A meta-analysis and scoping review of social cognition performance in social phobia, posttraumatic stress disorder and other anxiety disorders

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Article history:
Received 20 February 2013
Received in revised form 15 July 2013
Accepted 12 September 2013

Keywords:
Social cognition
Social phobia
Posttraumatic stress disorder
Mentalizing
Attributional style
Emotion recognition

Abstract
Social cognition deficits are observed in a variety of psychiatric illnesses. However, data concerning anxiety disorders are sparse and difficult to interpret. This meta-analysis aims at determining if social cognition is affected in social phobia (SP) or posttraumatic stress disorder (PTSD) compared to non-clinical controls and the specificity of such deficits relatively to other anxiety disorders. The scoping review aims to identify research gaps in the field. Forty studies assessing mentalizing, emotion recognition, social perception/knowledge or attributional style in anxiety disorders were included, totaling 1417 anxious patients and 1321 non-clinical controls. Results indicate distinct patterns of social cognition impairments: people with PTSD show deficits in mentalizing (effect size $d = -1.13$) and emotion recognition ($d = -1.6$) while other anxiety disorders including SP showed attributional biases ($d = -0.53$ to $d = -1.15$). The scoping review identified several understudied domains of social cognition in anxiety disorders. Some recommendations are expressed for future studies to explore the full range of social cognition in anxiety disorders and allow direct comparisons between different disorders.

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1. Introduction

Social cognition is defined as the capacity to perceive, interpret and generate responses to the intentions, dispositions and behavior of other people. It includes different specific cognitive processes that underlie social interactions (Green et al., 2008). Four different but interrelated domains of social cognition are typically studied in the literature, namely mentalizing (also known as Theory of Mind), emotion recognition, social perception/knowledge and attributional style (Pinkham et al., 2013). Mentalizing refers to the ability to attribute mental states, like beliefs, desires and intentions to other people (Green et al., 2008), typically based on multiple pieces of information on the person and the context (Achim, Guitton, Jackson, Boutin, & Monetta, 2012). Emotion recognition is the ability to accurately perceive and identify emotions from social stimuli, such as facial expressions or prosody. Social perception/knowledge refers to the awareness and recognition of social rules, norms, or goals in different social situations (Green et al., 2008). Finally, attributional style reflects how people typically infer the cause of different events (Green et al., 2008). Poor social cognition impacts on the global functioning and quality of life (Fett et al., 2011; Maat, Fett, Derks, & Investigators, 2012). It thus has become an important study target in clinical populations such as schizophrenic and autistic patients since it predicts their current and future social functioning (Abdi & Sharma, 2004; Bora, Eryavuz, Kayahan, Sungu, & Veznedaroglu, 2006; Fett et al., 2011; Green et al., 2008; Mancuso, Horan, Kern, & Green, 2011; Sparks, McDonald, Lino, O’Donnell, & Green, 2010).

Anxiety disorders are the most prevalent psychiatric illnesses (Kessler, Berglund, Demler, Jin, & Walters, 2005) with lifetime prevalence around 17% (Somers, Goldner, Waraich, & Hsu, 2006). In addition to suffering from important psychiatric comorbidity (Brown, Campbell, Lehman, Grisham, & Mancill, 2001; Grant et al., 2004), people with anxiety disorders show remarkable functional impairments and a poorer quality of life than non-clinical controls (Mendelowicz & Stein, 2000; Olatunji, Cisler, & Tolin, 2007; Stein et al., 2005). Even though the link between social cognition and poor functioning has not yet been directly addressed in anxiety disorders, an increasing number of studies report potential social cognition impairments in these patient populations (Machado-de-Sousa et al., 2010; Mazza et al., 2012; O’Toole, Hougaard, & Mennin, 2012; Sripada et al., 2009). Social cognition deficits could thus explain part of the functional impairments and poorer quality of life in anxiety disorders. This may be especially true for those anxiety disorders where social abilities are known to be affected, such as social phobia (SP), where emotion recognition appears to be disturbed since childhood (Battaglia et al., 2005, 2012; Simonian, Beidel, Turner, Berkes, & Long, 2001), and posttraumatic stress disorder (PTSD) where emotional numbing, a core symptom of the illness, is known to impact interpersonal relationships (Cook, Riggs, Thompson, Coyne, & Sheikh, 2004; McFarlane & Bookless, 2001; Ruscio, Weathers, King, & King, 2002).

The purpose of this study is to sum up what is known from the existing literature about social cognitive abilities of people with SP and PTSD by means of a meta-analysis, and to compare their abilities to those found in other anxiety disorders. As SP and PTSD are often reported as particularly socially-impairing anxiety disorders (Anthony, Roth, Swinson, Huta, & Devins, 1998; Liu, Zhu, Wu, & Hu, 2008; Mendelowicz & Stein, 2000; Schonfeld et al., 1997; Simon et al., 2002), it is expected that more important and pervasive social cognition deficits will be found among people with these diagnoses. Concurrently, we performed a scoping review to identify research gaps in the current literature on social cognition in anxiety disorders. Accordingly, we summarized and quantified available data regarding four domains of social cognition, namely mentalizing, emotion recognition, social perception/knowledge and attributional style, in people with a primary diagnosis of social phobia (SP), posttraumatic stress disorder (PTSD), generalized anxiety disorder (GAD), obsessive compulsive disorder (OCD) or panic disorder with or without agoraphobia (PD).

2. Method

This study is based on Rosenthal and DiMatteo (2001) meta-analytic procedures and on Arksey and O’Malley (2005) methodological framework for scoping reviews, both of which share similar methodologies to identify and select the relevant studies, but have different aims and analytic procedures, as scoping reviews are not centered on effect sizes.

2.1. Literature search

Relevant articles were identified through literature searches in PsycINFO, PubMed and Web of Knowledge databases using the keywords: social phobia, social anxiety disorder, panic disorder, agoraphobia, post traumatic stress disorder, generalized anxiety disorder and obsessive compulsive disorder along with mentalizing, theory of mind, social cognition, emotion recognition, emotion perception, emotion processing, emotion identification, facial affect, emotion discrimination, attribution bias, attributional style, interpretation bias, social knowledge and social cue. The titles and abstracts of the corresponding articles were examined for possible inclusion in the meta-analysis. Additional titles were obtained from the references cited in these articles.

2.2. Inclusion and exclusion criteria

The inclusion criteria were: (a) inclusion of a group of adults (i.e. older than 18 years old) with a primary diagnosis of an anxiety disorder (SP, PTSD, GAD, OCD or PD) according to standard diagnostic criteria (i.e. DSM or ICD); (b) inclusion of a non-clinical comparison group in which participants did not meet diagnostic criteria for the anxiety disorder assessed in the study (note that in some studies, participants of the control group were not comprehensively screened for disorders other than the one addressed in the study, leaving open the possibility that they may have presented with an undiagnosed condition); (c) report of a measure for at least one social cognition construct (mentalizing, emotion recognition, social perception/knowledge, attributional style), and (d) accessibility, whether in the paper or by contacting the author, of

3.2. Scoping review and target areas for future work

3.2.1. Social phobia

3.2.2. Posttraumatic stress disorder

3.2.3. Obsessive-compulsive disorder

3.2.4. Panic disorder with or without agoraphobia

3.2.5. Generalized anxiety disorder

4. Discussion

Acknowledgements

References
the necessary data for the calculation of the effect size \((r)\) of the difference between groups on the social cognition measures. Studies that were written in another language than English or unpublished were excluded.

2.3. Task classification criteria

The boundaries of the different social cognition constructs are not always evident. For this review, we used the conceptual definitions of Green et al. (2008) and the operational definitions proposed by Achim et al. (2012). For the purpose of this meta-analysis, classification of the tasks into the different domains of social cognition was made by two of the authors (I.P. and A.M.A.) who reached full agreement following the definitions presented below.

2.3.1. Mentalizing

In mentalizing tasks, participants have to attribute mental states (e.g., emotions, intentions, beliefs, desires) to a specific agent in a specific context. Thus in those tasks, both information about the agent and about the context are provided to the participant.

2.3.2. Emotion recognition

In emotion recognition tasks, participants have to infer the emotional state of a specific agent by relying only on information about what is being expressed by this agent with no further contextual information. Tasks can be classified into two categories, namely accuracy tasks (Etkin & Schatzberg, 2011; Fonzo et al., 2010; Mazza et al., 2012) and sensitivity tasks (Arrais et al., 2010; Kornreich et al., 2001; Palm, Elliott, McKie, Deakin, & Anderson, 2011). In accuracy tasks, participants are asked either to identify the emotion expressed in the stimuli, or to discriminate between emotional expressions (e.g., ‘which of 2 faces is the most expressive’, or ‘which face matches the emotion of a target face’). When different intensities of the same emotional face are presented, it is then possible to calculate a sensibility score that determines the minimal intensity level required to correctly identify the emotion. Those tasks are considered sensibility tasks.

2.3.3. Social perception/knowledge

Social perception/knowledge tasks presented contextual information without presenting information about a specific agent, and participants are asked to identify what is normally expected in that situation (e.g., social rules or norms, expected actions or reactions).

2.3.4. Attributional style

Attribution style measures are easier to distinguish, as in these tasks there is no right or wrong answer. Rather, the aim is to determine which explanation the participant will favor to explain the event. Explanations can be negative, positive or ambiguous. Consequently, different kinds of biases can be assessed depending on the type of event presented in the task. For example, a negativity bias can be inferred based upon how often a participant favors negative causes for ambiguous events (Franklin, Huppert, Langner, Leiberg, & Foa, 2005). A depressive bias can be inferred when a person attributes a negative event to internal, stable and global causes (Peterson et al., 1982).

2.4. Meta-analysis procedure

Based on Rosenthal (1991), the effect size \((r)\) of the difference in performance between the clinical group and the comparison group was calculated for each measure of social cognition in each study, either from the means and standard deviations, or from the \(t\) or \(F\) statistics. These ESs were then transformed to Fisher’s \(Z\) (\(Z_r\)) for subsequent analyses. For studies in which data were reported for different clinical subgroups e.g. (Montagne et al., 2008), \(Z_r\) were pooled between the groups before further analysis. Moreover, when a study reported data for several measures targeting the same social cognition domain (e.g. accuracy and sensitivity task in Poljac, Montagne, & de Haan, 2011; or 3 different mentalizing tasks in Sayin, Oral, Utku, Baysak, & Candansayar, 2010), these \(Z\) were also pooled before further analysis. For studies where more than one control group was assessed, our main analyses were performed using the \(Z\) calculated from the control group to which the clinical group was most similar (e.g. military officers who took part in the same mission, but did not develop PTSD in Maaza et al., 2012).

Based on the \(Z\) of the individual studies, mean \(Z\)s were calculated for each study group and each domain of social cognition. These mean weighted \(Z\)s were then converted back to \(ES\) and transformed into Cohen’s \(d\) for presentation of results. We chose to use \(r\) as a measure of effect size because it allows the calculation of effect sizes based on \(r\) or \(F\) statistics when the means and standard deviations are not provided in a paper. We then converted \(r\) into Cohen’s \(d\) since more people are familiar with this metric, as well as making comparisons with other meta-analyses more obvious.

A negative effect size in mentalizing, emotion recognition and social perception/knowledge implies that anxious patients scored lower than non-clinical controls. For attributional style, a negative effect size implies that anxious patients displayed more negative or depressive attributional style than the non-clinical controls. For each anxiety disorder and each domain of social cognition, we calculated a homogeneity statistic (Rosenthal, 1991) and examined the presence of outliers using focused tests (Rosenthal, 1991). Finally, for each social cognition domain, we also compared the mean effect sizes of the different anxiety disorders using Hedges (1982) procedure.

3. Results

Altogether, forty studies were included in our analyses for a total of 1417 patients presenting with an anxiety disorder and 1321 non-clinical controls. The characteristics and effect sizes of these studies are shown in Table 1. As can be seen from Table 1, all diagnoses put together, the large majority of studies (97.5%) measured either emotion recognition or attribution biases, whereas fewer studies (10%) assessed social perception/knowledge or mentalizing performance. For some domains of social cognition, very few studies or no study at all were available for some of the diagnoses (see Figs. 1 and 2 for the number of studies by domain and by diagnosis).

3.1. Meta-analysis results

Fig. 1 shows the meta-analytic results for the 2 domains for which there was a sufficient number of studies for the meta-analysis, namely emotion recognition and attributional style. Compared to the other anxiety disorders, people with PTSD present a distinct pattern of performance for both emotion recognition and attributional style. For the other two social cognition domains, mentalizing and social perception/knowledge, the number of studies was insufficient to conduct a meta-analysis. While we nonetheless present the available effect-sizes for these two domains (Fig. 2), this figure should be interpreted with caution.

3.1.1. Emotion recognition

PTSD showed a large weighted mean effect size \((d = -1.60)\) of studies \((k = 4)\) while SP \((d = 0.12; k = 11)\), GAD \((d = -0.12; k = 2)\), OCD \((d = -0.16; k = 12)\) and PD \((d = -0.25; k = 2)\) showed small effects on emotion recognition tasks. The mean effect size in SP was however affected by the presence of an outlier with a \(d = 0.84\) (i.e. significantly higher than the mean \(d = -0.23\) of the other
Table 1
Characteristics and effect sizes for each study included in the meta-analysis and scoping review.

<table>
<thead>
<tr>
<th>Mentalizing</th>
<th>Anxiety disorder</th>
<th>n Patients</th>
<th>n Controls</th>
<th>% Men (PT/CO)</th>
<th>Mean age (PT/CO)</th>
<th>Effect size (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jacobs et al. (2008)</td>
<td>SP</td>
<td>28</td>
<td>21</td>
<td>54/52</td>
<td>32.4/36.0</td>
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<td>−</td>
<td>41.1/36.8</td>
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<td>OCD</td>
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<td>25</td>
<td>40/56</td>
<td>32.7/33.4</td>
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<td>30</td>
<td>33/33</td>
<td>34.3/35.0</td>
<td>−0.55</td>
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<td>38/15</td>
<td>22.3/21.4</td>
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<td>Campbell et al. (2009)</td>
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<td>Garner, Baldwin, Bradley, and Megg (2009)</td>
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<td>17</td>
<td>31/33</td>
<td>43.1/39.9</td>
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<td>Gilboa-Schechtman et al. (2008)</td>
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<td>54</td>
<td>65</td>
<td>48/48</td>
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<td>−0.08</td>
</tr>
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</table>

<table>
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<td>Jacobs et al. (2008)</td>
<td>SP</td>
<td>28</td>
<td>21</td>
<td>54/52</td>
<td>32.4/36.0</td>
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<td>26</td>
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<td>21.5/21.1</td>
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<td>Montagne et al. (2006)</td>
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<td>26</td>
<td>42/46</td>
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<td>10</td>
<td>40/40</td>
<td>25.0/23.2</td>
<td>0.38</td>
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<td>11</td>
<td>45/45</td>
<td>27.0/26.9</td>
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<td>16</td>
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<td>44.1/36.5</td>
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<tr>
<td>Etkin and Schatzberg (2011)</td>
<td>GAD</td>
<td>43</td>
<td>32</td>
<td>39/28</td>
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</tr>
<tr>
<td>Palm et al. (2011)</td>
<td>GAD</td>
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<td>16</td>
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<td>34.0/34.0</td>
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<tr>
<td>Aigner et al. (2007)</td>
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<td>40</td>
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<td>37</td>
<td>43</td>
<td>22/30</td>
<td>37.8/36.4</td>
<td>−0.51</td>
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<td>21</td>
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<td>66/40</td>
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<td>58</td>
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<td>Clark et al. (1997) study 1</td>
<td>PD</td>
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<td>30/40</td>
<td>32.5/35.5</td>
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<td>SP</td>
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<td>GAD</td>
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* Data were only available for all participants with no distinction between groups.

* Studies in which control participants were screened to exclude any current axis 1 psychiatric diagnosis.
studies of the category; $d$ ranging from $-0.65$ to $0.38$). All subjects in that study (Arrais et al., 2010) were high-functioning university students that were not necessarily seeking treatment for their SP, which might explain why they showed a pattern of performance distinct from the subjects of the other studies. When this study was removed from the analysis, the mean weighted effect size for SP dropped to $d = -0.23$. After removing that outlier, the effect size in PTSD differed significantly from the effect sizes of SP ($X^2 = 31.46$, $p < 0.05$), GAD ($X^2 = 31.46$, $p < 0.05$), OCD ($X^2 = 24.61$, $p < 0.05$) and PD ($X^2 = 24.26$, $p < 0.05$). The other differences between the diagnoses did not reach statistical significance ($all \ p's > 0.63$). With the outlier removed for SP, there was no evidence of heterogeneity between the effect sizes of the different studies for each anxiety disorder ($all \ p's > 0.06$).

3.1.2. Attributional style

Large weighted mean effect sizes were observed for SP ($d = -1.15$; $k = 6$), GAD ($d = -0.97$; $k = 2$), and PD ($d = -0.97$, $k = 4$), whereas PTSD and OCD respectively showed small ($d = 0.08$; $k = 2$) and medium ($d = 0.53$; $k = 1$) weighted mean effect sizes. Again, PTSD differed significantly from SP ($X^2 = 53.34$, $p < 0.05$), GAD ($X^2 = 26.32$, $p < 0.05$) and PD ($X^2 = 27.36$, $p < 0.05$). None of the other differences between the different anxiety disorders reached statistical difference ($all \ p's > 0.17$). Heterogeneity only reached significance for GAD ($X^2 = 16.34$, $p < 0.001$), for which the only two available studies showed significantly different patterns of results ($d = -1.78$ in Clark et al., 1997 vs. $-0.28$ in Riskind, Castellon, & Beck, 1989). These discrepant results may be attributed to the different types of attributional biases assessed by each study (i.e. a negative bias in Clark et al., 1997 and a depressive bias in Riskind et al., 1989).
3.1.3. Mentalizing

The four studies assessing mentalizing together provided data only for PTSD, SP and OCD. The analysis yielded a large effect size for PTSD ($d = -1.13$; $k = 1$) whereas SP and OCD showed effect sizes that were respectively almost null ($d = 0.04$; $k = 1$) or small ($d = -0.30$; $k=2$). The effect size observed for PTSD was significantly larger than the effect size in SP ($X^2 = 5.92$, $p < 0.05$) and was marginally different from the effect size in OCD ($X^2 = 3.76$, $p = 0.05$). The last two diagnoses did not significantly differ from each other ($p = 0.34$). Homogeneity was respected in OCD. No homogeneity test was conducted for the other categories (PTSD and SP) as they contained only one study.

3.1.4. Social perception/knowledge

The only study that reported results concerning social perception/knowledge was in SP and showed a medium effect size ($d = -0.48$; $k = 1$). As only one study was included in the category, no further analysis was conducted.

3.2. Scoping review and target areas for future work

As can be seen in Table 1, the interest in studying social cognitive performance of people with anxiety disorder is relatively recent. Except for attributional style that has been studied for about 20 years, it is only in the last 10 years that publications have targeted other domains with approximately 65% of studies published within the last five years. Compared to attributional style and emotion recognition, mentalizing and social perception/knowledge were given minimal attention, with respectively 2 and 1 studies. For the domains that were of greater general interest for the researchers (i.e. emotion recognition and attributional style), certain disorders have been set aside. For example, of the 31 studies found regarding emotion recognition, GAD and PD were only addressed by 2 studies each and only 4 studies targeted PTSD. Furthermore, attributional style was mainly assessed in SP (6 studies) while sparse studies could be retrieved for the other disorders. More generally, there is a lack of studies assessing social cognition in more than one disorder, restricting the possibility to compare the different diagnoses. To date, only 4 of the 40 studies in this review (10%) have covered more than 1 anxiety disorder diagnosis. Furthermore, only 3 studies out of 40 (7.5%) addressed more than one domain of social cognition in the same patients, and none assessed all 4 domains. Data are thus insufficient to allow a more global understanding of the complete range of social cognitive abilities in the different anxiety diagnoses.

3.2.1. Social phobia

SP was the most studied disorder (17 studies), representing more than 42% of the studies listed in Table 1. Men (43%) and women (57%) were almost equally represented. Emotion recognition was the most studied aspect with 11 studies that assessed either accuracy (9 studies) and/or sensitivity (4 studies; see Section 2.3.2 for the definition of accuracy and sensitivity). Attributional style was assessed in 6 studies, 5 of which (83%) used a measure of negative bias while only 1 (17%) used a measure of depressive bias. Mentalizing and social perception/knowledge were each addressed in only one study. The lack of data on those two domains represents a gap in the existing literature.

3.2.2. Posttraumatic stress disorder

Overall, 6 studies were conducted in PTSD, representing 15% of the reviewed studies. The majority of those studies were conducted in male samples (88% of the subjects). Three types of trauma were targeted: war participation (4 studies), partner violence (1 study) and refugees (1 study), the overrepresentation of men being driven mainly by war participants.

The most studied domain was emotion recognition, evaluated in 67% of the PTSD studies, though only 1 study comprised a sensitivity index. The other domains were scarcely studied, with 2 studies of attributional style both focused on the depressive bias, one mentalizing study that included two different verbal tasks, i.e. Strange stories test (Happe, 1994) and Emotion attribution task (Blair & Cipolotti, 2000; Mazza et al., 2007), and no study assessing social knowledge/perception in people with PTSD.

3.2.3. Obsessive-compulsive disorder

Fourteen studies were found in OCD, making it the second most studied anxiety disorder. Both genders were almost equally represented in the total sample.

Eighty-six percent (86%) of the studies assessed emotion recognition, making it by far the most studied domain in OCD. The majority of those studies (92%) assessed the accuracy to correctly label facial emotions whereas only 8% of these studies assessed sensitivity. Interestingly, OCD is the only disorder in which emotion recognition was studied using stimuli other than emotional facial expressions, i.e. emotional prosody (Bozikas et al., 2009). Again, the other domains of social cognition were scarcely studied. Of the 2 mentalizing studies, one used 3 different classical tasks, i.e. False beliefs (Baron-Cohen, 1989; Frith & Corcoran, 1996), Strange stories (Happe, 1994) and Hinting task (Corcoran, Mercer, & Frith, 1995), and the other used a non-verbal mentalizing task (Fantie, 1989). The only one study of attributional style assessed the negative bias. No study could be found for social perception/knowledge, restricting the possibility of drawing conclusions regarding the performance of OCD patients across social cognition domains.

3.2.4. Panic disorder with or without agoraphobia

Only 6 studies dealt with PD. About 35% of participants in the overall sample suffered also from agoraphobia, with women being over-represented (70% of participants).

The most studied domain in PD was attributional style with 4 studies, 3 of which measured the negative bias while the remaining one assessed the depressive bias. Finally, a gap in knowledge was identified for mentalizing and social perception/knowledge as no study targeted these domains in PD.

3.2.5. Generalized anxiety disorder

GAD was the least studied disorder with only 4 studies, i.e. 10% of all the studies included in our analyses. Men were slightly under-represented relatively to women, counting for about 31% of the total sample.

Only two domains were assessed in GAD, namely emotion recognition and attributional style. Both studies of emotion recognition assessed accuracy. For attributional style, one study assessed the depressive bias and the other targeted the negative bias. Here again, a gap in knowledge was identified for mentalizing and social perception/knowledge as no study targeted these domains in GAD.

4. Discussion

This meta-analysis and scoping review covered social cognitive abilities in PTSD and SP and compared these abilities to those found in other anxiety disorders, namely GAD, OCD and PD. The results of the meta-analysis confirmed that social cognition deficits are present in anxiety disorders, although the affected domains differ among anxiety disorders. Results were more robust for emotion recognition and attributional style, where more data were available, at least for PTSD and SP. A serious lack of research in other domains of social cognition was however highlighted, in particular for social perception/knowledge and mentalizing. The results for these two last domains must thus be interpreted with caution, as the number of published studies is
limited. Also for the other domains, variations in the number of studies found for the different disorders must be kept in mind when interpreting the results, some disorders having received little interest.

However, studying social cognition is particularly relevant for disorders that are stemming from social-interpersonal difficulties such as SP, and that are more socially impairing like SP and PTSD. However, gaining data on social cognition in the other anxiety disorders is also important in order to understand which impairments are due to a specific disorder and which belong to the general presence of anxiety. The availability of data concerning the entire range of anxiety disorders is thus required to allow comparisons between the disorders. In the long term, if social cognition abilities appear to have different presentations across the different disorders, it could become a distinctive clinical tool to help for differential diagnoses.

Despite the small number of published studies, our meta-analysis provides important results. Overall, the meta-analysis suggested that people who suffer from PTSD show a different pattern of social cognition performance compared to other anxiety disorders, while people suffering from SP seem to show social cognition abilities similar to what is found in GAD, OCD and PD. More specifically, available results suggested that people with PTSD present large impairments in mentalizing (effect size $d = -1.13$) and emotion recognition ($d = -1.60$) tasks in comparison to controls, and that these deficits are significantly larger than in most other anxiety disorders. In contrast, available studies suggested that patients with SP, GAD, OCD or PD principally present attribution biases (respectively $d = -1.15$, $-0.97$, $-0.53$ and $-0.97$) whereas the other social cognition domains do not seem as affected (ranging from $d = -0.48$ to $d = 0.04$). Mentalizing and emotion recognition impairments in PTSD can be partly related to the symptomatology of the disorder. Emotional numbing, one of the core symptoms of PTSD, is defined by emotional response deficits and contributes to the emotional processing deficits reported in the disorder (American Psychiatric Association, 1994; Lanius et al., 2010; Litz & Gray, 2002). Apart from being linked to emotion recognition deficits, emotional numbing has been related to impairments in mentalizing (Mazza et al., 2012). Furthermore, aberrant activity of brain regions highly implicated in emotion processing and mentalizing, including a hyperactive amygdala and a hypoactive medial prefrontal cortex, has also been observed in patients with PTSD (Etkin & Wager, 2007; Koenigs & Grafman, 2009). Results concerning attributional biases (overall effect size of $d = 0.08$) are more surprising, as cognitive biases are part of most cognitive theories on PTSD (Brewin & Holmes, 2003). However, only 2 studies assessed attributional style in PTSD and these results might deserve replication and comparison with other disorders before firm conclusions can be drawn. It is also possible that cognitive biases are more apparent in situations that concern the traumatic event.

The scoping review revealed differences across domains of social cognition in anxiety disorders. Mentalizing and social perception/knowledge were largely neglected across all anxiety diagnoses. Given that the effect size of the mentalizing deficit was large at least in the one study targeting this ability in PTSD ($d = -1.13$), it would certainly be interesting to learn more about mentalizing in PTSD. As for social perception/knowledge, the only study was conducted in SP and showed an effect size in the medium range ($d = -0.48$), suggesting that this social cognition domain could be of relevance for patients with anxiety disorders.

Moreover, very few studies have directly compared patients with different anxiety diagnoses in terms of their social cognition performance, and the few studies that did so included only two or three diagnoses (Amir, Foa, & Coles, 1998; Clark et al., 1997; Corcoran, Woody, & Tolin, 2008; Heimberg et al., 1989; Rosmarin, Bourque, Antony, & McCabe, 2009), not the full range of diagnoses. One factor that might contribute to the difficulty in comparing the different diagnoses is the frequent presence of comorbidities between the different disorders in the same patient. In most studies, groups were differentiated according to the primary diagnosis, but it is possible that a patient with a primary diagnosis of GAD also presents with a secondary diagnosis of OCD or major depressive disorder. Relatedly, variations in the composition of the samples across studies and the resulting disadvantage for between-studies comparisons support the need for studies that assess all domains of social cognition in the same sample.

In conclusion, this study leads to two major results. First, PTSD seems particularly impaired in certain domains of social cognition, namely emotion recognition and mentalizing, compared to other anxiety disorders. This emphasizes the different nature of PTSD compared to other anxiety disorders by highlighting the implication of different cognitive processes involved in understanding the social world. The classification of PTSD among the other anxiety disorders has long been debated (Resick & Miller, 2009) and this disorder is now part of a new psychiatric spectrum called trauma- and stressor-related disorders in the DSM-V (American Psychiatric Association, 2013). Our results thus provide further evidence of a distinct pattern of social cognitive functioning of people with PTSD compared to the rest of the anxiety disorder spectrum and contributes to support this new classification. Second, there is a lack of research across several domains of social cognition in anxiety disorders, which is even more drastic for mentalizing and social perception/knowledge. Well-conducted research in these domains could help refine our comprehension of anxiety disorders and bring to light more differences in social cognitive capacities of people presenting with different anxiety disorders, abilities which can have an impact on these patients’ functional recovery.

Acknowledgements

This work was supported by studentships from the Faculté de médecine de l’Université Laval and from the Fondation Robert-Giffard to India Plana. The authors report no potential conflict of interest.

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