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Theory of mind and hypomanic traits in general population

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ABSTRACT

Theory of Mind (ToM) is the ability to assign a set of mental states to yourself and others. In bipolar disorders, alteration of social relationship can be explained by the impairment of the functioning of ToM. Deficit in ToM could be a trait marker of bipolar disorder and people in the general population with high hypomanic personality scores would be more likely to develop bipolar disorders. This study examined 298 participants. Measures of hypomanic personality were evaluated using the Hypomanic Personality Scale. ToM was explored using the Yoni task. Participants also completed the BDI-II. Forward multiple regressions were performed to examine the effect of components of the HPS on the total score in the ToM task. In the women's group, no subscales of the HPS were included in the model. Conversely, the analyses performed on men revealed that the mood vitality and excitement subscale was a significant predictor of ToM abilities. Our study is the first to show the impact of certain dimensions of hypomanic personality on performance in ToM in a male sample. This result supports the idea that deficits in ToM can be a trait marker of bipolar disorder in a healthy male population.

1. Introduction

Theory of Mind (ToM) refers to the ability to represent one's own and other person's mental states (desires, intentions, beliefs) and use this knowledge to understand and predict other people's behavior (Frith and Frith, 2003). ToM is considered, along with emotion recognition and empathy, to be one of the components of social cognition (Gallagher and Frith, 2003). ToM is currently described in terms of two components, referred to as affective and cognitive ToM (Brothers and Ring, 1993; Shamay-Tsoory and Aharon-Peretz, 2007). Cognitive ToM relates to the ability to understand and make inferences about others' mental states, whereas affective ToM refers to the ability to make inferences regarding other people's emotions. Thus, ToM is a complex metacognitive process which is fundamental to social relationships and impaired in several mental disorders, such as schizophrenia (Corcoran et al., 1995; Sarfati et al., 1997; Marjoram et al., 2005; Bommer and Brune, 2006; Kettle et al., 2008; Bozikas et al., 2011), autism (Baron-Cohen et al., 1994, 2001; Lam and Yeung, 2012) and unipolar depression (Lee et al., 2005; Wang et al., 2008; Wilbertz et al., 2010; Wolkenstein et al., 2011).

Another mental disorder in which ToM seems to be impaired is Bipolar Disorder (BD). Indeed, many studies have revealed impaired social, familial and working relations in BD, including during periods of remission (Jaeger and Vieta, 2007). These social difficulties can be explained by the impairment in ToM, especially during symptomatic periods (Kerr et al., 2003; Inoue et al., 2004). Results regarding the euthymic period are inconsistent. While several studies have revealed impaired ToM (Bora et al., 2005; Olley et al., 2005; Lahera et al., 2008; Wolf et al., 2010), Samamé et al.'s (2012) meta-analysis emphasized the fact that impairment is not systematically observed. These discrepancies may be explained by the fact that different criteria of euthymia have been used (Samamé et al., 2012). Finally, differences between affective and cognitive ToM are often observed in euthymic BD patients. BD patients' results have been found to be impaired in cognitive but not in affective ToM (Montag et al., 2009; Shamay-Tsoory et al., 2009; Martino et al., 2011; Ibanez et al., 2012) except in the case of two studies: Bora et al. (2005) revealed impairments on both the cognitive and affective components of ToM in euthymic BD participants, while Barrera et al. (2012) showed preserved abilities on both components. Even if the results about the deficit in ToM in BD patients are inconsistent, most authors highlight the fact that difficulties on ToM tasks can persist during the remission period, and especially with regard to the cognitive component of ToM.

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The fact that euthymic BD patients exhibit impaired social cognition has led researchers to explore the hypothesis according to which this ability could constitute a cognitive endophenotype in BD. For instance, McKinnon et al. (2013) suggested that social cognition could help predict the risk of developing BD prior to the onset of mood symptoms. Given that social cognition impairments can lead to recurrent difficulties in everyday interpersonal relationships, it might increase levels of stress and anxiety and act as a vulnerability factor in the triggering of the first mood disorder episode (McKinnon et al., 2013).

Two methods are commonly used to explore cognitive endophenotypes. The first of these consists in examining individuals who are genetically at risk of developing the disease (i.e., BD) due to its presence, for example, in first-degree relatives. Seidel et al. (2012) adopted this method and found impaired facial emotion recognition in adult, high-risk subjects. Similarly, Brotman et al. (2008a, 2008b) showed that children at-risk for BD presented impairments in facial emotion recognition. However, Whitney et al. (2013) did not find any significant differences in ToM and affect recognition abilities between healthy and symptomatic children with familial risk of BD. Nevertheless, Whitney et al. (2013) underlined the atypical performances of their healthy participants, who made more errors than have generally been observed in other studies that have used the same ToM and affect recognition paradigms. One result of the Whitney et al. study should be stressed: exploratory correlations among high-risk participants showed a significant and negative relation between levels of social functioning and ToM score, thus indicating that poorer social functioning was associated with poorer ToM performance in these participants.

Another way of exploring cognitive endophenotypes consists in examining, in the general population, certain clinical dimensions known to be risk factors for the disorder. In this context, McCarthy-Jones et al. (2012) emphasized that hypomanic personality, a term used to describe people who are cheerful, optimistic, extraverted, self-confident and energetic, although sometimes also irritable, rude, reckless and irresponsible (e.g. Eckblad and Chapman, 1986; Akhtar, 1998), is associated with an increased risk of subsequently developing BD (see also Miller and Chapman, 2001). Hypomanic personality can be assessed using the Hypomanic Personality Scale (HPS) (Eckblad and Chapman, 1986) which contains three clusters: Social Vitality, Mood Volatility and Excitement (Schalet et al., 2011). Mood Volatility explores negative, unpredictable mood states and hypomanic cognition; the Excitement dimension explores the energetic, extremely cheerful mood exhibited by such individuals; and Social Vitality explores social potency and vivaciousness. Schalet et al. (2011) highlighted the importance of analyzing each HPS subscale separately and not the total score.

However, despite the fact that the study of hypomanic personality could shed new light on the vulnerability factors involved in the development of BD, we are not aware of any study that has focused on possible impairments of either affective or cognitive ToM in hypomanic personality subjects. If ToM difficulties appear to be a vulnerability factor for BD, people with a hypomanic personality should present difficulties in ToM tasks given that hypomanic personality is known to be associated with an increased risk of developing BD.

The aim of this study is to examine whether sub-clinical hypomanic personality traits are associated with ToM difficulties in the general population. We hypothesized that the level of hypomania, considered as a trait dimension, could be a good predictor of ToM abilities. Following Schalet et al.'s (2011) suggestion that Mood Volatility is the subscale of the HPS that should best predict the risk of developing BD, we predicted that this subscale would also be the best predictor of scores on a ToM task. Finally, we expected the scores on the HPS subscales to impact more on the cognitive than on the affective dimension of ToM, given that impairments are more pronounced on the cognitive component of ToM during the euthymic period in BD.

We know, on the one hand, that several characteristics differ between bipolar men and women: for example, bipolar men are more likely to exhibit a (hypo)manic polarity whilst bipolar women are significantly more likely to have depressive predominant polarity (Nivoli et al., 2011; Azorin et al., 2013). On the other hand, we know that women are better mind readers than men (Bosacki and Astington, 1999; Baron-Cohen et al., 2001). We therefore conducted separate analyses for women and men.

2. Methods

2.1. Participants and procedure

This study included 393 participants. One hundred and fifty-one participants (30 men) were recruited from the psychology department of the University of Reims. Two hundred and forty-three participants (55 men) were recruited via the web. After removing participants with missing data, the sample consisted of 316 participants (250 women, 66 men; mean age in years $=23.34 \pm 7.8$; education level in years $=13.31 \pm 2.14$).The study was anonymous and written or electronic informed consent was obtained from all participants. The study was designed in accordance with the Declaration of Helsinki.

2.2. Measures

2.2.1. Hypomanic Personality Scale (HPS)

Eckblad and Chapman (1986) developed this scale to assess the risk of developing BD among healthy populations. It is a self-report scale which contains 48 true–false items concerning the features of hypomanic personality and is subdivided into three factors: Social Vitality, Mood Volatility and Excitement (Schalet et al., 2011).

2.2.2. Beck Depression Inventory (BDI-II)

According to Kerr et al. (2003), ToM is impaired in depression. In order to control the impact of depression on our results, we used the BDI-II (Beck et al., 1996) which is a 13-item self-report measure administered to determine the presence and severity of depressive symptoms.

2.2.3. Theory of Mind (ToM evaluated with Yoni task)

ToM was explored using the Yoni task (Shamay-Tsoory and Aharon-Peretz, 2007). This test can be used to explore the ability to attribute mental states on the basis of verbal cues and gaze direction. Each item ($n=54$) is presented with a face named Yoni, surrounded at each corner of the screen by images. A sentence is presented above each item and the participant is asked to complete it depending on Yoni's gaze direction and facial expression and the information contained in the sentence. This test makes it possible to distinguish the affective component ("Yoni likes…") from the cognitive component ("Yoni is thinking of…"). There is also a control condition ("Yoni is near…"). Answers in the control condition only require an analysis of Yoni's physical attributes, whereas the affective and cognitive components require the participants to analyze facial expressions, eye gazes and verbal cues in order to make mental inferences. The task involves two levels of difficulty and contains both first-order items ("Yoni likes….") and second-order items ("Yoni likes the car that… likes") for all conditions (affective, cognitive and control). The Yoni task contains the same number of affective and cognitive component: eight first-order items and 12 second-order items. The physical condition contains eight first-order items and six second-order items. Each answer was scored 0 if incorrect and 1 if correct.

2.3. Statistical analyses

Analyses were conducted using Statistica© 7.1 for Windows. Multiple linear regressions were performed with the Yoni score as the dependent variable. Given that gender effects have been observed in the ToM field (Bosacki and Astington, 1999; Baron-Cohen et al., 2001), indicating that women report higher ToM abilities than men, we decided to conduct separate analyses for women and men as recommended by Howell (2008) in order to avoid biasing the results by gender. We also conducted a *t*-test in order to control for a possible gender difference in education level.