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Brief Communication

Theory of mind abilities in patients with psychogenic nonepileptic seizures

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ABSTRACT

Background: Psychogenic nonepileptic seizures (PNES) have been frequently linked to deficits in affect regulation and altered processing of emotionally salient information. However, less is known about how patients suffering from PNES actually process and interpret affective social stimuli. Thus, the present study aimed to investigate basal facial affect recognition as well as mind-reading skills in a sample of patients with PNES and matched control subjects.

Methods: Patients with PNES (N = 15) and healthy controls (N = 15) completed self-report questionnaires that measured alexithymia and perceived stress vulnerability. Affect perception was tested using a series of computerized movies of models whose facial expressions slowly change from neutral to full-blown emotions (anger, fear, sadness, happiness, disgust, and surprise), allowing for a fine-grained assessment of facial emotion recognition impairments. Further, all participants were presented with the Movie for the Assessment of Social Cognition, a well-validated video-based test for the evaluation of subtle mind-reading deficits.

Results: Data analyses revealed increased alexithymic traits and, impaired mentalizing skills in individuals with PNES, while basal facial expression recognition was not compromised.

Discussion: The present findings are the first to demonstrate that patients with PNES exhibit several deficits in reasoning about their own and other people's mental states. Patients with PNES may benefit from psychotherapeutic interventions that focus on disturbed affect regulation and aim to enhance emotional awareness.

1. Introduction

The pathogenesis of psychogenic nonepileptic seizures (PNES) has been frequently related to specific psychological factors and personality traits. Most of the patients suffering from PNES are diagnosed with additional psychopathological disturbances (e.g., somatoform, anxiety, and affective disorders) [1,2] exhibit inabilities in identifying and describing internal emotional experience (i.e., alexithymia) [3,4], emotional dysregulation [5,6], and profound social and interpersonal problems [7,8]. Individuals with PNES tend to report more stressful events and hassles in their daily lives [9] and are more likely to cope in ways that may increase emotional distress and interpersonal problems (i.e., emotion-focused instead of problem-focused coping) [10].

Disturbances in emotion perception and affect regulation as well as maladaptive coping strategies are thought to trigger seizure-like episodes in these patients [11,12]. However, most studies that investigated PNES-related alterations in these domains relied on self-report measures. Thus, although it is widely assumed that PNES experiences are strongly influenced or even mainly caused by socioemotional distress, less is known about how individuals with PNES actually process and interpret affective social information and how this (presumably inadequate) information processing can affect vulnerability towards their attacks.

An intact theory of mind (ToM), that is, the capacity to change perspectives in order to understand other people's volitional or emotional mental states, is a necessary prerequisite for the ability to appropriately interpret and respond to affective cues in social contexts. Theaory of Mind is assumed to comprise two separable components that can be associated with different developmental trajectories and depend on distinct underlying neuro-cognitive mechanisms: a perceptual component and a cognitive facet [13]. The social–perceptual aspect encompasses the capacity to quickly infer affective meaning on the basis of immediately available perceptual information from facial and body expressions. The social–cognitive component refers to higher-order abilities involved in reasoning about others' mental states by integrating contextual information about a person. Hence, both facets refer to

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different, although interconnected, abilities in the processing of mental state information. Socioemotional competence problems have been linked to impairments in either one or both components, depending on the underlying psychopathology [14,15].

To date, three experimental studies demonstrated an increased vigilance towards angry faces in individuals with PNES when compared to healthy matched control subjects [16–18], thereby providing first evidence for an altered processing of social threat cues. However, to our knowledge, there are no published studies that investigated social information processing skills in PNES more broadly. Thus, it remains unclear whether the recognition of negative social expressions other than anger (e.g., fearful or sad faces) is also facilitated in PNES. Further, and aside from these basal social–perceptive capacities, no previous study examined social–cognitive aspects in these patients using experimental approaches.

The present study, therefore, aimed to examine basal facial affect recognition as well as higher-order cognitive mind-reading skills to further investigate specific perceptual and cognitive biases in the processing of social affective information in a sample of patients suffering from PNES. Facial affect recognition was assessed by employing a morphing paradigm in which the participant determines the exact onset of an emotional expression in a series of computerized movies, depicting facial expressions that slowly change from neutral to full-blown emotions. Based on previous evidence which indicates threat vigilance in PNES, we expected to find increased sensitivity to negative social expressions in patients with PNES compared to healthy controls. Further, mind-reading abilities were tested using a well-validated video-based test that allows the separate quantification of the use of aberrant mentalizing strategies related to affective and cognitive social dimensions. In accordance with previous findings from studies that suggest increased alexithymia in PNES [3,4] and research that demonstrated strong associations between deficits in emotional self-awareness and impaired ToM [19], we hypothesized that individuals with PNES would exhibit diminished mind-reading skills.

2. Methods

2.1. Participants and procedure

The sample consisted of 15 patients diagnosed with PNES and 15 healthy controls matched for sex, age, and education level. Patients with PNES were consecutively recruited from the epilepsy center of the University Hospital of Tübingen by the attending neurologist. Inclusion criteria were as follows: i) diagnosis based on an ictal video/EEG recording of a typical seizure, ii) a frequency of at least 2 seizures in the year prior to the study, and iii) absence of history of epileptic seizures or a comorbid neurologic disease. Healthy controls with no history of psychopathology or neurological problems were recruited from the institute's participant database. The study was approved by the local ethics committee, and all participants provided written informed consent and received monetary compensation for participation.

2.2. Measures

2.2.1. Demographic and clinical measures

All participants completed a questionnaire that assessed demographic information. Current and lifetime psychopathology was assessed with the German version of the Mini International Neuropsychiatric Interview [20]. In addition, all participants completed the German version [21] of the 'Toronto Alexithymia Scale — 20' (TAS-20) to assess alexithymic traits on three subscales, that is, 'difficulties identifying feelings', 'difficulties describing feelings', and 'externally oriented thinking'. Further, the Perceived Stress Scale (PSS) was administered, a questionnaire that measures a person's evaluation of the stressfulness of the situations in the past month of their lives.

2.2.2. Animated morph task

Basal affect perception was assessed by presenting participants with an animated morphing paradigm [15,22,23]. Participants were instructed to determine the subjectively experienced onset of an emotion in a series of computerized movies, depicting facial expressions that slowly change from neutral to one of the six emotional expressions. Digitized color photographs of three male model identities depicting six affective states (angry, happy, fearful, sad, surprised, and disgusted) were selected from the Radboud Faces database [24] and served as stimulus material for the experimental trials. Neutral, disgusted, and surprised expressions of one additional male model were used for the two practice trials. Pictures were cropped to the standard size of 421 × 500 pixels using Adobe Photoshop CS4. The emotional expression was then parametrically varied using a morphing procedure (FantaMorph software, Abrosoft, Beijing, China), which produced a set of 51 intensity levels (2% increment steps) ranging from 0% (neutral) to 100% of the respective emotion for each model. The stimulus material consisted of a total of 18 sequences (3 model identities × 6 emotions).

The experiment was run on a 15.4′ WXGA wide TFT LCD notebook monitor, and stimuli (400 × 500 pixels) were presented at a viewing distance of about 50 cm at the center of the computer screen against a black background. During the task, each morphed image was presented for 500 ms, beginning with the neutral face that progressed successively into one of the six basic emotional expressions. Participants were instructed to press a button as soon as they were able to detect an emotional expression and to indicate which emotion they had identified. Given a correct response, the intensity of emotional expression at the time of the button press was averaged for every affective condition. The experiment consisted of 72 emotion sequences (three face models × six emotions × four repetitions) presented in random order. Stimulus presentation and data collection were controlled by Presentation Version 14.1 (Neurobehavioral Systems, Albany, CA, USA).

2.2.3. Movie for the Assessment of Social Cognition (MASC)

Mind-reading skills were assessed using the MASC [25], a video-based task revolving around a narrative in which four characters meet for a dinner party. The narrative consists of 45 sequences each lasting between a few seconds to about 1 min which are interrupted by a break. The video is then stopped, and the participant has to indicate what a target person might feel, think, or intend in that given sequence. Participants are provided with four answer alternatives (forced-choice task) and are asked to log their answer via a button press. The questions refer to complex mental states and allow for a detection of subtle mind-reading difficulties [25]. Incorrect responses can be organized into two error categories: (1) 'undermentalizing', which corresponds to errors reflecting either a complete lack of a theory of mind (ToM) or insufficient mental state inferences, and (2) 'overmentalizing', which reflects that mental state inferences are too excessive [26]. Completion of the MASC takes approximately 30 min. Sum scores are calculated for each response category by administering a scoring key provided by the authors.

2.3. Statistical analyses

Statistical analyses were performed using PASW Statistics 21 software for Windows (SPSS Inc., Chicago, IL, USA). Demographic and clinical variables were compared by *t*-tests for continuous variables. Group differences in averaged intensity levels and error rates across emotions in the animated morph task were analyzed with two separate repeated measures analyses of variance (ANOVAs) and followed by post hoc *t*-test analyses in order to examine possible group differences in the perception of specific facial emotions. Differences in error categories between groups in the MASC were analyzed using a multivariate ANOVA and followed by post hoc univariate ANOVAs. Pearson's correlation coefficients were calculated to investigate a possible relationship between participants' performance in experimental paradigms and self-report measures.