Accordingly, in order to maximize sensitivity to subtle configural differences, humans have adapted to be able to process faces holistically (Wilhelm et al., 2010) and the degree of this holistic processing significantly predicts the accurate recognition of the identity of a face (Taubert et al., 2011). According to Maurer, Le Grand and Mondloch (2002) there are three stages of processing associated with face recognition: (1) face detection (based on first-order information), (2) holistic processing (the integrations of facial features following detection) and (3) face discrimination (based on second-order information extracted from the holistic representation; Taubert et al., 2011).

Holistic processing

For years, holistic processing has been used to explain what makes face recognition special (Richler, Palmeri, & Gauthier, 2012). Accordingly, in order to maximize sensitivity to subtle configural differences, humans have adapted to processing faces holistically – extracting information as a whole rather than as a constellation of individual components – and the degree of this holistic processing significantly predicts the accurate recognition of the identity of a face (Norman & Tokarev, 2014). Holistic processing is a term too loosely defined. The same term is applied to different measures, even though they may be capturing different things. A review of the literature reveals at least a dozen different tasks that ostensibly measure holistic processing of faces (Richler et al., 2012). The two most popular are the part-whole task and the composite task. In this study, we will use the part-whole task as measure of holistic processing. In the part-whole task, holistic processing is measured as better recognition of a feature (e.g. eyes, nose or mouth) when the feature is presented in the context of a whole face versus when it is presented in isolation (Tanaka & Farah, 1993).

Though it is generally assumed that holistic processing is automatic and immune to outside influences, Curby, Johnson and Tyson (2012) reported in their study that emotional state significantly modulated face processing style, with the negative emotion induction leading to a decrease in holistic face processing. Self-reported change in emotional state correlated with changes in holistic processing (Curby, Johnson, & Tyson, 2012). Xie and Zhang (2015) examined the influences of induced emotions on holistic processing of faces and face discrimination. They found that negative emotion impaired holistic face encoding in the composite-face task and reduced face discrimination accuracy. Negative affect, arising as a natural response to potential threats, triggers an urge to change the current situation by engaging focused attention on to detailed-oriented processing (Xie & Zhang, 2015). Xie and Zhang (2015) reported opposite effects for positive emotion induction, positive affect led to an increase in holistic face processing.

Emotional experiences modulate various perceptual and cognitive processes. According to the broaden-and-build theory positive emotions tend to broaden one's thought-action repertoire (the broaden hypothesis; Xie & Zhang, 2015). Support for the broaden hypothesis centres around relationships between positive emotions and holistic/configural processing (Xie & Zhang, 2015). First, positive emotions can increase processing efficiency of gestalt stimulus such as faces (Maurer, Le Grand & Mondloch, 2002). Second, positive emotions tend to induce a bias towards global attributes in perceptual processing global-local stimuli, such as a big letter T (a global attribute) composed of many smaller letters Hs (local attributes; Xie & Zhang, 2015). Individuals who are sad or depressed have been found to show enhanced memory for details of a perceptual experience, at the expense of perceiving the overall picture (Hills, Werno, & Lewis, 2011); happy people tend to focus on the "gist", rather than on details of a scene (Xie & Zhang, 2015).

Processing style, local versus global

Emotions influence everything we see and do. Emotions can influence how one literally perceives the environment. Negative mood states are detrimental to performance on a wide range of cognitive tasks by limiting cognitive resources causing deficits in tasks including face perception (Hills et al., 2011). Negative emotions have been linked with a “local” visual processing bias, characterized by heightened attention to individual features (Derryberry & Reed, 1998).

Individual differences in face recognition performance are related to the precedence of global processing over local processing (Curby et al., 2012). In addition, Basso and colleagues (1996) found that whereas positive mood and optimism were associated with a global perceptual bias and inversely related to a local perceptual bias, depression and anxiety were associated with the opposite pattern (Curby et al., 2012). Induction of a local processing bias has been found to impair face recognition performance (Curby et al., 2012). It is believed that the damaging effect of a local processing context on face recognition arises via its impact on the holistic strategy that characterizes face processing (Takana & Farah, 1993; Curby et al., 2012).

Current research

Given the growing interest in face recognition it is interesting to investigate what could influence holistic face processing, which in turn can influence face recognition ability. Individual differences in face-related social cognitive abilities have been largely neglected. Though a lot of face recognition research has been concerned with the relationship with social anxiety and face recognition ability, in this study we focus on trait anxiety; individual differences in anxiety as a personality dimension, generally assed by measures of trait anxiety, e.g. The State-Trait Anxiety Inventory (Derakshan & Eysenck, 2009). Depression is also included in this study (CES-d), considering depression is also associated with experiencing negative emotions. As mentioned before, Curby and colleagues (2012) and Xie and Zhang (2015) found that negative emotion induction modulates holistic processing. It might be interesting to explore if people who are sensitive for experiencing negative emotions (anxiety, depression) process faces differently than people who are not. Investigating the impact of trait anxiety or having depressive symptoms on holistic face processing can shed light on what individual differences can influence face processing.

Prior research has shown that the perceivers' affective state can influence perception (Lynn, Zhang, & Barrett, 2012). Two earlier studies have already attempted to examine the relationship between face identity recognition and (general) anxiety (Davis et al., 2011). The first study compared groups who were low and high on general anxiety, and reported better face recognition ability for the group low in general anxiety (Mueller, Bailis, & Golstein, 1979). Nowicki, Winograd and Millard (1979) also reported the same results as Mueller, Baillis and Golstein (1979) but only found a relationship for females (Davis et al., 2011). However, for these experiments only face recognition ability was measured and not holistic face processing. Also, face recognition and depression have been examined before. Previous research from Curby and colleagues have shown convincingly that sad people do not employ holistic processing as readily as happy people (Hills et al., 2011). Therefore, we predict that anxiety as well as depression may lead to less holistic processing, which eventually can lead to impaired facial recognition.

Our second objective in this study is to investigate what could influence holistic face processing. As been proposed by Chen (2014) recognition of emotions or emotional faces could influence and/or depend on an individual's face-processing ability (Chen, 2014). Therefore the second objective of the current study is to investigate whether there is a relationship between social cognitive ability and holistic face processing. And if so, does anxiety or depression modulate holistic face processing?

Method

Participants

Respondents were recruited via Facebook advertising; some respondents were excluded from analyses because they did not finish the study. Among the respondents who completed the entire study a bol.com voucher of 50 euro's was raffled. The final dataset contained 109 respondents (40 males, M_{age} = 35, SD_{age} = 14. Twenty-five percent of the respondents have finished a bachelor's degree at HBO, followed by fifteen percent who finished a master's degree at the university and thirteen percent who completed their MBO diploma.

Design

This online survey consisted of a series of questionnaires. The questionnaires measured trait anxiety, depression, and social cognitive ability. The presentation order of the three measures was randomized across respondents. Respondents also completed a face completion task as a measure of holistic processing (person perception), to measure holistic processing a classic part-whole task was used. For the part-whole task respondents were asked to take a look at six faces and study their names. After that each respondent first completed the whole face condition, where features are shown within the context of the target. After those trials features were shown in isolation (part face condition). The trials were not randomized; each respondent had to complete the whole face condition first. At the end of the survey demographic data was collected including gender, age and education.

Measures

Trait anxiety (STAI, form Y2). To measure trait anxiety we used the State-Trait Anxiety Inventory for Adults. It's a self-evaluation Questionnaire (Form Y-2, trait anxiety) developed by Charles D. Spielberger and R.L Gorsuch. The development of STAI was initiated in 1964 and STAI-form X was published in 1970. A revision of the scale began in 1979 and eventually Form-Y was published in 1985 (Fountoulakis et al., 2006). The STAI is reported to be reliable and valid and has been used in research and clinical practice. The T-anxiety scale consists of twenty statements that evaluate how the respondent feels "generally". The questionnaire consists of statements like: "I feel nervous and restless", "I am happy" and "some unimportant thought runs through my mind and bothers me". The subjects rate the frequency of their feeling on the following four-point scale: (1) almost never, (2) sometimes, (3) often, (4) almost always. Each item is given a weighted a score of 1 to 4. The scores for the anxiety scale can very form a minimum of 20 to a maximum of 80. For the Dutch translation of the STAI we used the Zelf-Beoordelings Vragenlijst (ZBV). We only used the trait anxiety scale; the Cronbach's alpha of the scale was .844. For the analyses we separated trait groups as follows: one standard deviation above average is considered as high trait anxiety and one standard deviation below average is classified in the low trait anxiety group.

Depression (CES-D). The Center for Epidemiological Studies Depression Scale (CES-D) is an instrument that measures the magnitude of depressive symptoms in the population (Bouma, Tanchor, Sanderman, & Sonderen, 1995). The CES-D consists of twenty questions on a 4-point Likert scale. For every statement the respondent needs to indicate whether it is applicable to her or himself, from never (1) to all the time (4). The

CES-D measures depressive symptoms in the seven days prior to the questionnaire and is not intended to establish clinical depression. The higher the CES-D score, the greater the extent of depressive symptoms. In the general population respondents with a score of 16 or higher is considered depressed. The Chronbach's alpha of the depression scale was .909. We splitted the groups such that we picked one standard deviation above and below one standard deviation and compared those people for further analyses.

Reading the Mind in the Eyes Test revised (RMET). The Reading the Mind in the Eyes Test (revised) (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001) contains the eye region of 36 faces displaying social emotions (e.g. serious, ashamed, alarmed and bewildered). Respondents are forced to choose between four different emotions displayed next to the face, and chose the one that they think the person in the picture was thinking or feeling. Although it was first introduces in autism research, the Eyes Test's potential for studying individual differences among normally developing individuals was quickly established (Peterson & Miller, 2012). Used in over 250 studies, it has been conceptualized as an advanced theory of mind test that is relatively free of general cognitive abilities. Completing the instrument requires not only the ability to recognize emotional expressions but also the ability to determine the complex cognitive mental state of an individual based on a partial facial expression. Given the sensitivity of the instrument, many studies with healthy adult samples have used this instrument as a measure of individual differences in social perceptual processes (Peterson & Miller, 2012).

Holistic face processing. To measure holistic face processing we used the Part-Whole task. In the part-whole task, holistic processing is measured as better recognition of a feature (e.g. eyes) when the feature is presented in the context of a whole face versus when it is presented in isolation (Tanaka & Farrah, 1993). The face images used in this work have been provided by the Computer Vision Laboratory, University of Ljubljana, Slovenia (Solina, Peer, Bataglj, Juvan, & Kova, 2003). The database consisted of seven photos for each person in the database, with a resolution of 640*480 pixels. Six males around the age of eighteen were selected and only the frontal views were used. Features of the face (eyes, nose and mouth) were selected with Adobe Photoshop. A two-choice recognition test was administered. Respondents were first presented with the whole trials, in which one stimulus was the target face and the other a foil. For every male face three foil faces were created, where the eyes, nose or mouth were mixed up. There was a session of 18 trials for the whole trial condition. The stimuli were presented side by side. Respondents remained on the screen until they made a choice between the left or right face. After the whole trials the respondents were presented the part trial condition. In the part trial condition only an isolated feature was given from both the target and foil face. Also for the part trials three foil features were created for every man. For the part trial condition, there was a session of 18 trials. For an example of the whole, and part trial condition see Figure 1.

For the Part-Whole task, we calculated holistic processing using regression, as was used in prior studies (DeGutis, Wilmer, Mercado, & Cohan, 2013). The regression approach creates a measure that is not correlated with the control task but is strongly correlated with the condition of interest. In Figure 2 the whole trial performance is plotted against part trial performance, and the least squares regression line shows the expected whole performance for someone with any given part performance.

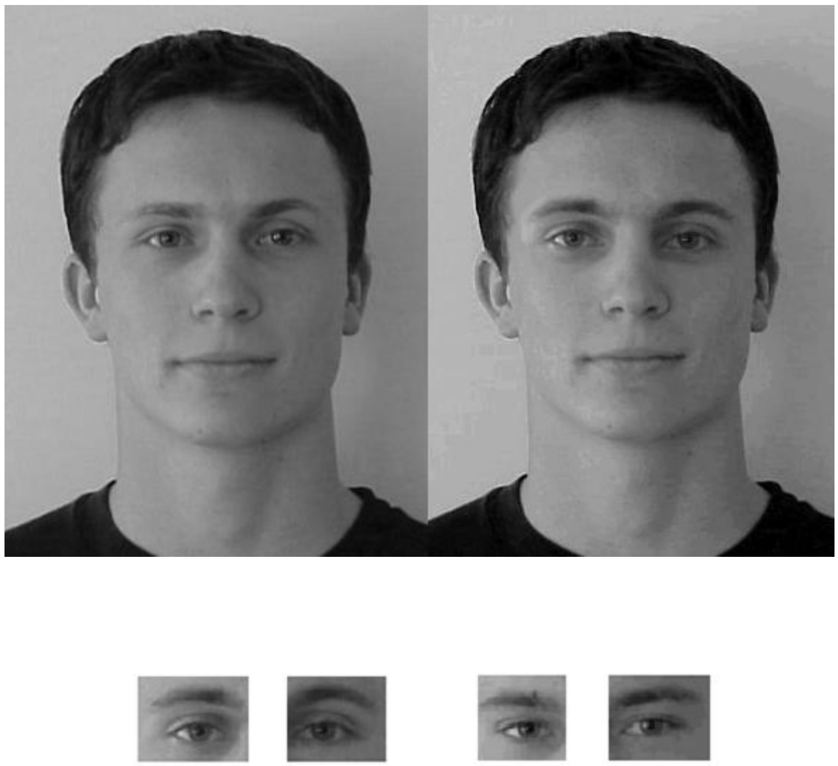

Figure 1. An example for the whole and part condition (eye feature).

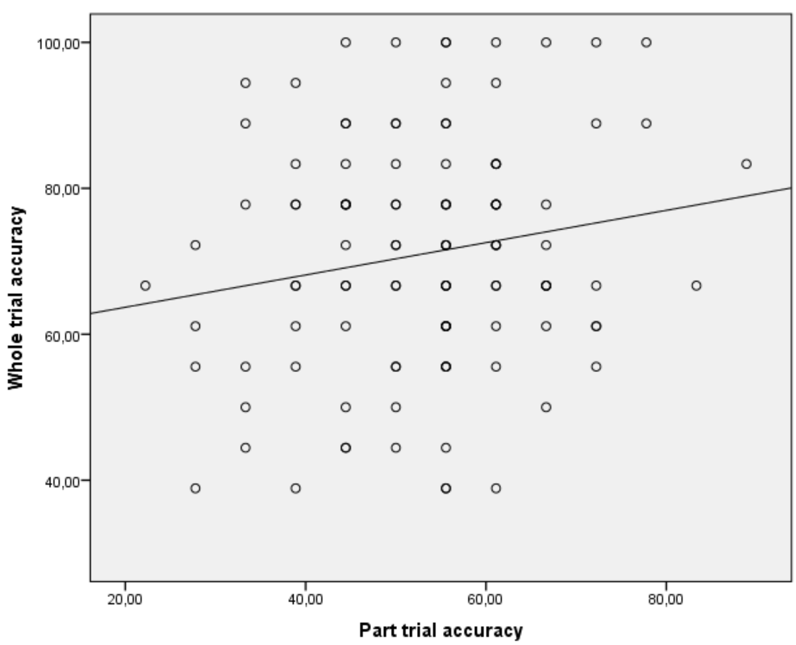

Figure 2. Regression plot.

Procedure

The online survey was conducted via the online program Qualtrics. When respondents opened the link to the survey, they filled out an informed consent before they could start. As mentioned before the respondents first filled out three questionnaires (STAI, CES-D and High Sensitivity Scale) which were randomized across the respondents. After the three questionnaires respondents had complete the Reading the Mind in the Eyes Test (RMET). When they finished the RMET respondents were informed they were about to see six faces and their task was to learn the correct face-name associations. There was no time limit for learning the correct face-name associations and no time was measured during the learning phase. When respondents were thought to be ready they could continue where a two-choice recognition test was administered. In the full-face test condition respondents were asked to identify the face that matches the given name (e.g. which is Jan?). In the isolated test condition, subjects identified isolated features of the learned faces (e.g. which is Frans's nose?). All of the respondents first started with the whole-face condition followed by the isolated condition. When the respondents were done with the task they were asked to fill in some demographic data and were debriefed and thanked for their participation. Finally they could fill in their e-mail address for winning a 50,- bol.com voucher.

Results

Correlations

As can be seen from Table 1, the holistic processing score is highly correlated with the whole face condition, $r(107) = .985$, $p < .01$, which was expected as they measure the same construct. For this reason the isolated part condition was not correlated at all with holistic processing $r(107)= .000$, $p = .998$, because this is not a measure of holistic processing. Furthermore RMET correlates positively with holistic processing $r(107) = .340$ $p < .01$, and even so does the RMET score correlates with the whole face condition $r(107) = .364$, $p < .01$. RMTE had a marginal positive correlation with the isolated part condition $r(107) = .171$, $p <.10$, which means that scoring higher on the RMET is related to scoring higher in the isolated part condition. These correlations could support hypothesis 3, however you cannot tell in which direction the correlations are. Finally, the CES-D score showed a positive correlation with the trait score $r(107) = .699$, $p < .01$, which was as expected because anxiety and depression measure overlapping elements. Trait anxiety showed no correlation with holistic processing $r(107) = -.017$, $p = .861$, nor did depression $r(107) = -.1.32$, $p = .171$.

Table 1

Correlations of self-report measures and Part-Whole task (N = 109)

	Holistic processing	Whole face condition	Isolated part condition	RMET	Trait_score
Whole face condition	**.985****				
Isolated part condition	.000	.174			
RMET	**.340****	**.364****	.171^{+}		
Trait_score	-.017	-.028	-.068	-.099	
CES-D	-1.32	-.154	-.137	-.135	**.699****

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed). $^{+}$. Correlation is significant at the 0.10 level (2-tailed).

Independent samples t-test

Low trait anxiety versus high trait anxiety. To test whether people in the high trait anxiety groups performed worse compared to the low trait anxiety groups, on a holistic processing task, we conducted an independent samples t-test. Results show that people in the high trait anxiety condition did not perform worse on a holistic processing task $t(46) = .59$, $p = .560$. This does not support our main hypothesis in which we state that people who score high on trait anxiety will perform worse on a holistic processing task.

Low depressive symptoms versus high depressive symptoms. To test our other main hypothesis we conducted a second independent samples t-test. Comparing the high depressed and low depressed groups on holistic processing. Results show that people in the high depressive condition did not perform worse on a holistic processing task $t(35) = 1.13$, $p = .190$. This does not support our hypothesis in which we state that people who suffer more from depressive symptoms will use less holistic processing.

Regression analyses

We expected that social cognitive ability (ToM) could influence person perception. Regression analyses with RMET score as independent variable and holistic processing as dependent variable showed that RMET score can predict holistic processing, $F(1,107) = 13.96$, $p < .05$. This result provides evidence for our third hypothesis. Besides this we wanted to show a negative impact of trait anxiety and depression on holistic processing. Regression analyses for trait anxiety and depression score as independent variable and holistic processing as dependent variable (after correction for social cognition score), showed that both trait anxiety, $F(1,107) = .033$, $p = .856$, and depression, $F(1,107) = 1.17$, $p = .283$, were no predictors for holistic processing. These results disprove our fourth hypothesis; that trait anxiety and/or depression could moderate holistic processing.

Discussion

Impact trait anxiety on holistic processing

For our first hypothesis we expected that people high in trait anxiety would perform less on a task that measured holistic face processing. From our results it appears to be that people who scored high on trait anxiety scored no different on a task that measured holistic face processing then people who scored low on trait anxiety. This result is not consistent with what we expected to find. The first explanation for this result is that we did not measure their current emotional state. Curby and colleagues (2012) as well as Xie and Zhang (2015) reported that negative emotion induction led to less holistic processing. Though our results suggest people who score high on trait anxiety do not perform less well on holistic processing, we could not control for their current mood. Our respondents might have scored high on trait anxiety but were experiencing happy feelings during the study, which could lead to normal holistic face processing. However, our results do suggest that people who score high on trait anxiety do not per se process face less holistically regardless of their emotional state. Our results imply that being sensitive for experiencing negative emotions does not lead to less holistic face processing.

Negative emotions have been linked with a “local” visual processing bias, characterized by heightened attention to individual features. The attentional control theory posits that trait anxiety interferes with the inhibition, shifting and updating processes of working memory (Berggren & Derakshan, 2013). High anxious individuals are predicted to perform worse on cognitively demanding tasks requiring efficient cognitive processing (Berggren & Derakshan, 2013). Maybe the task used to measure holistic processing was not the most adequate one. Instead of using the Part-Whole task the composite task might have given different results. The composite task measures holistic processing as a failure of selective attention. A high affective state (for example anxiety) narrows the focus of attention and presumably hinders holistic processing (Curby et al., 2012). Another possibility is that face perception does not tax cognitive resources (Hills et al., 2011).

Second, a few shortcoming of the study could explain the results found in this study. The task was very difficult and long, people might have rushed through to the end of the study without taking it serious. There was no learning phase included in this study so we could not control if people actually did study the faces and learned the names that belonged to the faces. Also, for every face the three trials were presented after each other what might have influenced their choice. Instead of remembering the face they could have matched the face to what they have seen one image before.

Impact of depressive symptoms on holistic processing

We hypothesized that people who experienced depressive symptoms would use less holistic processing than people who do not. However, our results do not support our hypothesis. Hills and colleagues (2011) surprisingly found in their study that sad people, despite the fact that they have shown to use less expert face recognition processes, showed better face recognition. This could suggest that sad participants engage in other forms of processing, which may improve face processing. Deveny and Deldin (2004) demonstrated that sad people show sustained attention to all faces leading to better encoding and thus better memory (Hills et al., 2011). Also Curby and colleagues (2012) stated that being sad (a low motivation state) should broaden one's attention. This could be an explanation for our results found. Sad people may possibly pay more attention to faces, which could result in recognizing the correct face accurate in the whole part condition. Despite the fact they may have used other processes instead of holistic processing. In addition, our study design mentioned before could also explain the results. The part condition was considered to be very difficult and people might have not been taken the task seriously.

Relationship between social cognitive ability and holistic processing

We found a positive relationship between social cognitive ability (ToM) and holistic face processing. Our results showed that social cognitive ability could predict holistic processing. This means that people who are better able to “read other people’s minds” overall use more holistic processing in face perception. A higher social cognitive ability might be due to a higher Emotional Intelligence. People with higher degrees of emotional intelligence might process faces better because they pay more attention to faces than people with lower scores of Emotional Intelligence (Chen, 2014). Richler, Palmeri and Gauthier (2012) demonstrated that holistic processing predicts face-recognition abilities. Chen (2014) provided evidence that face recognition ability is positively correlated with a person’s emotional intelligence. Since holistic processing is positive related to face recognition ability, and ToM is an aspect of someone’s emotional intelligence, it does make sense there is a relationship between holistic face processing and social cognitive ability. Our analyses imply that people with more social cognitive ability skills, process faces more holistically. This may lead, but not tested in this study, to an overall better face recognition ability.

Additionally we investigated whether trait anxiety or depression would modulate holistic face processing. There was no effect found whatsoever in this study. Motivation, an affective state, influences people’s attentional breadth (Curby et al., 2012). It might be that motivation intensity depending on negative emotions experienced is what modulates holistic processing of faces. People who are more inclined to be anxious or depressed don’t experience negative emotions all the time. This may lead to the following conclusion that there seems to be no general effect of being more inclined to be anxious or depressed on one's holistic face processing. Thus neither trait anxiety nor depression does seem to modulate holistic face processing.

Future research

Future research should focus on current emotional state and holistic processing. It might be interesting to redo the experiment, but we recommend manipulating emotional state. In addition, not only holistic processing should be the main focus but also face recognition ability is important for future research. Another interesting addition could be time measurements, in order to find out if different negative emotions experienced in individuals indeed have different effects on holistic face processing or face recognition ability. Tracking of eye movements could also shed light on differences in face recognition ability, and clarify where individuals focus their attention on.

Conclusion

From our research we can conclude that social cognitive ability does affect holistic processing. People who possess better social cognitive ability use more holistic face processing. However, we did not find any modulating relationship for trait anxiety or depression on holistic processing. Nor did we find evidence that people high on trait anxiety compared to people low on trait anxiety did differ in holistic processing. That was also the case for depressed individuals in comparison to non-depressed individuals.

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