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Cognitive and affective empathy in depression linked to executive control

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ABSTRACT

Depression has been linked to executive dysfunction and emotion recognition impairments, associated with abnormalities in fronto-temporal and subcortical brain regions. Little is known about changes of different empathy subcomponents during depression, with potential impairments being related to the interpersonal difficulties of depressed patients. Twenty patients treated for an episode of unipolar depression and 20 matched healthy controls were assessed. Measures of dispositional and behavioural empathy components were administered along with tests of cognitive flexibility, response inhibition and working memory. Relative to controls, depressed patients showed higher self-reported dispositional empathy scores, mainly driven by increased personal distress scores. Patients and controls did not differ significantly in terms of behavioural cognitive empathy, empathic concern and personal affective involvement or in their executive function performance. In the patients, cognitive flexibility and response inhibition accuracy were associated with behavioural empathy. While an increased disposition towards feeling personal distress in response to other people's suffering seems to be in generally related to depressive symptoms, behavioural empathy might depend on the functional integrity of executive control during an episode of clinical depression. Impairments in this regard could contribute to the interpersonal difficulties depressed patients are frequently faced with which might have important implications for treatment.

1. Introduction

Depressive disorders have been associated with impairments of cognition and affect processing. Among the cognitive domains that are typically affected, deficits in attentional functions, executive control, verbal learning and memory are particularly prominent (see Marazziti et al., 2010). In terms of affect processing, there seems to be a bias to attend to and preferentially remember negative information as well as to favour negative over positive and neutral interpretations during depressive episodes (see Disner et al., 2011). For instance, patients with depression tend to interpret positive, neutral or ambiguous facial expressions as more sad or less happy than healthy controls (Bourke et al., 2010). By the same token, the recognition of affective prosody seems to be skewed towards negative emotions during depression, with the impairment being related to executive dysfunction (Uekermann et al., 2008a; Peron et al., 2011). Distinct neuropsychological mechanisms seem to underlie the attention, memory and interpretation biases in depression (Disner et al., 2011) and the different types of biases may be differentially affected by specific treatment strategies (Hallion and Ruscio, 2011).

In recent years, higher-order processing of socially relevant information has come into focus for depression researchers. Patients suffering from depression have been reported to show poor "Theory of Mind" (ToM), i.e. a reduced ability to infer other peoples' mental states (wishes, beliefs, intentions etc.) (Lee et al., 2005; Szily and Keri, 2009). This problem appears to persist even after remission of acute symptoms (Inoue et al., 2004), and to represent a major risk factor for relapse (Inoue et al., 2006). Depression-related ToM impairment becomes particularly evident when an integration of contextual knowledge about the target person's overall situation is required, which is described as "mental reasoning", in contrast to pure "mental state decoding", which may be spared in depression (Wolkenstein et al., 2011). The ToM deficits of patients with depression are at least in part attributable to executive dysfunction (Uekermann et al., 2008b; Zobel et al., 2010). From a neurobiological perspective, the altered cognitive and affective processing of patients suffering from depression has been associated with disruption of fronto-temporal and fronto-subcortical networks (Clark et al., 2009).

Changes in higher-order social cognition may have important implications for interpersonal relationships. In their review of this issue, Tse and Bond (2004) concluded that depressed patients show poor social skills, which are partly attributable to impaired perception and understanding of social signals and to an inability to act appropriately upon them. For instance, it has been shown that

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depressed mothers are less responsive to their new-born babies' crying. In turn, these children seem to show diminished responsiveness to emotional faces and voices in comparison with babies of non-depressed mothers (Field et al., 2009). Most probably, not only poor emotion recognition and/ or deficient ToM abilities of the depressed mothers, but also difficulties in empathizing with their children, might explain the findings of this study.

Currently, little is known about how the ability to empathize with others might change in the course of depression. Empathy is thought of as a multifaceted construct which involves at least three components (e.g. Decety and Jackson, 2004): 1) *a cognitive component* facilitating the understanding of other people's emotional states including the reasons for why they might be feeling in a particular way, 2) *an affective component* relying on intact emotion recognition abilities and facilitating affective sharing of other people's emotional states, and 3) a mechanism allowing for the maintenance of *self/other distinction* during empathizing. The latter component might rely on top-down executive mechanisms which allow for the down regulation and/or enhancement of the empathic response (e.g. feeling empathic concern) depending on contextual factors (Singer and Lamm, 2009). Failure to maintain the distinction between one's own and another person's feelings while empathizing with his/her suffering may contribute to reduced empathic concern, increased personal distress and ultimately reduce other-oriented helping behaviour (Batson, 1991).

In the only study based on a multicomponent view on empathy in depression we are aware of, O'Connor et al. (2002) found an association between the depressive symptom severity in depressed inpatients and the tendency to experience personal distress as a response to other people's suffering. However, this study relied only on one self-report measure of empathy and only established correlational associations between empathy and depressive symptoms. Although a healthy control group was assessed, this was a student population that was not matched to the patient group on relevant demographic characteristics as age, IQ and education.

In the current study, we aimed to elucidate whether patients suffering from depression differ from matched healthy controls on cognitive and affective (empathic concern and personal distress) empathy components. Two lines of evidence suggest that empathy might be impaired in depression: Firstly, impairments of other domains of basic and higher-order socioemotional processing and disrupted interpersonal interactions have been observed both in acute and remitted patients with depression. Secondly, the prefrontal cortex, the anterior cingulate, the temporal cortex and the amygdalae, which show changes in depression (Clark et al., 2009), have also been identified as neural correlates of cognitive and affective empathy components (Singer and Lamm, 2009). Thirdly, loss of interest in others possibly also pointing to respective cognitive malfunction is part of a key symptom in the definition of clinical depression, often lamented by patients and relatives alike. Both self-report and behavioural measures of cognitive and affective empathy were used in our study. Based on previous findings, we hypothesized that in depressed individuals specific empathy features might be related to depression severity and that the ability to empathize with other people's emotional states might depend on the valence of these emotional states (see negativity bias). Furthermore, we aimed to investigate the relationship between empathy and executive function in depressed individuals. As outlined above, deficient executive control has been shown to contribute to ToM impairments in depression and might exert a regulative effect on empathic responding (Singer and Lamm, 2009). We hypothesized that cognitive flexibility, response inhibition and working memory in particular might be significantly associated with empathy, which requires flexible shifting between one's own and other people's perspectives, inhibition of one's own emotional state and online processing of multiple information streams.

2. Methods

2.1. Participants

Twenty-one patients (DEP group), who were treated in the Department of Psychiatry, LWL Hospital, Ruhr-University Bochum either on an inpatient basis ($n=18$) or by attending the hospital's day care unit ($n=3$), were initially recruited for participation. All patients were diagnosed with a moderate ($n=12$) or severe ($n=9$) episode of unipolar depression according to ICD-10 F32/F33.1-2 criteria (Dilling et al., 2000) by senior psychiatrists who were blind to the cognitive data and well-trained in the application of diagnostic criteria in a research context. That way, good diagnostic reliability could be ensured in spite of the fact that a standard clinical interview could not be carried out on top of the already quite comprehensive assessment. Patients were excluded if they presented with a comorbid psychiatric or neurological disorder and if they had undergone electroconvulsive therapy in the past. On that basis, one patient with a severe depressive episode was excluded from further analyses because of probable alcohol abuse in the past year. All of the remaining patients were medicated with antidepressants at the time of testing. Four patients were treated with a selective serotonine reuptake inhibitor (SSRI: escitaloprame), five with a selective serotonine and noradrenaline reuptake inhibitor (SSNRI: venlafaxine or mirtazapine), two with agomelatine and one with a tricyclic antidepressant (opipramole). Two patients were medicated with atypical neuroleptic medication (seroquel) in combination with a SSNRI (plus diazepam in one case), two with a tricyclic antidepressant plus a SSRI or a SSNRI and lorazepam and one patient with lithium plus SSNRI. Three further patients received anxiolytic medication (lorazepam or promethazine) combined with a SSRI ($n=1$) or with a SSNRI ($n=2$).

Twenty-one healthy controls (HC group) were initially recruited as control participants and matched on age, gender and IQ to the DEP group. A present or past psychiatric/neurological disorder, current treatment with psychotropic medication or a family history positive for depression led to exclusion from study participation.

All participants were screened with a brief informal interview carried out by a trained member of the research team. The interview assessed the participants' demographic data, medical history and current health status with a particular focus on substance use (alcohol, illicit drugs) and on health problems that might impair cognitive performance. The interviews followed an established procedure for neuropsychological research protocols developed in our laboratory. In the HC group, psychiatric illness and other exclusion criteria were also ruled out on the basis of that interview. In the patient group, additional relevant clinical data (e.g. the number of previous hospitalizations etc.) were gathered during this screening, completing and confirming the information available from chart review and clinical caregivers.

All participants had to score above 80 on the estimate of general intellectual abilities (see below). The severity of depressive symptoms was estimated with the German version of the Beck Depression Inventory (Beck et al., 1995). This self-report questionnaire comprises 21 statements relating to different symptoms of depression. Participants are required to rate their agreement with the four answer options per question, in general representing an increasing degree of symptom severity. Multiple answers per item are allowed. For controls, a BDI score of 11 or above was chosen as a conservative cut-off score, as proposed by Gallagher et al. (1983). On that basis, one control participant with a BDI score of 11 had to be excluded from further analyses. BDI scores ranged between zero and nine in the HC group and between 15 and 49 in the DEP group.

Overall, the results from 20 participants in each of the two groups (DEP and HC) entered the final analyses. Table 1 presents the demographic and clinical characteristics of the DEP and the HC group, including the relevant statistics. The groups did not differ significantly in terms of the relevant demographic variables (all $P\geq 0.356$), but depressive symptoms were more severe in the patient group.

The study protocol was approved by the local Ethics board and observed the ethical guidelines laid down in the current version of the Declaration of Helsinki (2008). All participants gave written informed consent prior to participation.

Table 1
Demographic and clinical variables for the patients suffering from a depressive episode (DEP) and healthy controls (HC). Standard deviations are presented in brackets.

	DEP	HC	*t*	d.f.	*P*
General data					
N	20	20			
Age (years)	44.65 (8.86)	42.35 (11.03)	−0.727	38	0.472
Sex (M:F)	7:13	8:12	$\chi^2=0.107$	1	0.744
IQ estimate	102.40 (7.03)	104.28 (8.58)	0.723	34	0.474
Education (years)	10.50 (1.32)	10.95 (1.70)	0.935	38	0.356
Clinical data					
1st admission (age)	42.75 (8.25)				
No. of psychiatric admissions	1.35 (0.75)				
Length of current admission (days)	26.30 (30.67)				
BDI score	27.10 (10.15)	4.30 (2.74)	−9.699	38	<0.001

2.2. Assessment battery

2.2.1. General intellectual abilities

An estimate of general intellectual abilities was obtained using two subtests from a short German version (Dahl, 1972) of the "Wechsler Adult Intelligence Scale—Revised" (Wechsler, 1981). In the "Similarities" subtest, participants are asked to name the superordinate concept or common attribute for 11 pairs of nouns (e.g. "animal" for the pair "dog–lion"). In the "Picture Completion" subtest, naming the relevant detail missing for each of 15 pictures (e.g. the eyebrow of a woman) is required. IQ estimates were derived based on age-corrected norms provided in the manual as the average of the two subtest IQs.

2.2.2. Measures of empathy

2.2.2.1. Dispositional empathy. A German abbreviated variant (Paulus, 2007) of the Interpersonal Reactivity Index (Davis, 1983) was used for the assessment of dispositional empathy. The questionnaire consists of four subscales, each comprising four items. The "fantasy" scale assesses the tendency to imaginatively transpose oneself into fictitious situations e.g. when reading books or watching movies, while the "perspective taking" scale assesses the ability to adopt other people's point of view in everyday life. The "fantasy" and "perspective taking" subscales can be thought of as an assessment of cognitive empathy traits, while "empathic concern" and "personal distress", on the other hand, measure affective empathy (see e.g. Shamay-Tsoory and Aharon-Peretz, 2007). The items of the "empathic concern" subscale reflect the tendency to feel compassion and concern for unfortunate others. The "personal distress" scale, on the other hand, measures the degree to which one tends to experience discomfort in response to other people's suffering. Participants are asked to rate their agreement or disagreement with each item on a bipolar five-point rating scale ranging from "Does not describe me well" to "Describes me well". The summed scores per scale represented the dependent variables for this task.

2.2.2.2. Behavioural empathy. The "Multifaceted Empathy Test" (MET) (see Dziobek et al., 2008 for an extensive description of a related version) represents a behavioural empathy measure. A series of photographs (20 with a positive and 20 with a negative emotional valence) depicting people in emotionally charged situations is presented using Microsoft Power Point Presentation software. Cognitive empathy is assessed by asking participants to choose out of four adjectives the one that describes best the emotional state of the person presented in each photograph. A library of emotional adjectives accompanying the test can be consulted by participants at any time to make sure that a lack of familiarity with a specific mental state descriptor does not interfere with choosing the correct answer. Each correct answer scores one point. Additionally, the test comprises two measures of affective empathy, an explicit and an implicit one. In the explicit condition, which can be thought of as an assessment of empathic concern, participants are asked to rate how strongly they feel for the person presented in the photograph on a bipolar nine-point rating scale ranging from "not at all" to "very strongly". The implicit condition can roughly be viewed as an assessment of personal distress (which would only apply to the negative pictures) or, more generally, as an assessment of the degree of personal affective involvement with the emotional state of the person depicted in the photograph. In this condition, participants are asked to rate on the same nine-point rating scale as above, how strongly they feel aroused in response to the presented photograph. Each of the 40 photographs is presented once in each of the three conditions, yielding 120 trials in total. Blocks of 10 subsequently presented pictures always involve the same condition/question type ("How does the person feel?", "How strongly do you feel for the person?" or "How aroused do you feel by this picture?"), but the order of the pictures within the conditions is pseudorandomized.

No time constraints are enforced on the viewing of the stimuli and/or responding to them. On average, the completion of the MET takes 35 min. The Power Point Presentation contains all instructions, examples, questions and stimuli and advancing of the slides is controlled manually by the experimenter, while participants give their responses verbally.

For the cognitive empathy condition, the number of correct responses, computed separately for positive and negative pictures served as the dependent variable. The summed rating scores, also computed separately for positive and negative photographs, represented the dependent variables for the empathic concern and personal affective involvement subscales.

2.2.3. Measures of executive function

2.2.3.1. Cognitive flexibility. A paper-and-pencil version of the Trail Making Test (TMT) (Reitan, 1992) was used to assess cognitive flexibility. In the TMT A, participants have to connect a series of numbers from 1 to 25 (TMT A) which are randomly printed on a sheet of paper, in ascending order. In the second part (TMT B), participants have to alternately connect numbers (1 to 13) and letters (A to L), again in ascending order. Inflexibility costs were defined as the RT difference between the two subtests (TMT B–TMT A).

2.2.3.2. Response inhibition. A German card version of the Colour-Word-Interference Task (CWIT) (Bäumler, 1985) was used to assess response inhibition. Participants are instructed to a) read out colour names printed in black ink, b) name the colours of coloured bars and c) name the ink colour of printed colour names (ignoring the names), with the ink colour and the colour word interfering with one another. Two versions of each subtest were completed. The dependent variables were the average RTs in the three subtests as well as the number of corrected and uncorrected errors in the interference condition. "Inhibition cost" was assessed as RT difference between the interference and naming conditions.

2.2.3.3. Working memory. The Letter–Number-Sequencing (LNS) subtest from the most recent version of the German adaptation of the Wechsler Intelligence Scale (Horn et al., 2006) was used as a measure of working memory performance. Letter–number strings (e.g. T–9–A–3) of variable length are read out by the experimenter and participants are instructed to first repeat the numbers in ascending order followed by the letters in ascending order. The item load per string increases from two (one number, one letter) to a maximum of eight (four numbers, four letters). The next three trials always involve the same item load before item load is increased by one in the next step. If a participant fails on all three trials with the same item load, task administration is aborted. The number of correctly reproduced sequences served as the dependent variable.

2.2.4. Assessment procedure and statistical analyses

Completion of all tasks took between 60 and 90 min in total. If necessary, patients were offered the opportunity to complete the assessment in two separate sessions to minimize fatigue.

Statistical analyses were carried out using PASW statistics software (Version 18). Group differences were analysed by means of t-tests or repeated-measures ANOVAs, where appropriate. Significant interactions were resolved by post-hoc paired t-tests and by applying a Bonferroni correction for the number of t-tests to the accepted significance level. In the cases of identical sample sizes, as in our study, parametric tests yield robust results, even if the homogeneity of variance or normal distribution assumptions are violated (Howell, 2001). Differences in gender distributions were analyzed using the Chi-Square Test. To investigate the relationship between empathy and executive function performance, Pearson correlations were computed.

3. Results

3.1. Empathy measures

3.1.1. Dispositional empathy

The descriptive data for the brief German version of the Interpersonal Reactivity Index are presented in Fig. 1. A repeated-measures ANOVA was performed involving GROUP (DEP vs. HC) as between-subjects factor and EMPATHY COMPONENT (fantasy, perspective taking, empathic concern, personal distress) as within-subjects factor. There was a significant main effect of GROUP ($F(1,38)=5.498$, $P=0.024$), reflecting overall significantly higher IRI scores for the DEP relative to the HC group, a significant main effect of EMPATHY COMPONENT ($F(3,114)=29.791$, $P<0.001$) and a significant GROUP × EMPATHY COMPONENT interaction ($F(3,114)=3.263$, $P=0.024$). The significant main effect of EMPATHY COMPONENT was analysed further with paired post-hoc t-tests computed in the overall sample comprising all participants and applying a Bonferroni correction for the number of tests

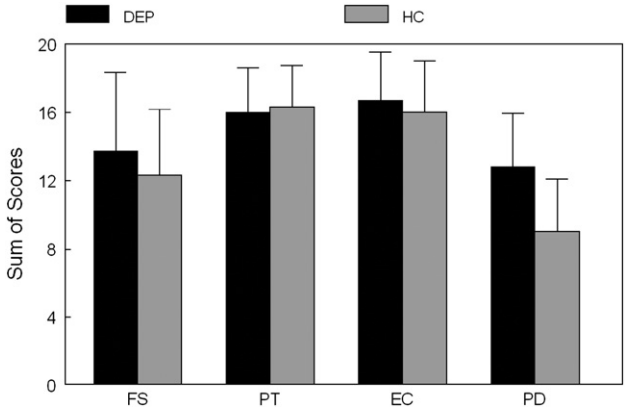

Fig. 1. Self-rated empathy scores on the four scales (FS: Fantasy, PT: Perspective Taking, EC: Empathic Concern, PD: Personal Distress) of the brief German version (Paulus, 2007) of the Interpersonal Reactivity Index for the depressed patients group (DEP) and healthy controls (HC). Error bars represent standard deviations.

computed to the significance level (0.05/6 = 0.008). Both fantasy and personal distress scores were overall lower than perspective taking and empathic concern scores (all $P<0.001$). No further comparisons reached the corrected significance level (all $P\geq0.017$). The significant GROUP × EMPATHY COMPONENT interaction was analysed further by comparing the DEP and the HC groups separately on the four IRI subscales using independent t-tests and applying a corrected significance level of 0.05/4 = 0.013. DEP patients scored higher on the personal distress subscale than the HC group ($t(38)=-3.879$; $P<0.001$), but did not differ significantly from controls on the other subscales (all $P\geq0.288$).

3.1.2. Behavioural empathy

The descriptive data for the performance on the MET are reported in Table 2. Repeated-measures ANOVAs were computed separately for cognitive empathy, empathic concern and personal affective involvement. GROUP (DEP vs. HC) and VALENCE of the depicted material (positive vs. negative) were considered as factors in each analysis. In the analysis of cognitive empathy, there was a significant main effect of VALENCE ($F(1,38)=13.968$, $P=0.001$) reflecting overall better recognition of positive relative to negative emotional states, but no significant GROUP effects or GROUP × VALENCE interactions (both $P\geq0.608$). For empathic concern, the analysis also yielded a significant main effect of VALENCE ($F(1,38)=33.921$, $P<0.001$) reflecting higher empathic concern for negative relative to positive emotional states, but no significant GROUP effects nor a significant GROUP x VALENCE interaction (both $P\geq0.556$). Similarly, the analysis of personal involvement scores revealed a significant main effect of VALENCE ($F(1,38)=30.577$, $P<0.001$), indicating higher personal involvement with negative relative to positive emotional states, and no significant GROUP effect nor an interaction (both $P\geq0.484$).

3.2. Executive measures

The results for the executive function measures including detailed statistics are presented in Table 3. DEP and HC groups did not differ significantly on any of the cognitive flexibility, response inhibition or working memory measures (all $P\geq0.078$).

3.3. Correlations

Pearson correlations were computed between the relevant empathy measures (IRI subscales/ total MET scores for cognitive empathy, empathic concern and personal involvement, summed across valences), executive performance measures (TMT inflexibility costs/ CWIT inhibition costs, CWIT corrected and uncorrected errors/ LNS working memory score) and BDI symptom scores. At first, correlational analyses were carried out in the sample as a whole, and, in a second step, only in the patient group.

Table 2
Average performance of the depressive patients (DEP) and the healthy controls (HC) in the Multifaceted Empathy Test (MET). Standard deviations are presented in brackets.

	DEP	HC
Cognitive empathy		
Positive valence	12.50 (2.50)	12.95 (1.85)
Negative valence	11.10 (3.02)	11.10 (2.71)
Empathic concern (affective empathy, explicit)		
Positive valence	104.35 (42.42)	95.95 (36.88)
Negative valence	121.60 (34.74)	116.95 (29.76)
Personal affective involvement (affective empathy, implicit)		
Positive valence	90.55 (45.39)	82.65 (34.34)
Negative valence	114.70 (39.46)	106.45 (34.34)

Note: MET (Dziobek et al., 2008).

Table 3
Average performance of the depressive patients (DEP) and the healthy controls (HC) in the executive tasks. Standard deviations are presented in brackets.

	DEP	HC	*t*	d.f.	*P*
Cognitive flexibility					
TMT: B-A conditions (sec.)	62.41 (46.39)	39.94 (28.05)	−1.854	38	0.078
Response inhibition					
CWIT: interference-naming conditions (sec.)	29.49 (9.82)	35.42 (15.11)	1.472	38	0.149
CWIT: number of corrected interference errors	1.00 (1.41)	1.40 (1.54)	0.857	38	0.397
CWIT: number of uncorrected interference errors	2.70 (2.23)	3.15 (1.81)	0.701	38	0.488
Working memory					
LNS: number of correctly reproduced sequences	10.15 (1.95)	10.55 (2.37)	0.582	38	0.564

Abbreviations: TMT: Trail Making Test (Reitan, 1992); CWIT: Colour-Word-Interference Test (Bäumler, 1985), LNS: Letter–Number-Sequencing (Horn et al., 2006).

In the overall sample comprising all participants, the severity of depressive symptoms, as assessed with the BDI, correlated significantly with IRI personal distress scores ($r=0.596$, $P<0.001$). MET cognitive empathy scores were significantly related to TMT inflexibility costs ($r=-0.467$, $P=0.002$) and the LNS working memory score ($r=0.330$, $P=0.037$). There were no further significant correlations (all $P\geq0.117$). In the patient sample alone, the correlation between the severity of depressive symptoms, as assessed by the BDI, and the IRI personal distress score no longer reached significance ($P=0.118$). However, MET cognitive empathy was still significantly correlated with TMT inflexibility costs ($r=-0.505$, $P=0.023$) and the LNS working memory score ($r=0.642$, $P=0.002$). Additionally, CWIT corrected errors were significantly correlated with both MET empathic concern ($r=0.500$, $P=0.025$) and MET personal affective involvement ($r=0.640$, $P=0.002$). All other correlations failed to reach significance (all $P\geq0.074$). BDI symptom severity was also not related to executive performance (all $P\geq0.719$).

4. Discussion

The present study aimed to investigate whether patients suffering from an acute moderate to severe depressive episode differed from healthy controls in terms of dispositional and behavioural empathy components. Secondly, our aim was to elucidate the relationship between empathy and executive function subcomponents in the patient group.

Depressed patients scored overall higher on dispositional empathy than healthy controls, which was mainly driven by increased personal distress scores. In the overall group comprising all participants, personal distress was positively associated with current severity of depressive symptoms. Inflexibility costs and working memory performance were significantly related to behavioural cognitive empathy in both the overall sample and in the patient group alone, while inhibition accuracy was significantly associated with behavioural measures of empathic concern and personal affective involvement only in the patient group.

Although limited power due to relatively small sample sizes calls for a cautious interpretation of non-significant results in the current study, the fact that the patients did not show any behavioural impairments, neither on the empathy nor on the executive function measures, might also be attributable to the relatively high general functioning of the sample. As can be inferred from Table 1, the patients seem to have experienced their first depressive episode later in life, most were receiving psychiatric hospital care for the first time and three patients were stable enough to receive only day care treatment. All of these parameters have been associated with good outcomes (Hamilton and Dobson, 2002). Psychiatric hospitalization

usually reflects a rather high initial problem severity, but potentially patients were already partly in remission. The above features speak in favour of choosing those patients against more chronic cases which may not show the effects of "clinical depression", but other non-specific effects of chronic treatment. In this regard, it been recently shown that relative to healthy controls, chronically depressed patients showed significantly poorer performance on cartoon picture ToM tests, but that after controlling for logical and working memory impairments, ToM performance no longer predicted patient status (Zobel et al., 2010). In future studies, it would be interesting to investigate whether potential compensatory brain mechanisms might lead to preserved empathy in high-functioning depressed patients.

A further relevant point relates to the specific features of the behavioural empathy task we used. Most of the pictures in this task represent isolated depictions of people, providing only minimal context information about the general situation these people are in. It is possible that affective empathic reactions that go beyond a purely cognitive decoding of the other person's emotional state are triggered more efficiently if more context information is available. Wolkenstein et al. (2011) showed that integrating contextual knowledge about other people when engaging in ToM mental state reasoning is particularly difficult for individuals suffering from unipolar depression. On the other hand, evidence from previous research suggests that impairments of cognitive empathy/ToM manifests itself more clearly in non-verbal tasks, as shown e.g. in patients suffering from multiple sclerosis (Banati et al., 2010) and in healthy older participants (Phillips et al., 2002). The availability of more context information in the verbal tests was interpreted as an aid for mental state attribution.

The significant correlation between BDI and self-reported personal distress, which emerged in the overall sample, and was also reported earlier by O'Connor et al. (2002), suggests that the tendency to be personally affected by other people's misfortune might contribute to depression proneness. Additionally, significant associations were observed between executive function and behavioural empathy. The nature of the correlational relationships fits well within the overall theoretical framework: While engaging in empathic perspective taking, depressed patients might benefit from overall good cognitive flexibility and working memory. On the other hand, poor response inhibition accuracy might also be associated with a disinhibition of feelings of caring for and personal affective responsivity to another person's emotional situation. It has been shown in other studies that disinhibition of the self-perspective may mediate changes of socio-emotional functioning in late adulthood (Bailey and Henry, 2008) and in Alzheimer 's Disease (Nash et al., 2007). Interestingly, in our study, the association between inhibition accuracy and empathic concern/personal affective involvement only emerged in the patient group and not in the overall sample and thus might be specific to depression.

Although, in the MET, cognitive empathy performance was overall better for positive emotions and empathic concern as well as personal affective involvement ratings were higher for negative emotions, these effects were not specific to the patients with depression. Thus, in our study, we could not find any evidence of a negativity bias. This is in line with recent findings suggesting that the presence of a negativity bias in emotion recognition may vary in the course of recovery from depression and may be abolished once patients receive antidepressant treatment (Anderson et al., 2011).

A possible confound in our study may lie in the fact that all patients were medicated, four of them with sedatives, which might lower the responsivity to other people's feelings. Diazepam, for instance, has been shown to impair facial emotion recognition in healthy volunteers (Coupland et al., 2003). Excluding the five patients medicated with sedatives moves the group difference in the analysis of MET affective empathy further towards significance ($p = 0.111$), in the sense that the patient group shows a trend for higher scores for both empathic concern and personal affective involvement relative to controls.

5. Conclusions

An increased disposition towards feeling personal distress in response to the emotional situation of other people appears to be related to clinical depression. On the other hand, the behavioural correlates of cognitive and affective empathy during a depressive episode might depend on the integrity of cognitive flexibility and response inhibition subcomponents of executive control. It is possible that this relationship is partially specific for depressive disorders; however, further research is warranted in this regard. Future studies should elucidate further the nature of empathy impairments in patients presenting with different degrees of depression severity and also with distinct clinical forms of depressive disorders (e.g. bipolar vs. unipolar depression).

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