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## In action or inaction? Social approach–avoidance tendencies in major depression



Sina Radke<sup>a,b,\*</sup>, Franziska Güths<sup>b</sup>, Julia A. André<sup>c</sup>, Bernhard W. Müller<sup>d</sup>,  
Ellen R.A. de Bruijn<sup>e</sup>

<sup>a</sup> Uniklinik RWTH Aachen, Department of Psychiatry, Psychotherapy and Psychosomatics and JARA - Translational Brain Medicine, Aachen, Germany

<sup>b</sup> Radboud University Nijmegen, Donders Institute for Brain, Cognition and Behaviour, The Netherlands

<sup>c</sup> University of Maastricht, Department of Clinical Science and Cognitive Neuroscience, The Netherlands

<sup>d</sup> Clinic for Psychiatry and Psychotherapy, University of Duisburg-Essen, Germany

<sup>e</sup> Leiden University, Institute of Psychology, Department of Clinical, Health and Neuropsychology and Leiden Institute for Brain and Cognition, Leiden, The Netherlands

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### ABSTRACT

In depression, approach deficits often impair everyday social functioning, but empirical findings on performance-based measurements of approach–avoidance behavior remain conflicting. To investigate action tendencies in patients with depression, the current study used an explicit version of the Approach–Avoidance Task (AAT). In this task, participants responded to emotional faces by either pulling a joystick toward (approach) or pushing it away from themselves (avoid). Reaction times to happy and angry expressions with direct and averted gaze were assessed in 30 patients with major depressive disorder and 20 matched healthy controls. In contrast to healthy individuals, depressed patients did not show approach–avoidance tendencies, i.e., there was no dominant behavioral tendency and they reacted to happy and angry expressions likewise. These results indicate that behavioral adjustments to different emotional expressions, gaze directions or motivational demands were lacking in depression. Crucially, this distinguishes depressed patients not only from healthy individuals, but also from other clinical populations that demonstrate aberrant approach–avoidance tendencies, e.g., patients with social anxiety or psychopathy. As responding flexibly to different social signals is integral to social interactions, the absence of any social motivational tendencies seems maladaptive, but may also provide opportunities for modifying action tendencies in a therapeutic context.

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### 1. Introduction

Individuals with depression often suffer from approach deficits, evident, for instance, in anhedonia, reduced energy and social withdrawal. Aberrant approach and avoidance processes may contribute to depression by decreasing reinforcing experiences, along with increasing social isolation (Trew, 2011), thereby likely impeding social functioning. Social adaptive behavior may be guided by facial expressions that communicate emotional and motivational states. Emotional expressions also elicit approach and avoidance tendencies not only in everyday life, but in experimental settings as well (Roelofs et al., 2010).

In the Approach–Avoidance Task (AAT; Rotteveel and Phaf, 2004; Roelofs et al., 2010), for example, participants have to react to facial expressions by pulling a joystick towards (approach) or pushing it away from their body (avoidance). Action tendencies are quantified by means of reaction time (RT) differences between push and pull movements. When explicitly categorizing the emotional expression, healthy individuals typically show an approach tendency in response to positive social cues (faster pull reactions to happy faces), and an avoidance tendency, i.e., faster push reactions in response to negatively valenced (angry) faces. The initiation and manifestation of approach–avoidance tendencies have been attributed to the explicit evaluation of stimulus valence (Rotteveel and Phaf, 2004). In contrast, implicit task variants that require reactions to emotion-irrelevant stimulus properties (color/gender) are assumed to measure action tendencies indirectly and to capture more automatic aspects of behavior (Heuer et al., 2007). As implicit versions often do not evoke response tendencies (Derntl et al., 2011; Volman et al., 2011) and

\* Corresponding author at: Uniklinik RWTH Aachen, Department of Psychiatry, Psychotherapy and Psychosomatics, Pauwelsstr. 30, 52074 Aachen, Germany.  
Tel.: +49 241 80 89459; fax: +49 241 80 82422.

E-mail address: [sradke@ukaachen.de](mailto:sradke@ukaachen.de) (S. Radke).

are therefore sometimes used as control tasks (Volman et al., 2011), certain task features appear to be essential for eliciting behavioral effects, such as attentional demands and zooming. Here, the movement of the joystick causes stimuli to increase (pull movement) or decrease (push movement) in size, creating the impression of moving towards or moving away from oneself (Heuer et al., 2007; Roelofs et al., 2010).

Interestingly, social motivational impairments, subclinical symptoms and clinical diagnoses are mirrored in performance on the AAT. Stronger avoidance responses to both happy and angry stimuli were evident in socially anxious individuals (Heuer et al., 2007; Roelofs et al., 2010), whereas incarcerated psychopathic offenders displayed reduced avoidance of angry faces (Von Borries, et al., 2012). In patients with depression, the processing bias for negative affective information (for reviews see Leppanen (2006); Stuhmann et al. (2011)) does not directly map onto altered action tendencies, at least when assessed with an implicit AAT. Whereas patients showed a pronounced avoidance tendency of angry faces in one study (Seidel et al., 2010), this inclination was absent in the neuroimaging follow-up (Derntl et al., 2011) as well as in both healthy control groups. However, when explicitly asked to rate their approach–avoidance tendencies, depressed patients reported less overall approach. The authors assumed that along with dysfunctional behavioral tendencies, more controlled, explicit processes in interpersonal approach–avoidance behavior are impaired in depression. However, given the distinction between explicit and implicit task variants, this hypothesis remains to be investigated.

The current study therefore used an explicit, zooming version of the AAT to investigate approach–avoidance tendencies in depressed patients. In addition, the direction of eye gaze was manipulated for exploration of potential differential effects and for comparison with populations associated with altered interpersonal behavior (Roelofs et al., 2010; Von Borries et al., 2012). Direct gaze is a strong imperative that initiates an interaction by putting the recipient in the position to react (Adams and Kleck, 2005), whereas averted gaze does not incorporate motivational affordances. Along these lines, we expected more pronounced action tendencies for emotional faces with direct gaze. Depressed patients are likely to show a decreased approach tendency for happy faces, in line with their approach deficits and reduced amygdala responses during approach of happy faces in a previous study (Derntl et al., 2011). For angry faces, based on Seidel et al. (2010), increased avoidance might be expected. Yet, impairments in flexibility and adaptational difficulties in tasks requiring the processing of relevant emotional stimuli are common in depression as well (Murphy et al., 2012; Chechko et al., 2013). In the context of socioemotional stimuli as used in the current study, such a reduced adaptation to different social demands would entail a lack of differentiation between emotional expressions. Consequently, and in contrast to healthy individuals, patients with depression might not show any approach–avoidance biases in an explicit version of the AAT where both the evaluation of emotional valence and behavioral adjustments are central.

## 2. Methods

### 2.1. Participants

Thirty patients of the LVR Clinic, Essen, Germany were matched with 20 healthy volunteers on age and educational level (see Table 1 for group characteristics). The study was approved by the local ethics committee of the University Duisburg-Essen, registered in the German Clinical Trials Register (DRKS0003563) and in accordance with the Declaration of Helsinki. All participants received written information about the experiment and gave written informed consent.

**Table 1**

Sociodemographic and clinical characteristics of study participants (presented as N or mean [S.D.], otherwise indicated).

	HC (N=20)	MDD (N=30)	p-value
<b>Profile</b>			
Age in years	44.5 (12.5)	46.6 (11.3)	0.54
Sex (M/F)	11/9	12/18	0.30
Education	16.5 (4.3)	14.8 (2.9)	0.12
BDI	4.4 (4.1)	27.0 (11.5)	< 0.001
<b>Comorbidities</b>			
Specific phobia (writing; heights)		2	
Agoraphobia		1	
Posttraumatic stress disorder		1	
<b>Medication</b>			
Exclusively antidepressants		22	
Antidepressants and antipsychotics		2	
Exclusively antipsychotics		3	
No medication	20	3	

Note: HC=healthy controls, MDD=depressed patients, M=male, F=female, BDI=Beck Depression Inventory.

Groups were derived based on the German version of the Structured Clinical Interview (Wittchen et al., 1997). All patients were diagnosed with a major depressive disorder without psychotic symptoms during past or current episodes (MDD, recurrent episode; 296.1(0-3), 296.3(0-3)) in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR; American Psychiatric Association, 2000) and had been taking the same prescribed medication (if any) for the past two weeks. Exclusion criteria were an IQ below 70, neurological disorders, substance dependence, and social anxiety disorder. Severity of affective symptoms was assessed with the German version of the Beck Depression Inventory (BDI; Hautzinger et al., 2006).

### 2.2. Materials and data preparation

Pictures of three facial expressions (happy, angry, neutral; with direct and averted gaze) displayed by eight actors (four male, four female) were taken from several databases (Ekman and Friesen, 1976; Lundqvist et al., 1998) and presented in black and white.

The AAT was self-paced and consisted of six blocks with 64 trials per block. Within each block, pictures of two emotional expressions were depicted (half of which with direct gaze) and participants responded by means of a joystick (Logitech Attack 3) with pull movements (approach) to one emotion and with push movements (avoid) to the other. Preceding each block, written instructions on the stimulus-response mapping were presented (e.g., "If the face looks happy, push the joystick away from you. If the face looks angry, pull the joystick towards you") and 16 practice trials were completed. Block order and response direction were counterbalanced.

At the start of each trial, a black screen was shown. Participants pressed the fire button on the joystick to initiate stimulus presentation, subsequently responded to the emotional expression and returned the joystick to the resting position before the next trial. Pull and push movements of the joystick caused the stimuli to shrink or grow before disappearing when the minimum, respectively maximum size was reached. The time between stimulus onset and the maximum joystick displacement (30°) was used for all analyses.

After excluding erroneous responses (3%) and RTs < 150 ms, median RTs were calculated for each level of the three experimental factors (Emotion, Gaze, Movement). Subtracting individual median RTs for pull movements from individual medians RTs for push movements provided effect-scores, i.e., individual dominant behavioral tendencies. Negative effect-scores reflect a stronger avoidance tendency, while positive effect-scores denote a stronger approach tendency (Heuer et al., 2007; Roelofs et al., 2010).

Subsequent to the AAT, participants rated the emotional intensity of each picture as 'angry' and 'happy' on a 10-point Likert scale. Averages were calculated for all analyses.

## 3. Results

### 3.1. AAT: RTs

Following previous AAT analyses focusing on emotional expressions (Volman et al., 2011; Radke et al., 2013), RTs were subjected to a mixed model ANOVA with Emotion (happy, angry), Movement (approach, avoid) and Gaze (direct, averted) as within-subject

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