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Implicit attentional bias for facial emotion in dissociative seizures: Additional evidence

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ABSTRACT

This study sought to extend knowledge about the previously reported preconscious attentional bias (AB) for facial emotion in patients with dissociative seizures (DS) by exploring whether the finding could be replicated, while controlling for concurrent anxiety, depression, and potentially relevant cognitive impairments. Patients diagnosed with DS (n = 38) were compared with healthy controls (n = 43) on a pictorial emotional Stroop test, in which backwardly masked emotional faces (angry, happy, neutral) were processed implicitly. The group with DS displayed a significantly greater AB to facial emotion relative to controls; however, the bias was not specific to negative or positive emotions. The group effect could not be explained by performance on standardized cognitive tests or self-reported depression/anxiety. The study provides additional evidence of a disproportionate and automatic allocation of attention to facial affect in patients with DS, including both positive and negative facial expressions. Such a tendency could act as a predisposing factor for developing DS initially, or may contribute to triggering individuals' seizures on an ongoing basis. Psychological interventions such as Cognitive Behavioral Therapy (CBT) or AB modification might be suitable approaches to target this bias in clinical practice.

1. Introduction

Dissociative seizures (DS) are also known as psychogenic, nonepileptic, or conversion seizures, and are classified as dissociative [1] and functional neurological symptom [2] disorders in International Statistical Classification of Diseases and Related Health Problems -10th revision (ICD-10) and The Diagnostic and Statistical Manual of Mental Disorders - Fifth Edition (DSM–5), respectively. The estimated prevalence of the disorder is approximately 2–33 per 100,000 [3]. Diagnosis is typically made in early adulthood, although the disorder occurs across the lifespan [4–6]. Females are known to be overrepresented [7]. Symptoms of DS differ considerably from case to case, but the events often superficially resemble epileptic seizures (ES), including pronounced alterations in awareness, sensation/perception, and volition. The DS are diagnosed on the basis of exclusion of clear organic causation (e.g., epilepsy, syncope, transient ischaemic attacks, hypoglycemia), with the diagnostic 'gold standard' being a video-recorded typical seizure in the absence of associated epileptogenic abnormalities in electroencephalogram (EEG) output (video-EEG) [8].

Patients with DS generally report a lack of voluntary control over seizure occurrence, with many being unable to identify specific and consistent environmental or internal antecedents to the attacks [9,10]. Nonetheless, stress is known to be a common precipitant [11]. Abnormal responses to emotional distress or bodily arousal have been hypothesized to contribute to DS occurrence, in at least a proportion of cases [12–14]. Affective manifestations and dissociative experiences during seizures are reported frequently [15–17], alongside more general elevations in psychological and somatoform dissociation [13,17–20]. Trauma, abuse, stress, and family dysfunction are common risk factors [17,21–24].

Heightened scores on measures of a range of affect-related variables have been observed commonly in this group, including alexithymia [25–28], emotional dysregulation [17,28–33], anxiety [15,17,25,27,28,34,35], and depression [17,19,25,27,28,34,36]. Additionally, a limited number of experimental studies have indicated abnormalities in emotional processing in patients with DS, most commonly in responses to facial affect. Findings include impaired switching from a facial emotion categorization task [31], exaggerated interference by facial emotion on working memory performance [37], and reduced explicit recognition and attenuated autonomic responses to facial expressions relative to controls [38]. The first experimental study of this nature [39] reported

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an increased attentional bias (AB) toward angry faces in patients with DS ($n = 19$) compared with healthy controls ($n = 20$) ($p < 0.05$), on an emotional Stroop test involving preconscious processing of affectively valenced facial stimuli. This AB correlated positively with patients' reports of sexual abuse ($p < 0.05$) and basal cortisol levels ($p < 0.05$) [39,40]. This was an important finding, as implicit ABs toward affective stimuli, particularly those of a negative or distressing nature, could increase overall levels of emotional arousal and distress in this patient group. Nevertheless, this possible implicit AB requires further investigation and replication, before being incorporated into theoretical models and/or clinical interventions for DS.

An issue to consider when interpreting studies of this nature in this population, is the extent to which the observed AB is specific to this disorder, or whether it is related to the other comorbid psychological symptoms (e.g., anxiety and depression), commonly observed in this group. There is a good evidence base to indicate, for example, that people with symptoms of anxiety show increased allocation of attention to threat-related stimuli [41,42] and individuals with depression display altered attentional allocation to negatively valenced stimuli [43]; thus, controlling for or exploring the influence of these symptoms would facilitate interpretation of findings in this area. Furthermore, patients with DS often exhibit subtle neurocognitive abnormalities [27,30,44]; therefore, it is also necessary to account for general intellectual functioning and cognitive abilities relevant to task performance (e.g., facial perception).

The current study aimed to replicate and extend Bakvis et al.'s findings [39] by examining implicit (preconscious) facial emotion processing in a larger sample of patients with DS, and to examine the influence of anxiety, depression, and relevant cognitive abilities. The group with DS included in the current study had also completed a test of explicit (conscious) facial expression recognition, in which reduced emotion recognition and autonomic responses have been observed [38]. In the present experiment, behavioral performance on a pictorial emotional Stroop test was compared between the group with DS and healthy controls. Anxiety and depression were measured with a validated self-report measure, and relevant cognitive abilities were assessed with standardized neuropsychological tests. It was predicted that patients with DS would display greater implicit AB for facial emotion compared with the control group, and that this bias would not be explained by diminished cognitive performance or elevated anxiety and depression. It was expected that the AB would be most pronounced for angry facial expressions.

2. Method

The study received ethical approval from the Joint South London and Maudsley and Institute of Psychiatry National Health Service (NHS) Research Ethics Committee (reference 08/H0807/82). Participants provided written informed consent prior to taking part. The study was part of a larger investigation of emotional processes in patients with DS, in which patients completed several other tasks, self-report measures, and cognitive assessments.

2.1. Participants

Patients with DS were recruited from two specialist neuropsychiatry clinics at the South London and Maudsley NHS Foundation Trust, UK. Diagnosis was determined on the basis of video-EEG, or consensus opinion of two neurologists, or a neurologist and a neuropsychiatrist. Control participants were recruited through websites and the distribution of fliers in the local community. All participants were between 18 and 65 years old, English-speakers, and had no documented evidence of intellectual disability.

Participants with documented diagnoses of current major depression, anxiety, substance dependence, psychosis, or major neurological disorder (including epilepsy, suspected or confirmed) were excluded from both groups. The assessment of the presence of these diagnoses in the DS sample was based on medical records, neuropsychiatric assessment (JM or other consultant neuropsychiatrist), or referral documentation from other clinicians (e.g., epileptologists). The presence of these diagnoses in healthy controls was based on self-report. Patients with DS were recruited prior to having commenced psychological treatment for DS.

2.2. Emotional Stroop task

The facial stimuli were pictures of models displaying angry, happy, and neutral facial expressions from the 'Pictures of Facial Affect' [45]. The faces were cropped digitally, and colored in a transparent shade of red, yellow, or green, allowing the facial expressions and features to remain clearly visible. The faces were backwardly masked by neutral patterns, consisting of several high-contrast concentric ovals in red, green, or yellow, presented on a black background. Examples of the stimuli can be found in Supplementary file 1. There were 30 facial stimuli in total, comprising 10 examples each of happy, angry, and neutral expressions. All 30 of the facial stimuli were presented three times within the experiment, each presented once in red, yellow, and green, yielding a total of 90 experimental trials. The 90 trials were presented in a different pseudo-randomized order for each participant, with no more than two stimuli of the same color or expression presented consecutively.

The task began with nine practice trials. These consisted of a 750 ms presentation of a fixation cross, directly followed by a neutral pattern stimulus. Participants were requested to say aloud the color in which the pattern was displayed as quickly as possible, with response onset registered with a voice key device. On registration of the verbal response, the pattern disappeared. The interstimulus interval (ISI) was fixed at 2 s, during which the screen was blank.

The experimental trials were identical to the practice trials, with the addition of individual facial stimuli presented for 17 ms, immediately after the fixation cross and prior to the masking (pattern) stimuli. This was the quickest refresh rate of the integrated laptop monitor used in the experiment; therefore, this was the minimum possible presentation time for the facial stimuli. Previous research has suggested that this is within the range (1–33 ms) that typically precludes conscious awareness of stimuli [46,47]. The face and masking stimuli on each trial were presented in the same color. Participants were required to name aloud the color of the masking stimulus as quickly as possible. The ISI varied between 2 and 4 s.

2.3. Awareness check

An objective awareness check was carried out after participants had completed the experimental task. The task involved a forced-choice procedure of 30 trials (identical to the experimental trials), in which participants were explicitly required to select which facial expression had been shown on each trial, from three choices (happiness, anger, neutral).

2.4. Cognitive measures

The two subscale version of the Wechsler Abbreviated Scale of Intelligence (WASI) [48] was used to assess general intellectual functioning. A standard version of the Stroop test [49] was administered to assess basic executive functioning (response inhibition/attention/processing speed). Furthermore, the Benton Facial Recognition Test [50] measured basic perceptual processing of facial stimuli.

2.5. Self-reported psychological symptoms

The Hospital Anxiety and Depression Scale (HADS) [51] measured self-reported current (nonsomatic) symptoms of anxiety and

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