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Deployment of attention to emotional pictures varies as a function of externally-oriented thinking: An eye tracking investigation

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ABSTRACT

Background and objectives: Alexithymia is a multidimensional personality construct including the components difficulties identifying feelings (DIF), difficulties describing feelings (DDF), and externally oriented thinking (EOT). Different features of alexithymia are thought to reflect specific deficits in the cognitive processing and regulation of emotions. The aim of the present study was to examine for the first time patterns of deployment of attention as a function of alexithymia components in healthy persons by using eye-tracking technology. It was assumed that EOT is linked to avoidance of negative images.

Methods: 99 healthy adults viewed freely pictures consisting of anxiety-related, depression-related, positive, and neutral images while gaze behavior was registered. Alexithymia was assessed by the 20-Item Toronto Alexithymia Scale. Measures of anxiety, depression, and (visual-perceptual) intelligence were also administered.

Results: A main effect of emotion condition on dwell times was observed. Viewing time was lowest for neutral images, longer for depression-related and happy images, and longest for anxiety-related images. Gender and EOT had significant effects on dwell times. EOT correlated negatively with dwell time on depression-related (but not anxiety-related) images. There were no correlations of dwell times with depression, trait anxiety, intelligence, DIF, or DDF.

Limitations: Alexithymia was assessed exclusively by self-report.

Conclusions: Our results show that EOT but not DIF or DDF influences attention deployment to simultaneously presented emotional pictures. EOT may reduce attention allocation to dysphoric information. This attentional characteristic of EOT individuals might have mood protecting effects but also detrimental impacts on social relationships and coping competencies.

1. Introduction

The alexithymia construct is multidimensional and commonly characterized by difficulties identifying feelings (DIF), difficulties describing feelings (DDF), and externally oriented thinking (EOT) (Parker, Taylor, & Bagby, 2003). It is assumed that different features of alexithymia could reflect specific deficits in the cognitive processing and regulation of emotions (Taylor & Bagby, 2000). Very little research based on eye tracking has been conducted to investigate the effect of alexithymia on visual attention towards emotional information. Findings from an eye tracking study examining subjects with autism spectrum disorders suggest an association between alexithymia and abnormal deployment of attention while watching facial expressions (Bird, Press, & Richardson, 2011). Reduced fixations to the eye region were predicted by level of alexithymia.

It is an open question whether certain facets of the personality trait alexithymia are related to attentional disengagement with emotional material while viewing pictures. EOT is characterized by an utilitarian way of perception and thinking and reduced reflecting on conflicts and unpleasant feelings (Taylor & Bagby, 2000). One of the Toronto-Alexithymia-Scale items assessing EOT refers to these tendencies very concisely: "*I prefer to watch "light" entertainment shows rather than psychological dramas*" (Bagby, Parker, & Taylor, 1994). According to Grynberg, Luminet, Corneille, Grèzes and Berthoz (2010), especially EOT is (negatively) related to empathic concern, i.e., feelings of sympathy and concern for

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unfortunate others. It has been observed that there exist links between empathic concern and interest in others' distress since early childhood (Volling, Kolak, & Kennedy, 2009). High EOT individuals appear to be characterized by low interest in negative feelings of others.

The main objective of the present study was to explore for the first time patterns of deployment of attention as a function of alexithymia components in healthy persons by using eye-tracking technology. To this end, we administered a free viewing paradigm which allows to measure preferential attention deployment over a rather long time period. The experimental paradigm administered followed previous work of Sears, Newman, Ference, and Thomas (2011). Pictures consisting of four images belonging to different emotional categories (i.e., threatening, dysphoric, positive, and neutral) were presented. It was hypothesized, that EOT is linked to avoidance of negative images (i.e. threat-related and dysphoric stimuli). Thus, it was assumed that time spent viewing negative images is negatively associated with EOT. In our study, we controlled visual-perceptual intelligence of participants and assessed their negative affectivity because it has been found to be associated with alexithymia (Berthoz, Consoli, Perez-Diaz, & Jouvent, 1999; Honkalampi, Hintikka, Tanskanen, Lehtonen, & Viinamaki, 2000).

2. Methods

2.1. Participants

Ninety-nine healthy adults (62 women) with a mean age of 24 years (SD: 4) took part in the experiment. They were recruited via advertisements posted in the city center, including campus areas. Only participants with normal vision as tested with a Snellen eye chart were included. That is, they read, without any errors, print at least as small as in line 5 when standing 4 feet from the eye chart. Participants wearing eyeglasses or contact lenses were excluded due to possible calibration interferences during eye tracking recording. Furthermore, subjects with past or present mental disorders, neurological disorders and persons older than 35 or younger than 18 years were excluded. One participant was excluded from eye-tracking data analysis due to missing BDI data; datasets of two participants were excluded due to poor calibration. Therefore, the final sample consisted of 96 individuals (61 women). More than 90% of final participants had a high school diploma (n = 87). Participants received a fee for taking part in the experiment. The study was approved by the ethics committee of the University.

3. Measures

3.1. Self-report measures

The 20-Item Toronto Alexithymia Scale (TAS-20; German version: Bach, Bach, De Zwaan, Serim, & Böhmer, 1996) is a self-report scale developed to measure alexithymia. The TAS-20 differentiates between three facets of alexithymia: difficulties identifying feelings (DIF), difficulties describing feelings (DDF), and externally oriented thinking (EOT). Validation studies have revealed adequate convergent and discriminant validity, internal consistency, and reliability of the German version of the TAS-20 (Bach et al., 1996). In the present sample, mean scores for difficulties identifying feelings, difficulties describing feelings, externally oriented thinking, and the total scale were 13.39 (SD = 4.30), 11.39 (SD = 4.82), 16.77 (SD = 3.78), and 41.54 (SD = 10.01).

Depressive symptoms and trait anxiety were assessed by the German versions of the Beck Depression Inventory (BDI-II; Hautzinger, Keller, & Kühner, 2006) and the State-Trait Anxiety Inventory (STAI-Trait-version; Laux, Glanzmann, Schaffner, & Spielberger, 1981). In our sample, mean BDI score was 5.87 (SD = 4.67) and mean STAI-Trait score was 36.36 (SD = 8.78).

3.2. Intelligence assessment

The Matrix Reasoning subtest of the German version of the Wechsler Adult Intelligence Scale (WAIS-IV; Petermann, 2012) was administered to measure fluid intelligence and perceptual organization. The mean Matrix Reasoning (scaled) score was 9.77 (SD = 2.68). This average score of our sample corresponds to a percentile rank of 47.

3.3. Eye tracking experiment

3.3.1. Stimuli

A total of 80 color pictures were presented against a gray background, divided into 20 trials, each of them forming a 2 × 2 matrix of images of four emotional categories: anxiety-related, depression-related, positive, and neutral. Anxiety-related images involved themes of threat and injury (e.g., scenes of people being threatened with weapons, and threatening animals). Depression-related images included scenes of neglected animals and people appearing sad and unhappy (e.g., scenes of poverty). Positive images showed rabbits and kittens, and people smiling and laughing. Neutral images were selected to include pictures of neutral objects, landscapes, and people in various activities having no obvious positive or negative implications. Each of the four emotional categories appeared equally likely in each corner, which was implemented by a randomized assignment. To minimize color effects, images were chosen (from a total set of 160 pictures) and combined into slides if they had a similar color constellation. It is of central importance to present several pictures simultaneously to investigate preferential attention. Presenting multiple images on each trial, each with a different emotional content is necessary and allows looking for differences in attention to specific themes when multiple images compete for attention. Pictures were placed at our disposal by Christopher R. Sears (University of Calgary) and have undergone a categorization and evaluation procedure using two independent samples (see Sears et al. (2011) for details). Images have been rated by a separate group of healthy adults (N = 21) for valence on a scale from −5 (very negative) to +5 (very positive), with a midpoint of zero. The mean valence ratings for the positive, neutral, depression-related, and anxiety-related images were 2.92 (SD = 0.56), 0.11 (SD = 0.22), −3.08 (SD = 0.52), and −3.32 (SD = 0.42), respectively. Results from *t*-tests for dependent samples indicated that all comparisons between image categories showed significant valence differences (all $ps \leq 0.01$). Stimuli were presented on a 22-inch TFT widescreen monitor (resolution: 1680 × 1050) using Presentation software (version 16.5).

3.3.2. Apparatus

Eye tracking data were recorded using an iView X RED250 remote eye-tracking system by SensoMotoric Instruments (SMI), an infrared video-based eye-tracking device sampling eye movements every 4 ms (250 Hz) with a gaze position accuracy of 0.4°. Fixations were defined as stable gaze locations within a 1° radius of visual angle and a minimum duration of 100 ms. The SMI RED250 tracker is capable of compensating changes in head position, so that a head resting device was not required. A SMI-customized Dell laptop (iView X laptop) was used for stimulus presentation and data acquisition.