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# Measuring empathy in schizophrenia: The Empathic Accuracy Task and its correlation with other empathy measures

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ABSTRACT

*Introduction:* Empathy is an interpersonal process impaired in schizophrenia. Past studies have mainly used questionnaires or performance-based tasks with static cues to measure cognitive and affective empathy. We used the Empathic Accuracy Task (EAT) designed to capture dynamic aspects of empathy by using videoclips in which perceivers continuously judge emotionally charged stories. We compared individuals with schizophrenia with a healthy comparison group and assessed correlations among EAT and three other commonly used empathy measures.
*Method:* Patients (n = 92) and a healthy comparison group (n = 42) matched for age, gender and education completed the EAT, the Interpersonal Reactivity Index, Questionnaire of Cognitive and Affective Empathy and Faux Pas. Differences between groups were analyzed and correlations were calculated between empathy measurement instruments.
*Results:* The groups differed in EAT performance, with the comparison group outperforming patients. A moderating effect was found for emotional expressivity of the target: while both patients and the comparison group scored low when judging targets with low expressivity, the comparison group performed better than patients with more expressive targets. Though there were also group differences on the empathy questionnaires, EAT performance did not correlate with questionnaire scores.
*Conclusions:* Individuals with schizophrenia benefit less from the emotional expressivity of other people than the comparison group, which contributes to their impaired empathic accuracy. The lack of correlation between the EAT and the questionnaires suggests a distinction between self-report empathy and actual empathy performance. To explore empathic difficulties in real life, it is important to use instruments that take the interpersonal perspective into account.



## 1. Introduction

Empathy is commonly defined as the ability to share and understand the emotional states of others (Eisenberg and Miller, 1987; Elliott et al., 2011). It is an interpersonal phenomenon, based on the interaction between the person who is empathizing and the person whose affective state is being shared or inferred (Zaki et al., 2008). This process involves the detection and perception of multimodal social cues that are dynamic and rapidly changing (Zaki and Ochsner, 2009).

Most studies on empathy differentiate between two aspects: affective and cognitive empathy (Michaels et al., 2014; Horan et al., 2015) which are integrated while being experienced (Ofir-Eyal et al., 2014). Affective empathy is hypothesized to be based on shared circuits in the brain: when seeing other people feel something, the same areas in the brain are activated as when feeling something yourself (Keyser and Gazzola, 2006). This makes it possible to empathize with others

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in an intuitive, unconscious manner. Cognitive empathy is a more conscious form of empathy and can be seen as the ability to explicitly interpret the thoughts and feelings of others (Blair, 2005; Frith and Frith, 2008).

Research has shown that both affective (Bonfils et al., 2016) and cognitive aspects (Sparks et al., 2010; Smith et al., 2012; Savla et al., 2013) of empathy are impaired in people with schizophrenia and deficits in empathy are associated with poor social functioning (Smith et al., 2012; Michaels et al., 2014; Abramowitz et al., 2014) in this group.

This has most commonly been measured using self-rating questionnaires. One widely used instrument is the Interpersonal Reactivity Index (IRI; Davis, 1983) with two subscales considered to measure cognitive empathy and two subscales measuring affective empathy. A more recently developed and potentially more valid (Michaels et al., 2014; Horan et al., 2015) instrument, the Questionnaire of Cognitive and Affective Empathy (QCAE; Reniers et al., 2011), was developed from items of several existing self-report measures whose structure and validity was validated in healthy individuals as well as schizophrenia patients (Horan et al., 2015). In addition to the self-report questionnaires, performance-based tasks have been developed and used to measure empathy, for example the Reading the Mind in the Eyes Task (RMET; Baron-Cohen et al., 2001) and the Faux Pas Task (Stone et al., 1998; Baron-Cohen et al., 1999).

It has been argued that these measurement instruments do not capture the dynamic process of empathy very well. Empathy appears to center around an ongoing interaction between the perceiver and the person whose affective state is being shared, not a momentary judgement by the perceiver alone (Zaki and Ochsner, 2009). Therefore it is debatable if measurement instruments with static cues such as a picture of a set of eyes (e.g., RMET), let alone questionnaires, can fully capture complex real-life empathy.

Instruments that try to account for this problem are for example the PEERS (Performance of Empathic Expression Rating Scale; Gagen et al., 2017) and the EAT (Empathic Accuracy Task; Aan het Rot and Hogenelst, 2014; Zaki et al., 2008). The PEERS uses role-play to measure empathy while the EAT measures empathy by asking participants ('perceivers') to continuously rate emotionally charged autobiographical stories described by 'targets' and presented in video clips; the extent to which a perceiver's rating of a target's emotions matches the target's rating of their own emotions is transformed into an empathic accuracy score for each perceiver/target combination.

As empathy not only depends on the perceiver but also on the characteristics of the target, the EAT allows for the assessment of the role of characteristics of the target, such as gender and expressivity as well as the valence of the story.

A first study using the EAT in a group of 30 patients with schizophrenia found an impairment in empathic accuracy in patients in comparison to a group of 22 healthy controls. Patients benefited less from the expressiveness of the targets than controls (Lee et al., 2011). This study found no significant correlation between the EAT and the IRI in patients, indicating a distinction between empathic accuracy and self-judgement of empathy. This distinction between objective and subjective measures of empathy was confirmed by Horan et al. (2015), who found no correlation between EAT vs IRI and EAT vs QCAE.

The aims of the present study were 1) to assess dynamic empathy by using the EAT in schizophrenia patients in replication of Lee et al. (2011), but in a larger sample and using the Dutch version of the EAT (Aan het Rot and Hogenelst, 2014); 2) to assess the moderating role of the target's gender and expressivity and the valence of the story on EAT performance and 3) to assess the correlation between EAT scores and scores on two commonly used empathy measurement instruments namely the IRI and the QCAE (in replication of Lee et al., 2011 and Horan et al., 2015) and the Faux Pas Task.

## 2. Methods

### 2.1. Participants

Ninety-three people with a diagnosis of schizophrenia or schizoaffective disorder according to DSM IV criteria (American Psychiatric Association, 2000) were included (for demographics see Table 1). Part of this group was recruited from a randomized controlled trial to investigate the effect of a new metacognitive therapy (n = 70) (Van Donkersgoed et al., 2014). Participants in this trial had to demonstrate impaired metacognition for inclusion, which was determined with four screening questions concerning metacognition. Participants who did not meet this inclusion criterion were approached and included in the current study as well (n = 23). All patients were recruited from six mental health care institutions in the Netherlands (GGZ Friesland, GGZ Drenthe, University Medical Centre Groningen, Lentis, Yulius, and Dimence). Exclusion criteria were: a current psychotic episode (PANSS positive symptoms average > 4), IQ < 70, age < 18, not being able to give informed consent, medication change in the 30 days prior to assessment and comorbid neurological disorder. Diagnosis was confirmed using the Mini International Neuropsychiatric Interview (M.I.N.I.; Sheehan et al., 1998).

The comparison group consisted of 41 people who reported they had never received a psychiatric diagnosis. They were recruited by advertisements on social media and with posters in the local area.

### 2.2. Instruments

#### 2.2.1. General measures

*2.2.1.1. Positive and Negative Syndrome Scale (PANSS; Kay et al., 1987).* To assess symptoms, this structured interview consisting of thirty items was conducted by raters who had attended a 2-day training course at the local hospital. Participants would only receive a certificate when the group reached an interrater reliability of 0.80.

The items fall into three subscales: positive symptoms (Cronbach's alpha $\alpha = 0.72$), negative symptoms ($\alpha = 0.77$) and general symptoms ($\alpha = 0.80$) and were rated on a scale from one to seven. The Cronbach's alpha for the total scale was 0.88.

*2.2.1.2. M.I.N.I. Plus (Sheehan et al., 1998).* Diagnosis according to the DSM-IV-TR criteria was confirmed with this structured interview. The interview is divided into 26 sections; each section concerns a diagnostic category. For this assessment we used the sections on psychotic disorders, depression and bipolar disorder and substance abuse.

#### 2.2.2. General cognition

*2.2.2.1. Dutch Adult Reading Test (DART; Schmand et al., 1991).* The DART tests the pronunciation of irregularly spelled words and is used to determine premorbid intelligence.

*2.2.2.2. Trailmaking Test A&B (TMT; Reitan and Wolfson, 1985).* The TMT provides information on visual search, scanning, mental flexibility speed of processing and executive functions. It is part of the Halstead–Reitan Battery. The TMT consists of two parts. Part A requires an individual to draw lines sequentially connecting 25 encircled numbers distributed on a sheet of paper. Task requirements are similar for Part B except the person must alternate between numbers and letters (e.g., 1, A, 2, B, 3, C, etc.). The final score is determined by subtracting the time to complete task A from the time it took to complete task B, with higher scores indicating lower cognition (Tombaugh, 2004).

*2.2.2.3. Digit Symbol Test (part of the Wechsler Adult Intelligence Scale; Wechsler, 1995).* This test evaluates the recognition and recoding of visual information. The test consists of several rows of paired boxes

**Table 1**
Demographic variables.

| Variable | Patients (n = 93) | Comparison group (n = 41) | $X^2$/t |
|---|---|---|---|
| Gender (% male) | 67 | 78 | $X^2 = 5.69$ (p = 0.06) |
| Handedness (% right) | 88 | 93 | $X^2 = 0.62$ (p = 0.43) |
| Level of education mean (sd) | 4.77 (1.31) | 5.22 (0.94) | $X^2 = 9.57$ (p = 0.14)[b] |
| Age in years mean (sd) | 41 (11) | 41 (13) | t = 0.09 (p = 0.93) |
| Diagnosis schizophrenia | 64 | | |
| Schizoaffective disorder | 29 | | |

| Variable | *Mean, sd (min–max)* |
|---|---|
| Number of hospital admissions | 3, 2.5 (0−12) |
| Illness duration in years | 13, 9.7 (0–38) |
| Age first psychosis | 24, 8.5 (12–52) |
| Number of psychotic episodes | 3, 3.5 (1−20) |
| PANSS Total | 62.96 (30−102)[a] |
| PANSS Positive | 15.11 (7–31) |
| PANSS Negative | 15.80 (7–29) |
| PANSS General | 32.82 (16–56) |

[a] Corresponds with a Clinical Global Impression (CGI; Guy, 1976) of moderately ill (Leucht et al., 2005).
[b] df = 5.

with a digit in the top box and an empty space in the box below. At the top of the page is shown which symbols are paired to the digits. The participant has to fill in as many symbols in the empty boxes within 90 s.

#### 2.2.3. Empathy measures

*2.2.3.1. Empathic Accuracy Task (EAT).* To measure empathic accuracy we used a Dutch version of the EAT developed by Zaki et al. (2008). This instrument is considered to measure cognitive empathy. A shorter version than the original Dutch task (described by Aan het Rot and Hogenelst, 2014) was used, this was necessary to keep the total assessment battery under 2 h. The original task was shortened by selecting four out of the twenty original videos. Participants were required to continuously rate the valence (positive-negative) of the videos in which a target tells a personal story, using a turning device. In line with previous EAT studies, ratings of the participants are linked to the target's own ratings using Pearson correlations, leading to an index of empathic accuracy. Level of expressivity of the targets is based on their score on the Berkeley Expressivity Questionnaire (BEQ; Gross et al., 1995), a self-report questionnaire.

*2.2.3.2. Interpersonal Reactivity Index (IRI; Davis, 1983).* The IRI is a questionnaire intended to measure self-reported empathy and consists of 28 statements. The participant has to indicate whether the statement applies to him/her on a six point Likert scale. The four subscales of the IRI are Perspective Taking ($\alpha = 0.54$), Fantasy ($\alpha = 0.63$), (together commonly labelled the Cognitive Empathy Scale), Empathic Concern ($\alpha = 0.45$) and Personal Distress ($\alpha = 0.75$) (Affective Empathy), with higher scores indicating greater self-reported empathy. The Cronbach's alpha for the total scale was 0.75.

*2.2.3.3. Questionnaire of Cognitive and Affective Empathy (QCAE; Reniers et al., 2011).* This self-report questionnaire was recently developed to measure cognitive and affective empathy using 31 items on a four point Likert-scale, with higher scores indicating greater self-reported empathy. The questionnaire consists of five scales: Perspective Taking and Online Simulation (Cognitive Empathy, $\alpha = 0.82$) and Emotion Contagion, Proximal Responsivity and Peripheral Responsivity (Affective Empathy, $\alpha = 0.79$). The development of this questionnaire was based on factor analysis of items from other well-known empathy questionnaires. The QCAE includes six items that also appear on the IRI. The Cronbach's alpha for the total QCAE was 0.83.

### 2.3. Procedure

Both patients and the comparison group gave their written informed consent for the use of their data for research before the assessment took place. Approval for the assessment of the patients was given by the local medical ethical committee (number METc2013.124 and METc2014.279) and for the comparison group by the ethical committee of Psychology at the University of Groningen (ECP research code: ppo-013-109). Assessments were conducted by trained assessors with at least a BSc. in Psychology. Patients were assessed with the MINI Plus to confirm diagnosis and the PANSS interview to assess symptoms. Both patients and the comparison group completed the DART, TMT and DST, the IRI and QCAE and were assessed with the Faux Pas and the EAT (see Instruments).

### 2.4. Analysis

Scores on the three measures of cognition were highly intercorrelated ($p < 0.01$, see Table S1 and S2 of the Supplement) and were therefore combined using Z-scores, into one measurement for general cognition. First the Z-score of each the three measurements was obtained by distracting the sample mean of the individual scores and dividing the outcomes with the standard deviation of the sample. Then the Z-scores of the three instruments where added and divided by three to get the final Z-score.

Differences between groups on general cognition were assessed using a *t*-test. The EAT data were analyzed using multilevel models and the maximum likelihood method with perceiver and target added as random effects. EAT scores were originally computed using correlations between perceiver and target ratings but transformed to Fisher *z* scores prior to analysis. Cohen's d values were computed as an indicator of effect sizes for main effects. The first model tested for overall group differences between patients and the comparison group (group = level 2 predictor). Subsequent models examined whether the valence of the videos, the gender of the target, and/or the expressivity of the target (all level 1 predictors) moderated the main result.

Independent-samples *t*-tests with a two-tailed significance level of $p < 0.05$ were performed to assess the differences between groups on the other empathy measures. Scores on the subscales of the QCAE were combined into an Affective subscale (Emotion Contagion + Proximal Responsivity + Peripheral Responsivity) and a Cognitive Subscale (Perspective Taking + Online Simulation). As most previous studies do not collapse the subscales of the IRI into one subscale for Cognitive Empathy and Affective Empathy (Michaels et al., 2014; Reniers et al., 2011) we

decided to look at the subscales independently. Mann-Whitney tests ($p < 0.05$ two-tailed) were performed to examine the differences on not normally distributed scales.

Pearson correlations were calculated between the person-level mean EAT scores and the other empathy instruments scores.

## 3. Results

### 3.1. Demographics and general cognition

No differences were found between patients and the comparison group on the demographic variables (see Table 1).

Scores on the three measures of general cognition (DART, TMT and DST, see instruments) were available for 88 patients and 18 people in the comparison group. The three measures correlated highly ($p < 0.01$, see Tables S1 and S2 of the Supplement) and were therefore combined into one cognition measure, using Z-scores. First the Z-score of each the three measurements was obtained by distracting the sample mean of the individual scores and dividing the outcome with the standard deviation of the sample. Then the Z-scores of the three instruments where added and then divided in three. Differences between groups were significant ($t = 2.74$; $p = 0.0072$). Differences in empathic accuracy between participants with and without cognition scores were not significant (healthy group: $F = 0.53$, $p = 0.47$; patient group: $F = 3.89$, $p = 0.06$).

### 3.2. Empathic Accuracy Task

The mean Fisher Z transformed EA score for patients was 0.83 (SD = 0.72, min = −1.60, max = 1.98) and for the comparison group the mean Fisher Z transformed EA score was 1.16 (SD = 0.51, min = −0.23, max = 2.22). The mean correlation across all participants was 0.38 with a range from −1.00 to 1.00. The mean correlations for patients and controls were 0.34 and 0.52, respectively. The overall difference between the two groups, analyzed using Fisher z scores rather than correlations (see Section 2.4) was significant, $F(1,114) = 7.71$, $p = 0.006$ $d = 0.52$.

A second multilevel analysis was performed to examine clip valence as a potential moderator. The main effect of group was still significant ($F(1,114) = 5.83$, $p = 0.02$, $d = 0.45$). The main effect of valence was also significant ($F(1,112) = 188.00$, $p = 0.001$, $d = 2.59$) and revealed that positive video clips were easier to rate (mean correlation: 0.69) than negative clips (mean correlation: 0.17). However, the interaction between group and valence was not significant ($F(1,112) = 0,13$, $p = 0.72$) indicating that the observed group difference was not moderated or confounded by the valence of the videos.

A third multilevel analysis was performed to examine target gender of the target as a potential moderator. A main effect for group was still found ($F(1,114) = 7.78$, $p = 0.007$, $d = 0.52$). There was no significant effect for gender ($F(1,113) = 0.38$, $p = 0.54$, $d = 0.12$). Moreover, as the interaction between group and gender was also not significant ($F(1,113) = 0.45$, $p = 0.50$), group difference were not moderated by the gender of the target.

A final multilevel analysis was performed to enter target expressivity as a potential moderator. Again, the main effect for group remained significant, $F(1,114) = 4.61$, $p = 0.03$, $d = 0.40$. Significant effects for Expressivity, $F(1,385) = 120.58$, $p = 0.0001$, $d = 1.12$, and the group by expressivity interaction, $F(1,385) = 7.23$, $p = 0.008$, were found as well. Follow-up testing revealed that the group difference in empathic accuracy was not significant for targets with lower expressivity ($t(385) = -0.16$, $p = 0.87$, $d = 0.02$). The group difference was significant for videos of targets with higher expressivity ($t(385) = 3.71$, $p = 0.0002$, $d = 0.38$) with patients scoring lower on empathic accuracy than the comparison group (see Fig. 1).

In summary, patients were found to have lower empathic accuracy than controls. This group difference was specifically found for video clips that were relatively easy for controls, but apparently remained hard for patients.

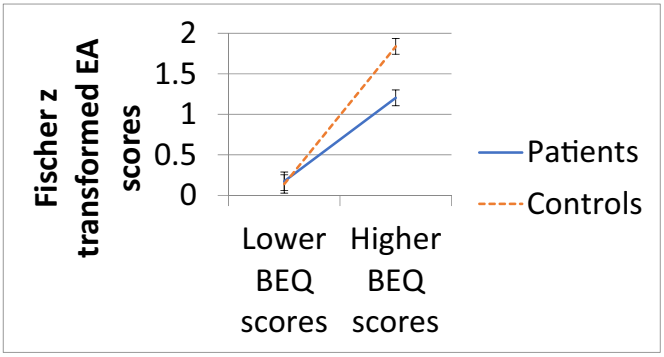


**Fig. 1.** Comparison of the mean Fisher z transformed EA scores for the lower and higher scoring targets on the Berkeley Expressive Scale (BEQ) in patients vs comparison group.

### 3.3. Differences between groups on IRI, QCAE and Faux Pas

Regarding the IRI, differences between groups were found for the Personal Distress scale ($t = -5.20$, $p = 0.0001$), with the patient group outperforming the comparison group. No significant differences were found between groups on the Fantasy, Empathic Concern and Perspective Taking subscales (see Table 2).

No significant group difference was found for Total QCAE or QCAE Affective Empathy. However a difference was found for the Cognitive Empathy Scale, primarily due to a difference on the Perspective Taking (PT) scale ($t = 2.41$, $p = 0.02$); there was no significant difference on the Online Simulation scale ($t = 1.00$, $p = 0.32$). Patients scored lower (mean 28.28, sd 5.38) than the comparison group (mean 30.4, sd 4.03) on PT.

No significant differences between groups were found on the Faux Pas Cognitive or Affective Scales.

### 3.4. Correlations among empathy measures

The EAT did not significantly correlate with the cognitive or affective subscales of the IRI and the QCAE as shown in Table 3. All subscales of the IRI and QCAE correlated with each other with two exceptions: the IRI subscales Personal Distress and Empathic Concern (considered to be Affective Empathy measures) did not correlate significantly with

**Table 2**
Differences between groups on empathy.

| Variable | Comparison group (n = 41) | Patients (n = 93) | *t-Statistic* |
|---|---|---|---|
| | *Mean* (*sd*) | *Mean* (*sd*) | |
| IRI Total | 55.32 (12.53) | 61.65 (13.83) | 2.51 ($p = 0.01$)[b] |
| IRI Perspective Taking | 16.90 (4.76) | 16.45 (4.86) | 0.50 ($p = 0.62$) |
| IRI Fantasy | 13.20 (5.51) | 13.81 (5.53) | 0.59 ($p = 0.56$) |
| IRI Empathic Concern | 16.61 (3.77) | 17.82 (4.52) | 1.50 ($p = 0.14$) |
| IRI Personal Distress | 8.61 (4.50) | 13.57 (5.33) | 5.20 ($p = 0.0001$)[b] |
| QCAE Total | 90.37 (9.47) | 87.85 (11.16) | 1.26 ($p = 0.21$) |
| QCAE Cognitive empathy | 57.79 (6.93) | 54.78 (8.42) | 2.00 ($p = 0.05$)[a] |
| QCAE Affective empathy | 32.59 (4.78) | 33.06 (5.01) | −0.52 ($p = 0.61$) |
| Faux Pas Cognitive | 4.36 (0.76) | 4.01 (1.08) | −1.48 ($p = 0.14$) |
| Faux Pas Affective | 2.31 (1.26) | 2.26 (1.65) | −0.25 ($p = 0.81$) |
| EAT score (mean across video clips) | 0.52 | 0.34 | 7.71 ($p = 0.007$)[b] |

IRI = Interpersonal Reactivity Index, QCAE = Questionnaire of Cognitive and Affective Empathy, EAT = Empathic Accuracy Task.
[a] Significant at 0.05 level.
[b] Significant at 0.01 level.

**Table 3**
Pearson correlations in patient sample between QCAE, IRI, EAT and Time Use.

| | QCAE-C | QCAE-A | IRI-PT (C) | IRI-F (C) | IRI-EC (A) | IRI-PD (A) | FP-C | FP-A | EAT |
|---|---|---|---|---|---|---|---|---|---|
| QCAE-C | 1 | 0.31[b] | −0.27[b] | 0.10 | −0.12 | 0.08 | 0.07 | −0.11 | 0.17 |
| QCAE-A | | 1 | −0.23[b] | −0.36[b] | −0.26[b] | −0.31[b] | 0.04 | 0.10 | −0.11 |
| IRI-PT (C) | | | 1 | 0.37 [b] | 0.56[b] | 0.33[b] | −0.12 | 0.08 | 0.01 |
| IRI-F (C) | | | | 1 | 0.36[b] | 0.43[b] | 0.12 | −0.09 | 0.16 |
| IRI-EC (A) | | | | | 1 | 0.46[b] | −0.07 | −0.02 | 0.09 |
| IRI-PD (A) | | | | | | 1 | 0.01 | −0.19[a] | 0.05 |
| EAT | | | | | | | | 0.18 | 1 |

QCAE-C = QCAE cognitive scale, QCAE-A = QCAE affective scale; IRI-PT = IRI Perspective Taking, IRI-F = IRI Fantasy, IRI-EC = IRI Empathic Concern, IRI-PD = IRI Personal Distress; EAT = Empathic Accuracy Task.
[a] $p < 0.05$.
[b] $p < 0.01$.

the QCAE cognitive scale. The Faux Pas cognitive and affective scale only correlated with each other.

## 4. Discussion

To capture empathy as a complex social process, involving dynamic cues in the interaction between perceiver and the person whose affective state is being shared (Zaki and Ochsner, 2009; Lee et al., 2011), we used the Dutch version of the Empathic Accuracy Task (EAT) in a large sample of schizophrenia patients. We compared EAT scores of patients to a healthy comparison group and assessed the correlation of the EAT with three other widely used empathy measurements.

Results indicate reduced overall empathic accuracy performance in patients in comparison to healthy individuals, indicating that findings of previous studies (Lee et al., 2011; Horan et al., 2015) hold cross-culturally. The valence of the stories or the gender of the target had no influence on this result, but the expressivity of the target did. With less expressive targets, the schizophrenia patients and the comparison group scored similarly low on empathic accuracy. In contrast, with more expressive targets, the comparison group performed better on empathic accuracy than the patients. Patients apparently benefit less from the expressiveness of more expressive persons. A previous study with a smaller participant group using the English version of the EAT found the same result (Lee et al., 2011).

Impairments in emotion recognition in people with schizophrenia can possibly explain this effect. Patients with schizophrenia experience problems in reading facial expressions (Kohler et al., 2010) and recognizing emotional prosody (Leitman et al., 2005; Petkova et al., 2014; Feingold et al., 2016). Healthy people benefit from explicit emotional cues in expressive persons and patients may miss these cues. They have less information to base their estimation of the emotional state of the other on, leading to mistakes in social judgement and poorer social functioning. This is supported by recent studies of Karpouzian et al. (2016, 2017), in which 'high functioning' individuals with schizophrenia showed preserved facial affect perception compared to individuals with 'low functioning' schizophrenia. Further research is necessary to determine if problems in empathic accuracy are based on problems in basic emotion recognition.

The current study found differences in cognitive empathy on the self-report measures between groups, as did previous studies (Smith et al., 2012; Michaels et al., 2014; Horan et al., 2015).

In line with other studies (Achim et al., 2011; Singh et al., 2011; Michaels et al., 2014; Horan et al., 2015) we did not find consistent evidence for decreased affective empathy in schizophrenia. The Personal Distress scale of the IRI was the only scale presenting a significant difference between the groups, with higher scores for the patient group. It has been discussed that this scale assesses self-oriented feelings of anxiety rather than other-oriented processes involved in empathy (Batson et al., 1991) and does not represent affective empathy (Zaki and Ochsner, 2012; Michaels et al., 2014).

These questionnaires did not correlate with EAT performance, which is in line with other studies with schizophrenia patients (Horan et al., 2015) and in multiple healthy samples (Levenson and Ruef, 1992; Ickes et al., 1990; Zaki et al., 2008). It seems that these questionnaires do not measure the same aspects of empathy as the EAT, as they measure one's own view of one's empathic abilities, which can be distorted. Insight is impaired in many people with schizophrenia (see for latest review: Elowe and Conus, 2016). It is possible that the view of schizophrenia patients of their own empathic performances is not accurate. Furthermore, self-report measurements are prone to different biases including intrusive symptoms biases, cognitive status biases and values and social comparison biases (McGurk et al., 2000; Hendryx et al., 2001; Bromley and Brekke, 2010; Patterson et al., 2001). Additionally, the Faux Pas task did not correlate with the questionnaires or the EAT, possibly measuring yet another aspect of empathy.

Taken together, it may be best to see empathy as a multi-faceted construct encompassing multiple overlapping domains including the basic interpretation of emotional cues, the dynamic integration of these cues, affective and cognitive pathways and trait empathy as measured with self-report questionnaires. To understand empathic difficulties, it is important to account for these different aspects, especially the gap between one's belief and one's performance in empathy (Devlin et al., 2014; Zaki et al., 2008). It is possible that more basic elements underlying empathy are impaired in patients with schizophrenia, while their subjective experience of empathy does not change. Future research is necessary to identify the distinctions and overlap between the elements of the empathy construct. In addition, to understand empathic difficulties in real life, it is important to take an interpersonal perspective of the construct. Understanding the empathic difficulties among persons with schizophrenia that affect their social well-being (Ofir-Eyal et al., 2014) as well as their possible benefits from psychotherapy (Hasson-Ohayon et al., 2017) will allow to better tailor interventions to improve empathy.

The current study has several limitations. Data on general cognition was only available for half of the healthy participants. The performance of patients on the EAT might be influenced by problems with sustained attention or motor abilities, reflecting attention or motor problems instead of problems in empathy. Furthermore, the expressivity of the targets was determined with a self-report questionnaire. It is possible that one's own view of one's expressivity is distorted. A more objective way of measuring this would have been to let an expert or independent rater determine the expressivity of the target. However, this is time consuming, and Aan het Rot and Hogenelst (2014) show that targets generally rate their own expressivity accurately.

Furthermore, most schizophrenia patients in this study used antipsychotic medication. It is not clear if the use of medication has any influence on empathic accuracy; more information needs to come from further studies on empathy in people with first onset psychosis who do not use medication. It must also be noted that we defined empathy in this study as 'the accurateness in which someone can understand another person's feelings'. We did not measure empathy in the sense of 'care for the other'. Furthermore, the performance of patients on the EAT might be influenced by problems with sustained attention or motor abilities, reflecting attention or motor problems instead of

problems in empathy. However, no differences on general cognition between groups were found and a previous study on empathic accuracy found that patients tracked a dynamically moving non-social visual stimulus with high accuracy (Lee et al., 2011).

## 5. Conclusion

Individuals with schizophrenia benefit less from the emotional expressivity of other persons than healthy individuals, which contributes to their impaired empathic accuracy. The lack of correlation between the EAT and the questionnaires suggests a discrepancy between subjectively experienced empathy and actual empathy performance. To understand empathic difficulties of people with schizophrenia in real life, it is important to take a dynamic, interpersonal perspective of the construct. The Empathic Accuracy Test can be a useful instrument to measure empathy in an ecologically valid way.

### Conflict of interests

The authors declare that they have no conflicts of interests.

### Contributors

Authors RD and GHMP conceived and designed the study. Author RD wrote the first draft of the manuscript. Author MR undertook the statistical analysis. Author GHMP supervised the writing process. Authors RD SJ MR LW PHL IH-O AA and GHM wrote the final paper. All authors contributed to and have approved the final manuscript.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.schres.2019.03.024.

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