Affective Empathy in Schizophrenia: A Meta-Analysis

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Abstract

Background: Affective empathy, or the emotional response one has to the experiences or emotional states of others, contributes to relationship-maintaining behaviors and is key in fostering social connections, yet no work has synthesized the body of literature for people with schizophrenia. The aim of the present meta-analysis was to determine the extent to which those diagnosed with schizophrenia experience deficits in affective empathy. **Methods**: A literature search was conducted of studies examining empathy. Data were analyzed using a random effects meta-analytic model with Hedges's *g* standardized mean difference effect size. **Results**: Individuals with schizophrenia exhibited significant, medium deficits in affective empathy (*k*=37). Measurement type moderated the affective empathy deficit such that performance-based measures showed larger schizophrenia group deficits than self-report measures. **Conclusion**: Consistent, significant deficits in affective empathy were found comparing people with schizophrenia to healthy controls, especially when using performance-based assessments. The medium effect suggests an important role for empathy in the realm of social cognitive research, and points to the need for further investigation of measurement techniques and associations with functional outcomes.

Keywords: schizophrenia, empathy, social cognition, theory of mind, psychotic disorders

1. Introduction

Cognitive deficits are a core feature of schizophrenia and have received extensive interest from the research community (Green et al., 2004; Hyman and Fenton, 2003). Social cognition, or the mental operations that enable social interactions like perceiving, interpreting, and generating responses to the thoughts, emotions, and behaviors of others (Green et al., 2008), has received particular emphasis (Green and Leitman, 2008), with one meta-analysis indicating social cognitive abilities are more closely related to functional outcomes for those with schizophrenia than neurocognition (Fett et al., 2011). Many consider the social deficits seen in schizophrenia to be a core feature of the illness, contributing fundamentally to the nature of psychosis (Gallese, 2003) and long-term outcome (Stevens et al., 2009). People with schizophrenia exhibit worse performance than healthy controls in multiple social cognitive domains, including social perception, emotion processing, emotion perception, and theory of mind (Savla et al., 2013). Further, deficits in social cognition are associated with negative functional outcomes (Fett et al., 2011) and increased symptoms (Ventura et al., 2011) in schizophrenia.

One social cognitive domain broadly recognized as impaired in schizophrenia is empathy, with references to empathic deficits dating all the way back to Bleuler (1911) and Kraepelin (1919). Since then, many in the field have explored the structure of empathy, its purpose, and the neural mechanisms through which it operates (De Vignemont and Singer, 2006; Decety and Jackson, 2004; Gallese, 2003; Preston and De Waal, 2002). Historically, the definition of the empathy construct has been contested among prominent researchers (De Vignemont and Singer, 2006; Decety and Jackson, 2004), but practically, many studies investigate cognitive and affective aspects of empathy. Some argue for the inclusion of a third domain, although the focus of that domain has been debated, with some suggesting emotion perception in oneself and others

(Derntl and Regenbogen, 2014) while others suggest a self-regulatory mechanism with an emphasis on knowledge of the origins of self- and other-feelings (Decety and Jackson, 2004, 2006). But, research on empathy in the general population and especially studies of people with schizophrenia disorders (i.e., schizophrenia, schizoaffective disorders, or other psychotic disorders) have typically measured the empathy construct in two general domains: cognitive and affective empathy.

Cognitive empathy, also referred to as mentalizing in some literatures (e.g., see Green et al., 2015), is defined as one's ability to perceive others' internal states, i.e., thoughts, intentions, and feelings (Hoffman, 2000). Although cognitive empathy is commonly used synonymously with the term "theory of mind" (Rogers et al., 2007), there is a need for greater clarity in terminology. Numerous assessment tools for theory of mind neglect the ability to perceive others' emotions, which is central to cognitive aspects of empathy (though there are some notable exceptions, such as the Reading the Mind in the Eyes Test [Baron-Cohen et al., 2001]). Although discerning the thoughts, beliefs, and intentions of others is important to cognitive empathy, emotional perspective-taking is a fundamental aspect of the cognitive empathy construct. Thus, we conceptualize the literature on theory of mind as central to our knowledge of cognitive empathy, but, though it informs one aspect of cognitive empathy, it does not provide a complete understanding of the construct.

Several systematic reviews and meta-analyses have been conducted to synthesize the literature on various aspects of cognitive empathy (Biedermann et al., 2012; Brüne, 2005; Harrington et al., 2005; Sprong et al., 2007), confirming impairments on performance-based tasks of theory of mind in people with schizophrenia. This finding extends to meta-analyses including tasks to assess emotional perspective-taking (Bora et al., 2009; Savla et al., 2013), and

newer literature with more recently developed performance-based tasks assessing emotional perspective-taking provides additional support for deficits in cognitive empathy in people with schizophrenia (Derntl et al., 2012a; Derntl et al., 2012b; Smith et al., 2014). Additional literature further indicates impairments in self-reported cognitive empathy (e.g., see Corbera et al., 2013; Fischer-Shofty et al., 2013; Michaels et al., 2014; Shamay-Tsoory et al., 2007; Singh et al., 2015; Sparks et al., 2010). Some interventions have been designed to foster cognitive empathy in people diagnosed with schizophrenia, such as Metacognitive Reflection and Insight Therapy (Lysaker et al., 2007; Lysaker et al., 2010; Van Donkersgoed et al., 2014) and training to enhance understanding of thoughts, behavioral motivations and emotions in video tasks that are often used to assess aspects of cognitive empathy (Kayser et al., 2006).

The other component of empathy has been the subject of less debate than its counterpart, though has still provoked some discussion among scholars. Affective empathy, often referred to as emotional empathy (Mehrabian and Epstein, 1972) or experience sharing (Green et al., 2015), refers to the emotional reaction one has in response to the experiences or emotional states of others (Davis, 1980; Decety and Jackson, 2004; Hoffman, 2000). Some definitions emphasize that this emotional reaction must reflect the emotional state of the person for whom empathy is felt (i.e., emotional-matching; (De Vignemont and Singer, 2006; Decety and Jackson, 2004; Derntl and Regenbogen, 2014) while others put more emphasis on the general valence or appropriateness of the emotional reaction, rather than matching a specific affective state (Davis, 1980; Mehrabian and Epstein, 1972; Salovey and Mayer, 1989; Stotland, 1969). Salovey and Mayer (1989), who incorporated empathy as a key characteristic in their model of emotional intelligence, theorized that those high in both cognitive and affective empathy appear warm and genuine to others, facilitating growth of a large, supportive social network. Affective empathy in

particular is thought to contribute to altruistic behavior (Eisenberg and Miller, 1987; Hoffman, 1981, 2000). Further, some literature supports a link between aspects of empathy and social functioning in people with schizophrenia (Michaels et al., 2014; Shamay-Tsoory et al., 2007; Smith et al., 2014; Smith et al., 2012), suggesting the importance of empathy for social interactions extends to this population.

Numerous studies in recent years have been conducted that compare people diagnosed with schizophrenia disorders to healthy controls on affective empathy, yet, unlike for aspects of cognitive empathy, no meta-analysis has been published on this topic. Other systematic reviews have examined the abilities of people with schizophrenia to experience emotions, indicating they are able to experience emotions in the same way as healthy controls, but results could not inform whether emotions are felt in an empathic context (Cohen and Minor, 2010; Kring and Moran, 2008). Of note, one meta-analysis was published (Achim et al., 2011) including only reports using the Interpersonal Reactivity Index (IRI), a commonly used self-report measure of empathy, but this study did not claim to be a comprehensive meta-analysis of affective empathy studies and included only six articles informing empathy deficits. Several studies published since that meta-analysis indicate that people with schizophrenia display reduced affective empathy (Abramowitz et al., 2014; Benedetti et al., 2009), though others do not detect this difference (Achim et al., 2011; Lehmann et al., 2014). Further, some newer performance-based measures have shown stronger effects than are typically shown with self-report scales (Derntl et al., 2012b; Lee et al., 2010). This pattern of results indicates the relationship between population (i.e., healthy control vs. schizophrenia) and affective empathy may be complex and vary with measurement.

Historically, the majority of research on affective empathy has employed self-report measurement techniques, with the IRI used most commonly. But, there are numerous criticisms of this measure. For example, the Empathic Concern subscale, which most closely reflects affective empathy, may conflate the construct with sympathy, and focuses primarily on reactions to others, with less emphasis on emotional-matching (Eisenberg and Strayer, 1987; Jolliffe and Farrington, 2004; Michaels et al., 2014). Further, self-report and performance-based empathy measures, though designed to measure the same construct, may tap different empathic mechanisms. Self-report measures assess respondents' perceived empathic tendencies or abilities, while performance-based measures are geared toward actual empathic skills. Indeed, research has shown low correlations between traditional self-report measures and newer performance-based paradigms (Derntl et al., 2012b; Smith et al., 2014), and people with schizophrenia rate themselves more highly on empathy than family members or other raters, indicating self-perception may be higher than actual performance of empathy in daily interactions (Bora et al., 2008; Lysaker et al., 2013). Thus, we may expect differences in deficits reflected on each type of empathy assessment.

While deficits in cognitive empathy have been reviewed in the literature, less is known about deficits in affective empathy. The aim of the present meta-analysis was to determine whether people with schizophrenia disorders significantly differ from healthy controls on measures of affective empathy, and, if so, to explore moderators of this relationship. We hypothesized that those with schizophrenia disorders would have reduced affective empathy as compared to controls. We also explored measurement type as a potential moderator.

2. Method

In order to maintain a high level of meta-analytic quality, the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) checklist and literature flow chart were used as methodological standards and reporting guidelines (Moher et al., 2009). See Table 1 in the supplementary online material for short descriptions of each checklist item, along with locations within this report where items are addressed.

2.1. Literature Search

Electronic databases *PsycINFO, PsycARTICLES, Web of Science Core Collection, Pubmed,* and *EMBASE* were searched, covering studies made available up to July 28th, 2015. All searches used the exploded terms "empath*" and "schizo.*" When possible, an English language filter was applied. Reference sections of key conceptual articles and recent meta-analyses in related areas (Bora et al., 2009; Derntl and Regenbogen, 2014; Fett et al., 2011; Savla et al., 2013) were searched. If a record indicated empathy data had been collected but was not reported in an otherwise eligible study, authors were contacted and additional information requested.

2.2. Study Selection: Inclusion & Exclusion Criteria

In order to be included in the meta-analysis, studies needed to compare participants with a schizophrenia disorder to healthy controls on affective empathy; studies examining only cognitive empathy were excluded. Studies were required to be written in English. If univariate relationships were not available for a given study, authors were contacted. If the necessary data could not be obtained, the study was excluded.

2.3. Coding

Variables from each sample were coded according to a codebook, developed based on suggestions from Lipsey and Wilson (2001) and Card (2012).

2.3.1. Sample-level information

Sample-level information included year, publication type, and country. Measurement type was also coded (self-report or performance-based). Several sample characteristics were coded, including sample size, mean age, gender, and race. However, as only seven studies (18.9%) included any information regarding race or ethnicity, the race variable is not described further. Demographic variables were coded independently for each group. Characteristics specific to the schizophrenia samples included diagnosis (percent schizophrenia, percent schizoaffective disorder, and percent other psychotic disorder) and duration of illness in years.

2.3.2. Effect size

For each study, means and standard deviations of the empathy measure were collected for each group. These values were used to calculate Hedges's *g*. When means and standard deviations were not reported, but other values (such as independent samples *t*-values or Cohen's *d*) were available, Hedges's *g* was calculated from these values. Hedges's *g* represents the standardized mean difference between participants with schizophrenia disorders and healthy controls on the empathy measure, with positive values signifying greater empathy in healthy controls and negative values signifying greater empathy in schizophrenia participants. In cases where sample statistics were calculated such that higher values reflected greater empathy in schizophrenia participants, effect sizes were reverse-coded to remain consistent.

When a study reported multiple effect sizes using different measures, one measure was chosen to represent the study. Measurement was of interest in moderator analyses, so averaging effect sizes across measurement types was inappropriate (Card, 2012), and comparing measurement types within studies violated assumptions of sample independence. Decisions of which measure to include as the main effect size adhered to the following guidelines: 1) If a

study incorporated both self-report and performance-based measures, the effect size for the performance-based measure was used to ensure a subgroup large enough to enable meta-analytic comparisons in moderator analyses. 2) If no performance-based measure was present, the more commonly used self-report measure was kept (often the IRI-Empathic Concern). This enabled exclusion of measures which were not often used, and, when used, only with another, more common measure.

All data were coded into Excel (where effect sizes were calculated). All data were then checked before being aggregated into SPSS version 23.0, and later imported into Comprehensive Meta-Analysis, Version 2 (CMA; Borenstein et al., 2011).

2.4. Analyses

Descriptive statistics were conducted in SPSS Version 23.0. In order to test if any individual effect size unduly influenced the overall results, one-study removed sensitivity analyses were conducted (Borenstein et al., 2009). In this procedure, the CMA program ran the meta-analysis repeatedly, each time removing a different study (Borenstein et al., 2011). Forest plots of the effect size point estimates were produced, allowing examination of how much each study impacted the overall effect size. Studies that visually appeared to be outliers were retained if effect size point estimates did not differ substantially upon their removal.

Presence of bias was assessed in two ways. First, studies' effect sizes were plotted against their standard error, creating a funnel plot. Funnel plots were visually examined for asymmetry, which can indicate the presence of publication bias (Borenstein et al., 2009). Duval and Tweedie's (2000) trim and fill approach was used to statistically examine potential for publication bias. Using this method, a new point estimate is produced based on an iterative process of trimming extreme effect sizes from small studies. This procedure artificially reduces

variance in the effects, so extreme effects are added back in, but with mirror images on the opposite side of the funnel plot to retain the adjusted effect size, while re-instating adequate heterogeneity to represent observed effects. The new point estimate can be compared to meta-analytic results; if results are comparable, greater confidence can be had in the observed effect size (Borenstein et al., 2009; Card, 2012). Adjusted trim and fill effect size estimates were computed using the random effects model, consistent with main analyses.

2.4.1. Main analyses

Effect sizes were calculated using a random effects model to account for both within- and between-study variability (Lipsey and Wilson, 2001); this method allows for generalizations to be made from results beyond the population of included studies. The standardized mean difference was calculated as Hedges's *g*, which is similar to Cohen's *d*; thus, mean effect sizes were interpreted in light of Cohen's (1992) recommendations for the effect size *d*: effect sizes ≤.20 were considered small, effect sizes of .50 were considered medium, and effect sizes ≥.80 were considered large. Effect sizes at the study level were weighted by the inverse variance in order to account for standard error in effect size estimates (Card, 2012; Lipsey and Wilson, 2001). All meta-analytic calculations were conducted using the CMA computer program (Borenstein et al., 2011).

2.4.2. Heterogeneity and moderator analyses

The *Q*-statistic was examined to assess the presence of heterogeneity (Card, 2012).As the *Q*-statistic only determines the presence of heterogeneity and not the extent, the I^2 index was calculated (Higgins and Thompson, 2002) to determine the percentage of the total variation due to between-studies variability (Huedo-Medina et al., 2006). Moderator analyses were conducted

when Q was significant and I^2 was 25% or greater, a common cut point for moderation analyses (Huedo-Medina et al., 2006).

For categorical moderators, an analysis of variance (ANOVA) analogue was conducted to examine subgroup differences. Effect sizes were calculated for each group and compared to the total effect, and Q and I^2 were evaluated at the level of the potential moderator. Potential categorical moderators were considered to significantly moderate the total effect when subgroup effect sizes differed, confidence interval ranges and I^2 values were reduced, and $Q_{between}$ was significant (Huedo-Medina et al., 2006). All moderator analyses were conducted in CMA (Borenstein et al., 2011).

3. Results

3.1. Study Selection

See Figure 1 for the flow chart of article identification and inclusion. Thirty-seven records met inclusion criteria for this meta-analysis. Of note, though there were few instances of unpublished data included in the meta-analysis, many of the records that were excluded due to overlapping samples were preliminary data (e.g., presentations) that were later published and included.

3.2. Study Characteristics

See Table 1 for detailed study characteristics at the individual study level and Table 2 for aggregated study characteristics. In total, the meta-analysis included 1,468 people with schizophrenia disorders and 1,247 healthy controls. The IRI-Empathic Concern subscale was the most frequently used measure, with effect size data available for 31 out of 37 studies, though four of these also administered performance-based measures, which were used as the effect sizes of interest for this meta-analysis. A number of studies were psychometrically-oriented, with two

new measurement techniques featured in multiple studies: the Questionnaire of Cognitive and Affective Empathy (QCAE; Michaels et al., 2014; Reniers et al., 2011) and the performance-based Derntl paradigm (Derntl et al., 2010).

3.3. Sensitivity Analyses & Publication Bias

Visual examination of the forest plot revealed heterogeneous effect sizes. Examination of one-study removed analyses and forest plots (available on request from the authors) indicated that no study needed to be removed as an outlier, as point estimates of effect sizes with studies removed did not greatly differ from the overall mean effect size. Thus, all studies were retained for analyses. Trim and fill analyses indicated no change in the effect size after looking for extreme values, suggesting results are robust against publication bias. See Figure 1 in the online supplemental material for the funnel plot of included studies.

3.4. Main Analyses

See Figure 2 for the forest plot of meta-analytic results. Results indicated a positive, medium effect size (k=37, Hedges's g=.36, 95% CI [.19, .52]), signifying healthy controls exhibit significantly more affective empathy than people with schizophrenia disorders. Heterogeneity analyses produced a significant Q-statistic (143.10, df=36, p<.001) and a high amount of heterogeneity indicated by the I^2 statistic (74.84%), suggesting moderator analyses were appropriate. Of note, we ran a second meta-analysis, removing studies with samples including schizoaffective or other psychotic disorders. Results of this meta-analysis did not differ greatly from the original results (k = 29, Hedges's g = .38, 95% CI [.19, .57]); thus, we retained all samples for further analyses.

3.5. Moderator Analyses

Five studies included performance-based measures of affective empathy, while the rest (k=32) used self-report scales. Categorical moderator analyses indicated significant moderation ($Q_{between}$=26.88, p<.001), with self-report measures exhibiting an average effect size of .22 (95% CI [.08, .36], p=.002, I^2=59.66), while performance-based measures exhibited an average effect size of 1.31 (95% CI [.92, 1.70], p<.001, I^2=60.58). Both effects were significant, and the I^2 index for the self-report and performance-based groups were reduced by 15.18% and 14.26%, respectively.

4. Discussion

The present meta-analysis, including a total of 37 samples informing affective empathy deficits, is the first to synthesize the literature on affective empathy in people diagnosed with schizophrenia disorders. Our findings confirm a significant deficit in affective empathy for people with schizophrenia disorders. The effect is of medium magnitude, somewhat smaller than large effects reported in prior meta-analyses of the cognitive aspects of empathy (Bora et al., 2009; Savla et al., 2013; Sprong et al., 2007). This effect appears robust to outliers. Further, results indicate a significant role of measurement, such that self-report measures produced much smaller effects than performance-based. In other words, individuals with schizophrenia perceive themselves to be more empathic than their skills portray in performance-based assessments. This is consistent with one study showing individuals with schizophrenia rated themselves more highly than observers on their overall empathy abilities (Lysaker et al., 2013), and another where empathy self-ratings were higher than those given by relatives (Bora et al., 2008).

The finding that measurement type moderates affective empathy deficits may explain the larger effects seen in meta-analyses of aspects of cognitive empathy (e.g., effect sizes of .96

found by Savla et al., 2013; 1.26 found by Sprong et al., 2007; 1.10 found by Bora et al., 2009), as there is a much broader base of performance-based measurement for cognitive empathy than affective empathy. Indeed, published meta-analyses to date largely include performance-based assessments (Bora et al., 2009; Fett et al., 2011; Savla et al., 2013; Sprong et al., 2007). The effect size found here for performance-based measures (g = 1.31) is very similar to those found in previous meta-analyses of aspects of cognitive empathy. Two types of performance-based tasks of affective empathy were included here, and all effects were .74 or higher, with one as high as 2.20 (Derntl et al., 2012b), indicating much greater deficits than those portrayed when looking only at self-report data. Although the performance-based affective empathy literature is still in its infancy in schizophrenia research, these results suggest that affective empathy is as impaired as cognitive empathy for individuals with schizophrenia when measured similarly.

Also related to measurement of affective empathy, the pattern of results for individual measures brings to light a need for continued investigation of a newer self-report empathy measure - the QCAE. Although it was only used twice, both times the measure produced moderate effects in the opposite direction, suggesting that participants with schizophrenia disorders report greater affective empathy on this measure than healthy controls. It is possible that one or more of the affective empathy subscales on the QCAE are tapping a construct more closely related to personal distress, which is heightened in individuals with schizophrenia disorders. For example, one affective empathy subscale of the QCAE, Emotion Contagion, showed moderate to large correlations with the IRI-Personal Distress subscale in both studies of the QCAE in this population (Horan et al., 2015; Michaels et al., 2014). People with schizophrenia typically report heightened scores on the IRI-Personal Distress subscale (as compared to the IRI-Empathic Concern subscale, used here), and some have posited that this

subscale reflects some aspect of a failure to downregulate negative emotions, rather than to experience empathy for others (Horan et al., 2015). If the QCAE is assessing personal distress to some degree, that may account for the heightened scores in the schizophrenia group. However, it is possible factors other than the scale itself impacted these results, as the IRI-Empathic Concern subscale also produced results in the opposite direction for some studies in the meta-analysis (though these effects tended to be small; Brown et al., 2016; Corbera et al., 2014; Fischer-Shofty et al., 2013; Matsumoto et al., 2015; McCormick et al., 2012; Montag et al., 2007; Thirioux et al., 2014). Future work should investigate the QCAE in more depth to better understand potential nuances in construct definitions and performance in samples with schizophrenia.

Our findings point to a number of areas for future research. First, continuing the discussion of measurement, more studies are needed using performance-based measures of affective empathy. Results indicate a substantially larger deficit is evident with use of these measurement techniques as opposed to self-report, but the body of literature is small – just five studies in this meta-analysis. Both the Derntl paradigm and the comic strip tasks employed in these studies should see further use. However, these measures are not perfect – both rely on a cognitive assessment of a situation to assess affective experience. Additionally, the Derntl paradigm assesses affective responsiveness by having respondents choose the emotion they would feel when presented with self-oriented statements (e.g., “you have lost a precious memory object;” Derntl et al., 2009). We may see different results if statements were other-oriented, which would more accurately represent affective empathy. Future studies should work to refine and improve existing performance-based measures of affective empathy while keeping an open mind to new paradigms, such as those utilizing neurophysiological methods like electroencephalography (EEG) or functional magnetic resonance imaging (fMRI). For example,

some studies using EEG have begun to investigate the association between suppression of the mu rhythm and empathy (e.g., see Brown et al., 2016; Horan et al., 2014; McCormick et al., 2012). Researchers should continue using such innovative techniques to parse apart the complex empathy construct and experience in schizophrenia. Results from this meta-analysis emphasize, especially considering the similarity of performance-based affective empathy effects to those seen for meta-analyses of performance-based aspects of cognitive empathy (Savla et al., 2013; Sprong et al., 2007), that greater use of performance-based affective empathy measurement has potential to flesh out our understanding of the empathy construct and how its cognitive and affective components operate in schizophrenia disorders.

In addition to better assessments, more work is needed to understand the role of affective empathy in relation to both functioning and symptoms. For example, Fett and colleagues (2011) found a significant, moderate association between cognitive empathy and community functioning. However, studies examining overall or affective empathy with functioning in this population are disparate and have not been synthesized, with some literature indicating an association between overall or affective empathy and aspects of social functioning (Michaels et al., 2014; Shamay-Tsoory et al., 2007; Smith et al., 2014; Smith et al., 2012) while other studies indicate no relationship (Corbera et al., 2013; Haker and Rössler, 2009; Sparks et al., 2010). Research linking empathy to symptoms is more prevalent, although findings are just as ambiguous. Several studies have found an association between affective or overall empathy and negative symptoms (Bora et al., 2008; Kucharska-Pietura et al., 2012; Lincoln et al., 2011; Shamay-Tsoory et al., 2007; Smith et al., 2014; Sparks et al., 2010); associations have also been found with positive symptoms (Konstantakopoulos et al., 2014; Lysaker et al., 2013; Smith et al., 2014; Sparks et al., 2010), depression (Abramowitz et al., 2014; Didehbani et al., 2012; Horan et

al., 2015), anxiety (Achim et al., 2011), and insight (Didehbani et al., 2012; Lysaker et al., 2013; Pijnenborg et al., 2013). However, though several studies report significant relationships with symptoms, as many studies have reported no association (Corbera et al., 2013; Derntl et al., 2012a; Derntl et al., 2012b; Fresán et al., 2015; Fujino et al., 2014; Fujiwara et al., 2008; Lam et al., 2014; Lehmann et al., 2014; McCormick et al., 2012; Montag et al., 2007).

If, like cognitive empathy, affective empathy is linked strongly to functioning, interventions could add focus to improving abilities in these areas, or to compensating for empathic deficits in other ways. For example, interventions have been developed for people diagnosed with autism who have significant empathic deficits. Some interventions have aimed to teach skills to compensate for empathic deficits through psychoeducation or interpersonal interaction, and successfully increased the frequency of empathic interactions (Argott et al., 2008; Cunningham, 2015; Gena et al., 1996). Others have attempted to foster empathy through video simulation (Kajganich, 2014) or virtual reality (Cheng et al., 2010). Some even suggest dance therapy may nurture empathic skills by providing an environment where imitation, synchronous movement, and motoric cooperation can be practiced, potentially fostering physical as well as emotional aspects of empathy (Behrends et al., 2012). These methods could be explored in people with schizophrenia disorders. Additionally, existing therapies could be investigated as to their impact on empathy. For example, Metacognitive Reflection and Insight Therapy (Van Donkersgoed et al., 2014) aims to help people with schizophrenia form complex and integrated ideas of others, which may in and of itself foster empathic skills.

Though this meta-analysis takes an important step in confirming and quantifying a deficit in affective empathy for people with schizophrenia disorders, results should be interpreted in light of some limitations. First, results are limited in that they cannot inform how empathy

deficits might differ with varied manifestations of symptoms. Schizophrenia is a heterogeneous disorder; as discussed above, empathy has been linked to different types of symptoms both with regard to schizophrenia (negative or positive symptoms) and other types of mental illness (anxiety). Second, not all potential moderators of interest could be examined here. For example, we could not assess gender as a moderator because most studies used gender-matching, which would obfuscate potential gender differences in a meta-analytic framework (e.g., using the percent female of the sample as a predictor). Given that females in the general population are more empathic (Derntl et al., 2010; Schulte-Rüther et al., 2008), and females with schizophrenia have better social functioning (Andia et al., 1995; McGlashan and Bardenstein, 1990; Usall et al., 2002), gender could be an important variable to study in relation to affective empathy in schizophrenia. We also could not assess the importance of testing environment – though some studies administered tasks while conducting fMRI scans (Benedetti et al., 2009; Derntl et al., 2012a; Lee et al., 2010), this group was too small to conduct categorical moderator analyses (Fu et al., 2011), preventing examination of the effects of a potentially stressful scanning environment on performance. Third, meta-analyses are always limited by the primary studies on which they are based. There were certainly methodological limitations of the included studies, such as small samples, use of convenience sampling, and incomplete moderator data; these should be considered when interpreting meta-analytic results. Lastly, measurement of affective empathy is, as of yet, imperfect. Our results are limited by the measurement used in the field, which is dominated by self-report empathy assessments. Because of the lack of adequate measurement tools, affective empathy has been excluded from efforts to determine the best measures for use in social cognition studies, despite general acknowledgment of its importance as a social cognitive domain (Pinkham et al., 2013). Future studies should focus on continuing to

perfect existing affective empathy measurement tools while also investigating new, more nuanced measurement techniques.

These results represent the first meta-analysis of affective empathy deficits in people with schizophrenia disorders. Despite ambivalence in the field, our findings portray robust, significant deficits in affective empathy among people with schizophrenia disorders as compared to healthy controls. The medium effect suggests an important role for empathy in the realm of social cognitive research, and points to the need for further investigation of measurement techniques, associations with functional outcomes, and potential interventions to improve affective empathy.

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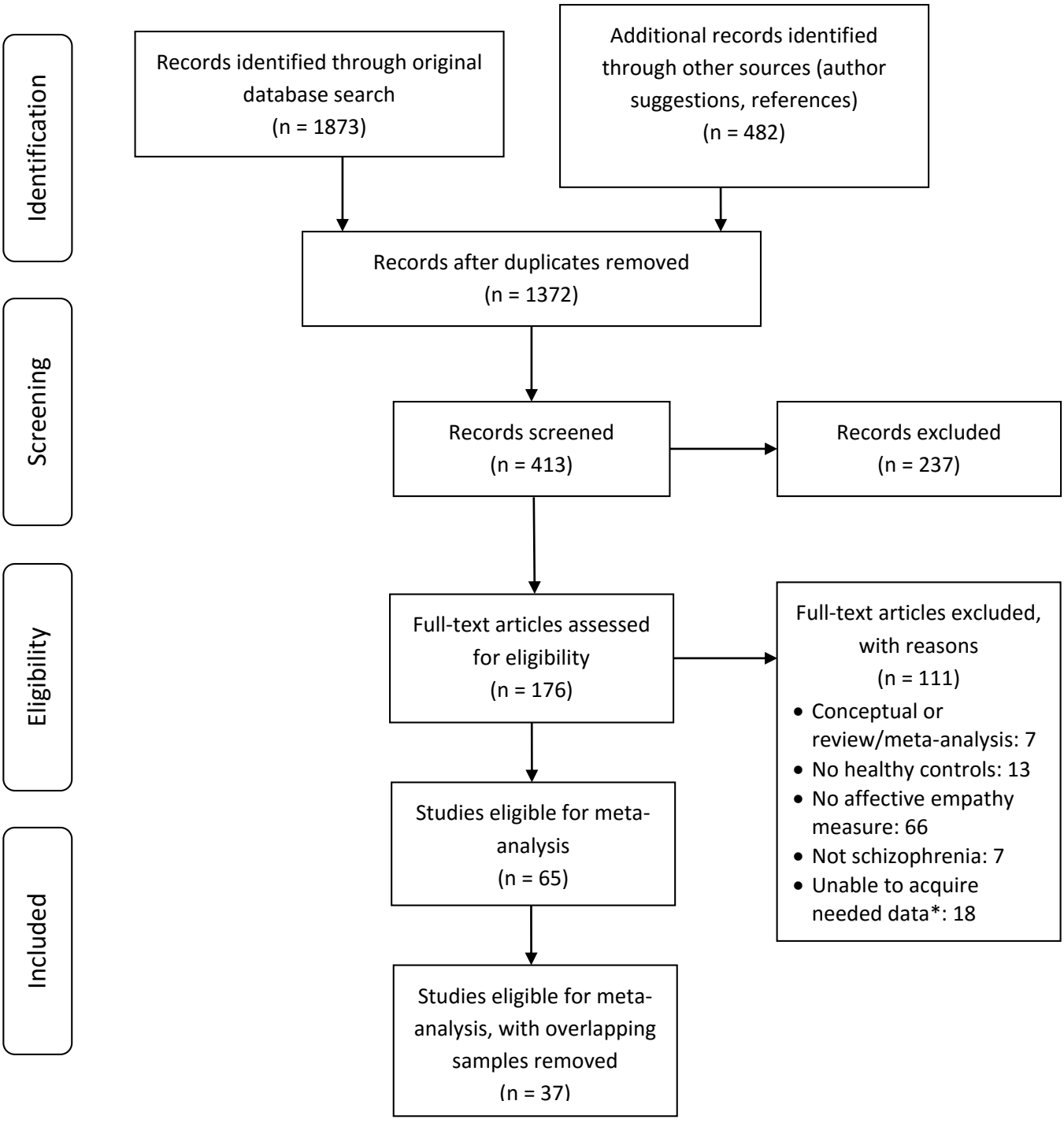
Figure 1, Literature Search Diagram (PRISMA)



Note. *Data could not be acquired when authors could not be contacted or chose not to supply data for a given sample.

Table 1

Studies included in meta-analysis

Citation (K=37)	Country	SSD N	HC N	% Schizophrenia	Duration of illness M	Duration of illness SD	Measures used	Hedges's *g*
(Achim et al., 2011)	Canada	31	31	74.2	1.7	1.2	IRI-EC	0.06
(Andrews et al., 2013) [t]	Australia	18	18	61.1	22.1	3.3	IRI-EC	0.37
(Benedetti et al., 2009)	Italy	24	20	100	12.7	7.0	Comic Strips – Affective	1.54
(Brown et al., 2016)	Germany	17	17	100	9.3	6.9	IRI-EC	-0.12
(Chiang et al., 2014)	Taiwan	70	35	100	--	--	IRI-EC	0.85
(Corbera et al., 2013)	United States	30	24	66.7	22.2	10.3	IRI-EC	0.29
(Corbera et al., 2014) [t]	United States	21	26	100	--	--	IRI-EC	-0.09
(Derntl et al., 2012b)	Germany	24	24	100	11.5	7.6	IRI-EC*	0.29
							Derntl-Affective responsiveness	2.20
(Derntl et al., 2012a) [t]	Germany	15	15	100	7.3	5.3	IRI-EC*	0.15
							Derntl-Affective responsiveness	0.74
(Fischer-Shofty et al., 2013)[t]	Israel	34	44	100	11.8	7.0	IRI-EC	-0.10
(Fujino et al., 2014)	Japan	69	69	100	13.1	9.7	IRI-EC	0.04
(Fujiwara et al., 2008)	Japan	24	20	100	10.4	8.4	IRI-EC	0.19
(Gizewski et al., 2013)	Germany	24	12	100	14.2	7.4	IRI-EC	0.62

Citation (K=37)	Country	SSD N	HC N	% Schizophrenia	Duration of illness M	Duration of illness SD	Measures used	Hedges's *g*
(Haker and Rössler, 2009)	Switzerland	43	45	100	11.0	9.0	IRI-EC	0.20
(Hooker et al., 2011)	United States	21	17	57.1			IRI-EC	0.35
(Horan et al., 2014)	United States	30	24	100	26.8	11.5	IRI-EC	0.84
(Horan et al., 2015)	United States	145	45	100	19.9	--	QCAE-Affective Total	-0.36
(Kucharska-Pietura et al., 2012)	Poland	100	50	100	8.6	9.8	BEES	0.60
(Lam et al., 2014) [t]	China	58	61	100	13.4	8.8	IRI-EC	0.29
(Lee et al., 2011)	United States	30	22	100	--	--	IRI-EC	0.73
(Lee et al., 2010)	South Korea	15	18	100	4.6	3.4	IRI-EC*	0.65
							Comic Strips - Affective	1.15
(Lehmann et al., 2014)	Germany	55	55	100	10.0	7.7	IRI-EC	0.25
							MET-Emotional Empathy*	-0.13
(Matsumoto et al., 2015)	Japan	17	18	100	15.2	7.9	IRI-EC	-0.09
(McCormick et al., 2012)	United States	16	16	87.5	15.8	8.8	IRI-EC	-0.47
(McGuire et al., 2015)[t]	Australia	24	20	83.3	22.7	10.2	IRI-EC	0.32
(Michaels et al., 2014)	United States	52	37	100	14.8	8.7	QCAE-Affective Total	-0.38
(Montag et al., 2012)	Germany	145	145	97.2	10.4	9.5	IRI-EC	0.07
(Montag et al., 2007)	Germany	45	45	100	11.6	9.6	IRI-EC	-0.17

Citation (K=37)	Country	SSD N	HC N	% Schizophrenia	Duration of illness M	Duration of illness SD	Measures used	Hedges's *g*
(Pijnenborg et al., 2013)	The Netherlands	53	53	100	7.0	8.5	EEQ	0.05
(Ramos-Loyo et al., 2012)	Mexico	38	38	100	2.0	1.3	Emotion Intensity**	-0.02
(Regenbogen et al., 2015)[t]	Germany	20	31	100	--	--	IRI-EC	0.13
(Shamay-Tsoory et al., 2007)	Israel	26	31	100	--	--	IRI-EC	0.50
							QMEE*	0.72
(Singh et al., 2015)	India	14	14	100	9.3	6.4	IRI-EC	1.14
(Smith et al., 2014)	United States	60	45	100	14.4	9.3	IRI-EC*	0.46
							Derntl-Affective responsiveness	1.05
(Sparks et al., 2010)	Australia	28	25	89.3	--	--	IRI-EC	1.29
(Thirioux et al., 2014)	France	10	10	100	11.8	1.5	IRI-EC	-0.04
(Wojakiewicz et al., 2013)	France	29	27	100	8.0	8.0	IRI-EC	0.32

Note. SSD = Schizophrenia-spectrum disorder sample. HC = healthy control sample. IRI-EC = Interpersonal Reactivity Index – Empathic Concern Subscale. BEES = Basic Emotional Empathy Scale. EEQ = Emotional Empathic Tendency Scale. QMEE = Questionnaire Measure of Emotional Empathy. MET = Multifaceted Empathy Test. **The emotion intensity task used in the study by Ramos-Loyo & colleagues (Ramos-Loyo et al., 2012) had individuals provide a self-reported rating of the emotion they experienced while watching an emotion-evoking film, along with the intensity of that emotion. *These effect sizes were not included in the meta-analysis because other effects produced by the same sample were used instead, based on guidelines laid out in the Methods. [t] Supplemental information was provided by authors to assist in coding for these studies.

Table 2

Study and sample characteristics

Sample Characteristics	**Mean (SD)/Mean Percent**	**Range**	**K**
Mean Age, healthy controls	35.4 (5.4)	25.2-46.1	37
Mean Age, schizophrenia spectrum	37.5 (5.9)	24.9-47.9	36
Percent Female, healthy controls	36.9 (15.9)	0-65.0	36
Female, schizophrenia spectrum	33.3 (15.4)	0-54.7	36
Diagnosis			
Schizophrenia	94.0 (11.5)	57.1-100	37
Schizoaffective	4.3 (10.9)	0-42.9	37
Other Psychosis	0.7 (3.3)	0-19.4	37
Years since onset	12.8 (6.2)	1.74-26.8	31
Chlorpromazine equivalents	396.8 (146.0)	181.3-672.3	17
Study Characteristics	**Mean (SD)/Percent**	**Range**	**K**
Sample type			
Published article	35 (94.6)	--	37
Poster data (supplied by author)	2 (5.4)	--	37
Year	2012	2007-2015	37
SZ Sample size	39.7 (32.0)	10-145	37
HC Sample size	33.7 (24.0)	10-145	37
Total Sample size	73.4 (53.1)	20-290	37
Location			
United States	9 (24.3)	--	37
Abroad	28 (75.7)	--	37

Figure 2 - Forest plot of studies included in the affective empathy meta-analysis (k = 37)

Citation	Hedges's g	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
Achim et al., 2011	0.060	0.250	0.063	-0.430	0.550	0.240	0.810
Andrews et al., 2013	0.370	0.340	0.116	-0.296	1.036	1.088	0.276
Benedetti et al., 2009	1.540	0.340	0.116	0.874	2.206	4.529	0.000
Brown et al., 2015	-0.120	0.340	0.116	-0.786	0.546	-0.353	0.724
Chiang et al., 2014	0.850	0.220	0.048	0.419	1.281	3.864	0.000
Corbera et al., 2013	0.290	0.280	0.078	-0.259	0.839	1.036	0.300
Corbera et al., 2014	-0.089	0.294	0.086	-0.665	0.486	-0.305	0.760
Derntl et al., 2012a	2.200	0.370	0.137	1.475	2.925	5.946	0.000
Derntl et al., 2012b	0.736	0.377	0.142	-0.004	1.475	1.950	0.051
Fischer-Shofty et al., 2013	-0.100	0.230	0.053	-0.551	0.351	-0.435	0.664
Fujino et al., 2014	0.040	0.170	0.029	-0.293	0.373	0.235	0.814
Fujiwara et al., 2008	0.190	0.300	0.090	-0.398	0.778	0.633	0.527
Gizewski et al., 2012	0.620	0.360	0.130	-0.086	1.326	1.722	0.085
Haker et al., 2009	0.200	0.210	0.044	-0.212	0.612	0.952	0.341
Hooker et al., 2011	0.350	0.330	0.109	-0.297	0.997	1.061	0.289
Horan et al., 2015	-0.360	0.170	0.029	-0.693	-0.027	-2.118	0.034
Horan et al., 2014	0.840	0.290	0.084	0.272	1.408	2.897	0.004
Kucharska-Pietura et al., 2012	0.600	0.180	0.032	0.247	0.953	3.333	0.001
Lam et al., 2014	0.290	0.180	0.032	-0.063	0.643	1.611	0.107
Lee et al., 2010	1.150	0.380	0.144	0.405	1.895	3.026	0.002
Lee et al., 2011	0.730	0.290	0.084	0.162	1.298	2.517	0.012
Lehmann et al., 2014	0.250	0.190	0.036	-0.122	0.622	1.316	0.188
Matsumoto et al., 2014	-0.090	0.340	0.116	-0.756	0.576	-0.265	0.791
McCormick et al., 2012	-0.470	0.360	0.130	-1.176	0.236	-1.306	0.192
McGuire et al., 2015	0.320	0.300	0.090	-0.268	0.908	1.067	0.286
Michaels et al., 2014	-0.380	0.220	0.048	-0.811	0.051	-1.727	0.084
Montag et al., 2007	-0.170	0.210	0.044	-0.582	0.242	-0.810	0.418
Montag et al., 2012	0.070	0.120	0.014	-0.165	0.305	0.583	0.560
Pijnenborg et al., 2013	0.050	0.200	0.040	-0.342	0.442	0.250	0.803
Ramos-Loyo et al., 2012	-0.020	0.230	0.053	-0.471	0.431	-0.087	0.931
Regenbogen et al., 2015	0.133	0.287	0.082	-0.430	0.695	0.462	0.644
Shamay-Tsoory et al., 2007	0.500	0.270	0.073	-0.029	1.029	1.852	0.064
Singh et al., 2015	1.140	0.410	0.168	0.336	1.944	2.780	0.005
Smith et al., 2014	1.050	0.210	0.044	0.638	1.462	5.000	0.000
Sparks et al., 2010	1.290	0.300	0.090	0.702	1.878	4.300	0.000
Thirioux et al., 2014	-0.040	0.450	0.203	-0.922	0.842	-0.089	0.929
Wojakiewicz et al., 2013	0.320	0.270	0.073	-0.209	0.849	1.185	0.236
	0.356	0.083	0.007	0.194	0.519	4.306	0.000