Fathers' "Not Just Right Experiences" predict obsessive-compulsive symptoms in their sons: Family study of a non-clinical Italian sample

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ABSTRACT

The heart of the obsessional process may be considered the subject's underlying impression that "something is wrong". Therefore, the phenomenon labeled "not just right experiences" (NJREs) has increasingly been receiving attention since it captures the subjective sense that "something isn't just as it should be". In the present study we sought to add to the evidence that NJREs may be a putative psychological marker of OCD. To this aim, measures of NJREs, obsessive-compulsive (OC) symptoms and OC-related cognitions were completed by 382 undergraduates (43.2% females), 318 mothers and 288 fathers. NJREs correlations between parents and children were typically in the small-medium range of magnitude and comparable to correlations both for OC beliefs and symptoms. A series of hierarchical multiple regression analyses showed that fathers' (but not mothers') NJREs predicted OC symptomatology in their sons even when parents' anxiety symptoms and their level of OC- related beliefs were controlled. This relationship generally also held for single symptom dimensions such as washing, checking, ordering, and mental neutralizing symptoms. On the contrary, none of parents' psychological variables considered in the present study predicted OC symptoms in daughters. The possible role of NJREs as a marker of OCD is discussed.

Keywords: Not-just-right experiences; obsessive-compulsive disorder; cognitions; endophenotypes; family study.

INTRODUCTION

The key diagnostic feature of obsessive-compulsive Disorder (OCD) in the *Diagnostic and Statistical Manual of Mental Disorders, 4th Edition* (DSM-IV-TR; American Psychiatric Association, 2000) is the presence of persistent, intrusive, and distressing obsessions or compulsions, with marked impairments in quality of life (Eisen et al., 2006; Parkin, 1997). Obsessions are defined as persistent thoughts, ideas, impulses, or images that are initially experienced as intrusive and senseless. Compulsions are a physical corollary to obsessions; they are intentional, repetitive behaviors or mental rituals that are performed in response to obsessive thoughts, or in some stereotyped manner.

Experts have recognized that the manifestations of the condition may be marked by a heterogeneous set of dimensions; for example, McKay et al. (2004) have identified as many as nine subtypes or replicable dimensions of OCD: contamination/washing, harming/checking, hoarding, symmetry/ordering, obsessionals, sexual and religious, certainty, sexual-somatic, and contamination/harming. Patients with OCD may report one (Stein, Forde, Anderson & Walker, 1997) or, more typically, multiple symptoms (Antony, Downie & Swinson, 1998).

OCD has a chronic course, with symptom intensity that usually remains elevated once it has reached clinical levels (e.g., Mataix-Cols et al., 2002). OCD is associated with significant impairments in daily life, including impairments in both social and occupational functioning (Albert, Maina, Bogetto, Chiarle & Mataix-Cols, 2010; Mancebo et al. 2008). For example, upwards of one in three patients with OCD is unable to work, and nearly one-half of these individuals receive disability payments primarily related to their condition (Mancebo et al., 2008).

Data from twin and family studies completed over the past 60 years suggest that OCD is familial. Twin studies of OCD show a strong genetic effect, with significantly higher concordance rates among monozygotic than dizygotic twins (see reviews by Arnold & Richter, 2007, van Grootheest, Cath, Beekman, & Boomsma, 2005, and Pauls, 2008). A meta-analysis based on five

family studies with adult probands found an odds ratio of 4.0 for OCD in case and control first-degree relatives (Hettema, Neale & Kendler, 2001). Black, Gaffney, Schlosser and Gabel, (2003) found that both having a mother with OCD and family dysfunction were predictive of OCD in offspring. Grabe and colleagues (2006) demonstrated that relatives of OCD probands (from clinical and community settings combined) had a significant 6.2-fold higher risk of definite OCD compared with relatives of comparison subjects.

Many studies found that subclinical OCD and obsessive-compulsive (OC) symptoms also aggregate in families in both clinical (e.g., Mathews et al., 2007; Pauls, 2005; see also Arnold & Richter, 2007) and non-clinical samples (e.g., Grabe et al., 2006; van Grootheest, Cath, Beekman & Boomsma, 2007; van Grootheest et al., 2008; Iervolino, Rijsdijk, Cherkas, Fullana & Mataix-Cols, 2011; Taberner et al., 2009). Lastly, several studies documented a family history of OCD especially in males, perhaps due to the preponderance of men with early onset OCD (e.g., Taylor, 2011), or with a higher frequency of tics (e.g., Leckman et al., 2010). It is also true that recent research in early childhood samples suggests that the gender ratio of early onset OCD may be closer than these retrospective data suggest (Garcia, Freeman, Himle, Berman, Ogata,.& Leonard, 2009). In any case, other studies have reported the presence of specific genetic influences for OCD in males (Pooley, Fineberg, & Harrison, 2007; Wang et al., 2009; see also Hu et al., 2013).

Research conducted during the last few decades has dramatically expanded our understanding of the OCD (see Sica, Chiri, McKay & Ghisi, 2010). In particular, scholars have increasingly considered the lack of a sense of satisfaction and presence of feelings of doubt as central features of obsessions and associated compulsions (Ferrao et al., 2012; Gentsch, Schütz-Bosbach, Endrass, & Kathmann, 2012; Harkin, Miellet, & Kessler, 2012; Prado et al., 2008). Such features have been referred to as "premonitory urges", "sensory tics," "just-right perceptions," "sensory experiences," "feelings of incompleteness," and "not just-right phenomena/experiences" (NJREs). OCD patients talk about a tormenting sense of dissatisfaction with their current state, profound feelings of imperfection regarding their need for experiences to conform to exact, yet

often inexpressible criteria (Ghisi, Chiri, Marchetti, Sanavio & Sica, 2010). In agreement with clinical reports, some studies documented prevalence of NJREs ranged from 70% to 80% in OCD patients (Ferrao et al., 2012; Leckman, Walker, Goodman, Pauls & Cohen, 1994; Miguel et al.,1997; 2000).

Moreover, a few broad theoretical models of OCD explicitly included NJREs as *etiologic factors* for OCD. Summerfeldt and colleagues posit the existence of two continuous orthogonal core dimensions—harm avoidance and *incompleteness*—that cut across overt symptoms and, in combination, may underlie most manifestations of OCD (Summerfeldt, Richter, Antony & Swinson, 1999). Szechtman and Woody (2004; see also Hinds, Woody, van Ameringen, Schmidt & Szechtman, 2012) contend that OCD stems from an inability to generate the normal "feeling of knowing" that would otherwise signal task completion and terminate the expression of a security motivational system. Lastly, it has been proposed that the dysregulated activity in frontostriatal system often observed in patients with OCD (e.g.,Chamberlain et al., 2008; ; Rotge et al., 2009; for a review, see Melloni et al., 2012) may manifest as persistent "error signals" erroneously prompting the individual to a (fruitless) corrective action (e.g., Aouizerate et al., 2004; Brown, Friston & Bestmann, 2011; Maltby, Tolin, Worhunsky, O'Keefe & Kiehl, 2005; O'Tool, Weinborn & Fox, 2012).

Several studies have provided evidence for the association between NJREs and OCD or OC symptoms. In two studies with large undergraduate samples, Coles, Frost, Heimberg, and Rhéaume (2003) reported that a measure of NJREs was significantly related to OC features. Further, NJREs have been found to be more strongly correlated with OC symptoms than other domains of psychopathology (e.g., social anxiety, worry, depression). In another study on undergraduate students, experimentally induced NJREs produced distress and urges to change something, but did not produce feared consequences (Coles, Heimberg, Frost, & Steketee, 2005). In the same study, significant relationships were found between NJREs and OC-related constructs (e.g., responsibility,

incompleteness), but not between NJREs and non-OC-related constructs (worry, depressive symptoms, social anxiety; Coles et al., 2005).

Cougle, Goetz, Fitch and Hawkins, (2011), asked non-clinical participants to complete a measure of NJREs along with other self-report measures. Participants were then asked to immerse their hands in a dirt mixture, and afterwards to wash their hands. Cougle and colleagues found that number and intensity of NJREs predicted hand-washing duration. Also, Cougle, Fitch, Jacobson and Lee (in press) found that two different measures of NJREs (the Obsessive-Compulsive Trait Core Dimensions Questionnaire and the Not Just Right Experiences Questionnaire-Revised) were predictive of urge to check following a stove checking task in nonclinical individuals.

Sica, Caudek, Chiri, Ghisi and Marchetti, (2012), administered measures of NJREs, OC symptoms, general distress (i.e., anxiety, depression), and looming maladaptive style to 187 college students on three occasions six months apart (baseline, six-months, and one-year later). Linear mixed effects regression models indicated that NJREs explained OC symptoms variation over time even when general distress and looming style were accounted for. Ghisi and colleagues (2010) examined the relation between self-reported NJREs and OC symptoms in non-clinical and clinical samples. They found an association between severity of NJREs and OC symptoms in a non-clinical sample after controlling for anxiety, depression, and perfectionism. In addition, NJREs sharply discriminated OCD patients from patients with other anxiety disorders or depression.

Lastly, Coles, Hart and Schofield (2012) investigated patients' reports of various factors that may have played a role in the transition from the presence of obsessions and compulsions to full-blown OCD. Increases in the strength of urges for things to feel 'just right' and increases in attention to one's thoughts were commonly viewed as contributing to the onset of OCD.

The putative role of NJREs in OCD appears therefore promising both from a theoretical and empirical perspective and encourages further study. In particular, in agreement with some scholars, we consider NJREs as the manifestation of a deficit in the ability to use emotional experience and sensory feedback to guide behavior (an emotional indicator that lets one know when a state has

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been satisfactorily achieved (e.g., Ecker & Gonner, 2008; Szechtman and Woody, 2004; Summerfeldt et al., 1999). As a such, NJREs may be investigated as a psychological marker of the disorder, a feature possibly reflecting vulnerability for OCD; in fact, in the last few years scholars have been trying to fill the gap in the causal chain between basic mechanisms responsible for OCD (i.e., genes and/or environment context in which an individual is raised) and their phenotipical expression (i.e., symptoms), by focusing on different types of putative markers of vulnerability (Sica et al., 2012; see also Hasler, Drevets, Manji & Charney, 2004, Miguel et al., 2005; Taylor, 2012).

The Current Study

Given the empirical support for OCD as a familial-based disorder, we speculated that a putative marker of vulnerability to this disorder should be shared between parents and their offspring, and that the presence/severity level of such marker in parents should predict OC symptoms in offspring. In fact, many studies have shown that children having a parent with OCD or OC symptoms are more likely to have OC symptoms (Jacobi, Calamari & Woodard, 2006; Leckman et al., 2003; Liakopoulou et al., 2010; Taberner et al., 2009).

We tested three hypotheses: 1) parents' NJREs severity will be associated with NJREs severity in their offspring; 2) parents' NJREs severity will predict OC symptoms in offspring; 3) parents' NJREs severity will predict OC symptoms in offspring above and beyond parental symptoms of anxiety.

Since familiarity for OCD seems influenced also by gender (see introduction), we wanted to test whether parents' NJREs differentially predict OC symptoms in sons and daughters. In addition, since recent research found that NJREs severity was equally related to the various types of OC symptoms (Ghisi et al., 2010; Sica et al., 2012), we expected parents' NJREs to be associated with the most common subtypes of OC symptoms in offspring (e.g., washing, checking, ordering, etc.).

To test the previous hypotheses, measures of NJREs, OC-related beliefs, OC symptoms, and anxiety, were collected from a sample of college students and their parents. We chose a nonclinical sample because phenotypic heterogeneity of clinical population is widely recognized as a possible impediment to the elucidation of the pathophysiology and etiology of neuropsychiatric disorders (e.g., Baer 1994; Charney et al., 2002; ; Iervolino et al., 2011; Haworth & Plomin, 2010). Moreover, nonclinical individuals present reduced comorbidity or treatment confounds compared to clinical ones. Importantly, OC symptoms in people without OCD seem to have similar form and content to OC symptoms in people with OCD (e.g., García-Soriano, Belloch, Morillo & Clark, 2011; Haslam, Williams, Kyrios, McKay, & Taylor, 2005; Julien, O'Connor, & Aardema, 2009; Muris, Merckelbach & Clavan,1997; Olatunji, Williams, Haslam, Abramowitz, & Tolin, 2008), and previous research has indeed demonstrated the utility of student samples in advancing theories of OCD (Grabe et al., 2006; see Gibbs, 1996, for a review). Finally, studies about vulnerability to psychopathology have tested the hypothesized markers under the assumption that they can exist in absence of clinically significant symptoms (see, Chamberlain, Blackwell, Fineberg, Robbins & Sahakian, 2005). Therefore it is particularly relevant to investigate the familiarity of putative markers in nonclinical samples. To our knowledge, this is one of the first studies to examine the relation between NJREs and OC symptoms in families.

METHOD

Participants and procedures

Approximately 550 undergraduates of Health Sciences (Psychology and Medicine) and Sciences (Computer Science and Engineering) from two different Italian universities in Central and Northern Italy were approached during lectures by faculty to participate in a study ''on psychology of family relationships''. To be eligible for the study, individuals had to have been raised by their biological parents and have lived at the family home until they were at least 18 years old. Among

those recruited, 508 students qualified and agreed to participate, corresponding to an average participation rate of 92%, similar to rates in our previous studies with other college-recruited samples. All students were Caucasian and single, and appeared representative of the university population.

Participants were given a general description of the purpose of the study, signed a consent form, and filled in a background information questionnaire and several self-report measures (see below). Each participant was given two sealed envelopes to take home, one for the father and one for the mother. These envelopes included a description of the study, instructions on how to return the questionnaires, a consent form, and the same set of questionnaires completed by the offspring. A few days later, a research assistant collected the parents' questionnaires—securely sealed in a signed envelope—from the students. Participation was voluntary and no payment or course credits were offered to participants. Data were collected at different times throughout the academic year (between October 2011 and October 2012) to avoid effects due to timing of the assessment. Ethical approval was obtained from the institutional ethics committee.

Eighty-six percent of students (n=436; 44% female) returned at least one of their parent's questionnaires (88% mothers, 74% fathers). Twenty-nine students were excluded because they reported anxiety (30%), depression (30%), eating disorders (25%), systemic disorders (10%) or self-harm (5%) which led them to obtain mental health professional advice or help, included pharmacotherapy. Likewise, 40 mothers (60% depression, 24% anxiety, 16% systemic disorders) and 13 fathers (40% depression, 25% systemic disorders, 25% anxiety, 10% neurological disorders) were excluded from the study. The final sample was composed of 382 undergraduates (43.2% females), 318 mothers and 288 fathers. All participants included valid information from at least one of the parents.

For the entire sample there were about 2% of missing answers to each item of the questionnaires and such figure was the same when offspring, mothers and fathers were examined separately. Maximum likelihood estimates of the missing data (EM algorithm) were then computed

and utilized for the subsequent analyses. According Graham (2009), researchers should use missing data procedures since they are good procedures that are based on strong statistical traditions (technical treatments of various EM algorithms are given in Little and Rubin (2002) and Schafer, (1997)).

The mean age was 21.6 years (SD 2.8; range 18–35) for the students, 51.4 years (SD 4.9; range 38–66) for the mothers, and 54.3 years (SD 5.2; range 36–70) for the fathers. Mothers had an average education of 12.6 years (SD=3.8) and 10% reported being separated or divorced; fathers had an average education of 13 years (SD= 4.2) and 7% were separated or divorced. Most student participants still lived with their parents (82.4%); the remainder had lived on their own for an average of about 16 months. With regard to birth order, 23% of students were only children, 46% of the remaining ones were first born, 33% second born and 5% third born (16% did not answer to this question).

Measures

All participants completed a background information questionnaire and the following measures:

The *Not Just Right Experiences-Questionnaire-Revised (NJRE-Q-R;* Coles et al., 2005) has 19 items in three parts. The first part (10 items) presents sample NJREs (e.g., ''I have had the sensation after getting dressed that parts of my clothes did not feel just right'', ''I have had the sensation while organizing my desk that my papers and other things didn't look just right.'') and instructs respondents to indicate whether they experienced these within the past month. The second part (2 items) asks respondents to indicate which NJRE occurred most recently and when it last occurred (past few hours to past month). In the third part (7 items), respondents rate frequency, intensity, immediate distress, delayed distress, rumination, urge to respond, and sense of responsibility associated with the most recent NJRE on a scale from 1 (absence) to 7 (extreme). The

sum of ratings for these last seven items comprises the *NJRE-Q-R severity scale* and represents the measure of NJREs utilized in the current study.

The Italian version of the NJRE-Q-R severity scale demonstrated unidimensionality, excellent internal homogeneity and good temporal stability. Correlations with OC symptoms were significantly higher than correlations with general distress, and after controlling for anxiety, depression and perfectionism, NJRE-Q-R severity remained significantly associated with OC symptoms (Ghisi et al., 2010). In the present study, the alpha coefficient for the NJRE-Q-R Severity was .93 for students, .93 for mothers and .92 for fathers.

The *Obsessive Compulsive Inventory* (OCI; Foa, Kozak, Salkovskis, Coles, & Amir, 1998) is a widely used 42-item self-report questionnaire assessing the distress and frequency of OC symptoms on 5-point Likert scale. Items are grouped into seven rationally derived subscales (washing, checking, ordering, obsessing, doubting, mental neutralizing, and hoarding). Initial reports supported the reliability and validity of this instrument, and showed strong convergence with established measures of OCD, moderate to high internal consistency across the six subscales, and adequate to high test-retest stability (e.g., Foa et al. 1998; Wu & Watson, 2003). The Italian version of the OCI indicated good internal consistency and a 30-day retest reliability, as well as good convergent, divergent, and criterion validity (Marchetti, Chiri, Ghisi & Sica, 2010; Sica et al., 2009). The present study assessed only distress associated with obsessions and compulsions since the two scales (distress and frequency) yield redundant information (e.g., Foa et al., 2002; Wu & Watson, 2003). In the present study, the alpha coefficient for the total OCI distress was .91 (.92 both for mothers and fathers). Consistent with the Italian validation study, alpha coefficients for the OCI subscales exceeded .70 for all individuals, except mental neutralizing and doubting (alpha=.60). Given the exploratory nature of the current study, we elected to use also these two subscales even though their reliability was barely within acceptable limits. The hoarding subscale was nonetheless excluded as hoarding symptoms appear to represent a separate type of mental

health problem (e.g., Pertusa et al., 2010). In any case, it is important to note that the total OCI score used in the present study comprises all the seven rationally derived subscales.

The OCI was preferred over the shorter version composed by 18 items (OCI-R) because previous investigations showed that the brevity of the OCI-R scales may be of concern especially for an excessive restriction of score range (Ghisi et al., 2010; Sica et al., 2012).

The *Beck Anxiety Inventory* (*BAI*; Beck Epstein, Brown, & Steer, 1988) is a 21-item self-report with excellent psychometric properties that measures the severity of anxiety. The Italian version of the BAI has shown good internal consistency (Cronbach's alpha = .89) and a 30-day retest reliability of .62, as well as good convergent, divergent, and criterion validity (Sica, Coradeschi, Ghisi, & Sanavio, 2006; Sica & Ghisi, 2007). In the present study, the alpha coefficient for the BAI was .84 for students, 86 for mothers and .91 for fathers.

Lastly, the sample also completed the Italian version of the *Obsessive Beliefs Questionnaire* (OBQ; Obsessive Compulsive Cognitions Working Group, 2003; 2005). The original OBQ is a self-report instrument consisting of 87 items representing dysfunctional beliefs assessed in 6 domains identified by the OCCWG as central to OCD. Each item is rated on a 7-point scale ranging from 1 (disagree very much) to 7 (agree very much). The Italian version of the OBQ (Dorz et al., 2009[a]; Dorz, Novara, Pastore, Sica, & Sanavio, 2009[b]) was derived from a confirmative factorial analysis on a sample of 752 university students (63.4% females) and comprises 46 items divided in five domains/subscales: excessive responsibility for omission, excessive responsibility for commission, over-importance of thoughts, excessive control of thoughts and perfectionism. The Italian version of the OBQ has shown good internal consistency for the five scales (Cronbach's alpha ranging from .68 to .86) as well as good validity (Novara, Dorz, Pastore, Sica & Sanavio, 2011). In the present study the alpha coefficient for the OBQ total was .93 for students, .94 and .93 respectively for mothers and fathers.

Statistical analyses

The observed range of scores was fairly wide for all variables, and most of the distributions were mildly to moderately positively skewed. Scatter plots for all pairs (not shown) indicated that a linear measure of association was appropriate. Accordingly, Pearson correlations were used to examine the association among variables within and across participant groups. Moreover, to control for the effect of parents' anxiety, Pearson partial correlations were computed when investigating the association between parents and their offspring for NJREs and OBQ scores. Following Cohen's classification (1988), large correlations were defined as .50 and above, medium correlations between .30 and .49, and small correlations between .10 and .29.

A hierarchical multiple regression analysis was performed with the OCI total score in the offspring as dependent variable. This analysis was also performed separately for sons and daughters. In each regression, parents' anxiety symptoms scores were initially forced into the models to control for their possible influence. In a posterior step, the parents' scores on the OBQ were allowed in the equation as independent variables. In the last step, parents' NJREs scores were entered. In this way, we sought to ascertain the role of parents' NJREs on offspring's OC symptoms while the effects of parents' anxiety and OC-related beliefs were taken in account.

To ascertain the predictive role of parents' NJREs on single OC dimensions, a series of multiple regression analyses were also performed with each dimension of the OCI (separately for sons and daughters) as dependent variable.

All statistical analyses were conducted using IBM SPSS statistics, version 20.

RESULTS

Preliminary analyses

Eighty-three percent of the undergraduate sample, 76% of mothers and 76% of fathers reported having experienced at least one of the 10 NJREs described in the NJRE-Q-R. For students the most common were: "When talking to people, I have had the sensation that my words did not sound just right" (58%) and "I have had the sensation while folding my clothes that they did not look the way folded clothes should look" (38%). Mothers and fathers both reported with higher frequency "When talking to people, I have had the sensation that my words did not sound just right" (35% and 29% respectively) and "I have had the sensation while writing something down that the words did not look just how I wanted them to look" (20% and 22% respectively).

Percentage of undergraduates experiencing at least one of the 10 NJREs was 15% within the past few hours, 21.7% within the past day, 47.6% within the past week, and 15.7% within the past month. Percentage of mothers experiencing at least one of the 10 NJREs was 12.3% within the past few hours, 17.3% within the past day, 41.4% within the past week, and 29.1% within the past month. Lastly, percentage of fathers experiencing at least one of the 10 NJREs was 8.8% within the past few hours, 15.5% within the past day, 43.8% within the past week, and 31.4% within the past month.

Means, standard deviations and range of scores for all measures are reported in Table 1. According to the original Italian validation study of the OCI (Sica et al., 2009), the percentage of participants who surpassed the threshold for clinical OC symptoms were the following: OCI-Total= offspring 5%, mothers 5%, fathers 5%; OCI- Washing= offspring 3%, mothers 3%, fathers 4%; OCI- Checking= offspring 6%, mothers 6%, fathers 6%; OCI- Ordering= offspring 7%, mothers 5%, fathers 6%; OCI- Obsessing= offspring 5%, mothers 3%, fathers 1%; OCI-Doubting= offspring 4%, mothers 2%, fathers 3%; OCI-Mental Neutralizing= offspring 8%, mothers 6%, fathers 6%.

Lastly, correlations between OC-related constructs (i.e., NJREs and OC-related beliefs) and OC symptoms within offspring, mothers and fathers are displayed in Table 2. As in many previous studies, NJREs and OC beliefs were consistently related to OC symptoms, with few differences

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among offspring, mothers and fathers. Likewise, the BAI score was associated both with NJREs and OC beliefs, as in previous studies (e.g., Sica et al., 2012).

Correlations between offspring and their parents for NJREs and OC symptoms

The bivariate correlations between students and their parents for NJREs and OC symptoms are reported in table 3. Correlations for NJREs were typically in the small-medium range (Cohen, 1988) and comparable to correlations both for OC beliefs and symptoms. With few differences, the same picture emerged when correlations were computed separately for sons and daughters.

We wanted also to test whether the correlations of NJREs and OBQ scores between parents and their offspring were affected by parents' anxiety symptoms, since in previous studies (as well as in the current one) the BAI score was significantly associated to these constructs (e.g., Ghisi et al., 2010; Sica et al., 2012). To this aim, the variance due to the BAI score was removed when computing correlations between parents and their children. Results showed that parents-children correlations did not substantially change (table 3).

Predicting OC symptoms in offspring from NJREs parents' scores

To examine the unique contribution of parents' NJREs in predicting OC symptoms in their offspring, a hierarchical multiple regression analysis was performed. Results for the final equations are shown in Table 4 (statistics indicated that multicollinearity was not a problem). Fathers' (but not mothers') NJRE-Q-R severity significantly predicted OC symptoms in offspring after controlling for parents' anxiety and OC-related beliefs (OBQ). However, when the same analysis was ran separately for sons and daughters, we found that fathers' NJREs predicted OC symptoms only in sons (Table 4).

To ascertain the role of parents' NJREs in predicting single symptoms dimensions in their offspring, we ran six additional hierarchical multiple regression analyses where the dependent

variables were washing, checking, ordering, obsessional, doubting and mental neutralizing symptoms (statistics indicated that multicollinearity was not a problem). Since the previous analyses showed an effect of parental NJREs for sons only, these additional regressions were carried out separately for sons and daughters. Again, only fathers' NJREs predicted washing, checking, ordering and mental neutralizing symptoms in sons (Tables 5 and 6). On the other hand, none of parents' psychological variables considered in the present study predicted OC symptoms in daughters[1]. In all these analyses but one (checking symptoms), parents' OC beliefs did not account for any significant amount of variance in the offspring's OC symptoms.

DISCUSSION

In the present study we sought to add to the evidence that NJREs may be a putative psychological marker of OCD. Since OCD is a familial disorder, we hypothesized that 1) NJREs aggregate in family and 2) parents' NJREs predict OC symptoms in offspring; 3) parents' NJREs severity predict OC symptoms in offspring above and beyond parental symptoms of anxiety.

Our hypotheses were partially supported. Parents' NJREs correlated with offspring's levels of NJREs; the magnitude of correlations was in the small-medium range, a noteworthy result given that our sample was screened for the absence of any psychopathology. Correlations between parents and offspring for NJREs were comparable in magnitude to correlations for OC symptoms and OC beliefs. This result suggests that, at least, the familial nature of NJREs is as strong as relationship between well-established measures of OC constructs (i.e., symptoms and OC-related beliefs).

Fathers' NJREs (but not mothers') predicted OC symptomatology in sons even when both parents' anxiety symptoms and their level of OC- related beliefs were controlled. This relationship also held for single symptom dimensions: again, only fathers' NJREs significantly predicted washing, checking, ordering, and mental neutralizing in sons. Interestingly, two OC symptoms

dimensions predicted by fathers' NJREs (contamination/washing and ordering) are those considered significantly heritable in family studies on OCD (Cullen et al., 2007; van Grootheest et al., 2008; Hanna et al., 2005).

Neither the obsessional score nor the doubting score were predicted by parents' NJREs, though. The obsessive subscale of the OCI refers basically to an impaired control over mental activity (e.g., "Unpleasant thoughts come to mind against my will and I can't get rid of them"), a broad symptom category not exclusively linked with the OCD features. For instance, in a very recent study of assessment of OC symptoms (Yovel et al., 2012), the OCI obsessive subscale showed the weakest correlations (together with doubting subscale) with 22 categories of OC-related symptoms. In addition, studies on Padua Inventory (Sanavio, 1988), one of the most used measure of OC symptoms, questioned the dimension named "impaired control over mental activities" because of its overlap with worry and rumination (Freeston et al., 1994). Accordingly, the link between NJREs and this type of symptom may be weaker compared to the association between NJREs and other forms of OC symptomatology (i.e., cleaning, ordering, etc.; see also, Alsobrook II, 1999; van Grootheest et al., 2008; Mataix-Cols et al., 2005; Leckman, Zhang, Alsobrook II & Pauls, 2001). Of course, it is also possible that unpleasant obsessions are fueled by different factors (e.g., disgust) and NJREs are more relevant to other OC symptoms categories.

It may appear surprising that parents' NJREs failed in predicting doubting symptoms in offspring, since both constructs seem to describe the tendency towards doubt. However, the doubting scale is the weakest (and shortest) scale of the OCI (see also Yovel et al., 2012) and it showed a low reliability in the present study as well. Actually, the doubting subscale was not included in the short version of the OCI (the OCI-R; Foa et al., 2002) because of its unsatisfactory psychometric properties. In short, we think that such result may be a consequence of the poor validity of the OCI doubting subscale (see below for an ampler discussion about OC measurement issues).

As we have seen, only the fathers' level of NJREs predicted sons' OC symptoms. A few previous studies of familial OC symptoms or OCD also found a prominent role of fathers' psychological characteristics. Lenane et al. (1990) reported that 25% of fathers and 9% of mothers of probands with OCD received this diagnosis; a family study with pediatric probands found that the rates of both OCD and tic disorders were significantly higher in male relatives (Leonard et al., 1992). Thomsen and Mikkelsen (1995) discovered that fathers of probands were more likely to have clinical OCD compared to mothers' subclinical symptomatology, and Liakopoulou and colleagues (2010) found that fathers of children with OCD had increased psychopathology in general and OC symptomatology in particular.

The lack of prediction towards daughters' OC symptoms was unexpected, even though a recent study on the familiarity of OC symptoms found that neither disgust sensitivity nor NJREs in parents were significant predictors of contamination/cleaning or symmetry/ordering in daughters (Taberner et al., 2012). A possible explanation of this result is suggested by a recent twin analyses on the Short Leyton Obsessional Inventory-Children's Version: in this study, significant quantitative sex differences in heritability for both the *Obsessions/Incompleteness* and Numbers/Luck dimensions were found, with these being significantly heritable in males only (Moore, Smith, Shevlin & O'Neill, 2010).

In addition, other studies have found that NJREs are associated to high symptoms severity and/or an higher frequency of precision or exactness manifestations (e.g., Ferrao et al., 2012). Interestingly, many data document in males a higher rate of exactness, symmetry obsessions, ordering compulsions (Castle, Deale & Marks, 1995; Jaisoorya, Janardhan Reddy, Srinath & Thennarasu, 2009; Lensi et al., 1996; Masi et al., 2010; Rasmussen & Eisen, 1988; Torresan et al., 2009), a significantly earlier onset of OCD (Lochner et al., 2004; Rapoport et al. 2000; Samuels et al., 2006), and worse clinical outcome (Lochner et al., 2004; Raffin, Guimaraes Fachel, Ferrao, de Souza & Cordioli, 2009; Stewart, Yen, Stack & Jenike, 2006).

NJREs may therefore be associated to characteristics more frequent in males (Sica et al., 2010; Torresan et al., 2009). As a matter of fact, sex-specific associations between OCD and vulnerability genes have been identified (Lochner et al., 2004); for example, the SLC1A1 gene seems associated with susceptibility to early-onset OCD, particularly among males (Dickel, Veenstra-VanderWeele & Cox, 2006); Wang and colleagues (2009) found evidence for linkage of OCD to chromosome 11 only in the male proband families.

Of note, fathers' NJREs predicted OC symptoms in sons beyond the well-known OC-related cognitive constructs measured by the Obsessive Beliefs Questionnaire. This result is in apparent discordance with the study by Taylor and Jang (2011) who investigated OC- related beliefs in 307 pairs of monozygotic and dizygotic twins and found that OC-related beliefs accounted for a mean of 18% of phenotypic variance in OC symptoms. However, Taylor and Jang studied a sample with a different familial profile than in the current study, and the limited variance in OC symptoms accounted for by psychosocial variables (in the present study, 9% for overall OC symptoms) may have hampered the detection of relevant variables. Also, Taylor and Jang did not examine NJREs in their study. Lastly, a previous study on a clinical sample demonstrated that a NJREs measure differentiated patients with OCD from those with other conditions (anxiety and depressive disorders) when OC beliefs were controlled, whereas OC beliefs did not discriminate among the groups after NJREs severity was controlled (Ghisi et al., 2010).

Our results, in conjunction with data which question the predictive role of OC beliefs in OCD or OC symptoms (e.g., Ghisi et al., 2010; Novara et al., 2011) suggest therefore that OC beliefs are not better related to OCD than NJREs.   In proposing the NJREs as a putative psychological marker of OCD, one crucial issue deals with the specificity of NJREs to OCD. For instance, NJREs have been also associated with Tourette syndrome (e.g., Prado et al., 2008) and a family history of tic disorders (Ferrao et al., 2012). In addition, given that impulse-control disorders, hypochondriasis and body dysmorphic disorder have been proposed to belong to an

"OCD spectrum" (but see also the criticisms to such position: Storch, Abramowitz and Goodman 2008; for a review, Sica et al., 2010) we cannot exclude a link between NJREs and these disorders. Lastly, a recent study advanced the hypothesis of a link between NJREs and autism (Kloosterman, Summerfeldt, Parker, & Holden, in press).

On the other hand, a fair number of evidences speaks in favor of a somewhat discriminant validity of NJREs (Coles and colleagues 2003; 2005; Ecker & Gonner, 2008; Ghisi et al., 2010; Sica et al., 2012). In addition, a few experimental studies demonstrated a specific relationship between NJREs elicited in the laboratory and OC symptoms (Cougle et al., 2011; Cougle et al., in press; see also, Coles et al, 2005; Pietrefesa & Cloes, 2009).

The current study has a number of limitations. Our sample was relatively restricted in educational level, ethnic background, and socio-economic status, and the exclusion of current psychological and physical disorders and distress requiring intervention renders the sample less representative of community samples. Our findings need to be replicated in larger samples with broader demographic characteristics and also with clinical individuals, preferably in prospective studies with longer temporal intervals. Moreover, the present study was based solely on self-report measures; future study may consider other evaluation methods such as a diagnostic interview.

In addition, results of the current study need to be considered with caution, given the modest amount of unique variance explained by the psychosocial variables under scrutiny. However, according Cohen's (1988) scheme to evaluate the substantive significance of R^2, our figures lay in the small-medium range[2].

Also, the OCI may not be the optimal measure of the central features of OCD. We chose such measure since it represents an optimal compromise between length and representativeness of contents (i.e., validity) and because it is probably the most used measure in the world of OC symptoms with excellent psychometric properties. As a matter of fact, the assessment of OCD has always been a challenge because of the complex and heterogeneous phenomenology and the unclear diagnostic limits of this disorder (Bloch et al., 2008; Grabill et al. 2008; Sica, 2012). Future studies

might consider other measures of symptoms. For instance, the Obsessive Compulsive Symptom Rating Scale (OCSRS; Wilhelm and Steketee, 2006; Yovel et al., 2012), assesses 67 specific OCD and OC-related symptoms grouped into 22 categories. The Dimensional Obsessive-Compulsive Scale (DOCS; Abramowitz et al., 2010) is a 20-item measure that assesses the four dimensions of OC symptoms most reliably replicated in previous structural research: contamination, responsibility for harm, injury, or bad luck, unacceptable obsessional thoughts, and symmetry, completeness, and exactness.

In conclusion, data suggest that NJREs appear more associated to OC features than to perfectionism, anxiety or depressive symptoms. This is an encouraging finding given that many psychological OCD-relevant constructs have been identified (e.g., perfectionism, OC beliefs, guilt, etc.), but far fewer OCD-specific constructs have been elucidated (e.g., Steketee, Frost, & Wilson, 2002; Taylor, 2011). No doubt that other studies are needed to establish the construct of NJREs as a putative marker of OCD. For example, it may be interesting to further inquire into the specificity of NJREs by evaluating this construct in other OCD "spectrum" disorders such as hypochondriasis, trichotillomania, tic-disorders, etc. Neuropsychological, neurophysiological, and neuroimaging studies, with appropriate designs and sample sizes, are needed to explore NJREs phenomena in greater detail; also NJREs should be investigated in unaffected first-degree relatives of OCD patients. More generally, longitudinal or even "high risk" research strategies are necessary to establish the role of NJREs in OCD. Lastly, it would be important to ascertain whether NJREs are useful in distinguishing between individuals with early versus late onset OCD, since it has been proposed that the latter form of OCD is more serious and associated with a greater prevalence of OCD in first-degree relatives (Taylor, 2011).

Notes:

1. Results available from the first author

2. According Cohen, "Large" $R^2 = .25$, "medium" $R^2 = .09$, and "small" $R^2 = .01$.

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Not just right experiences in family

Table 1. Means, standard deviations (in parenthesis) and range for NJREs, OC beliefs, anxiety, and OC symptoms in students, mothers and fathers

	Students (N=382)	Range	S	K	Mothers (N= 318)	S	K	Range	Fathers (N=288)	Range	S	K
NJRE-Q-R	17.5 (9.8)	0-46	-.14	-.54	14.7 (10.3)	.35	-.41	0-45	13.6 (9.2)	0-40	.20	-.74
OBQ	131.5 (39.2)	46-287	.43	.47	123 (39.2)	.24	.14	46-242	133 (40.1)	51-254	.41	.14
BAI	8.9 (6.9)	0-43	1.2	1.8	7.3 (6.6)	1.9	3.2	0-36	5.2 (6.5)	0-44	2.2	3.3
OCI-T	22.3 (16.4)	0-91	1.1	1.1	19.6 (15.6)	1.3	1.8	0-84	19.4 (15.5)	0-78	1.3	1.8
OCI-W	3.3 (3.8)	0-19	1.6	2.6	3.5 (3.7)	1.5	2.1	0-19	3.3 (3.9)	0-19	1.6	2.2
OCI-C	4.3 (4.1)	0-22	1.5	2.4	4 (4.1)	1.5	2.4	0-22	4.2 (4.1)	0-22	1.4	2.2
OCI-OR	3.2 (3.3)	0-16	1.2	0.8	2.9 (3)	1.6	3	0-17	3.5 (3.2)	0-14	1.6	2.3
OCI-OBS	5 (4.6)	0-20	1	.64	3.5 (3.8)	1.4	1.5	0-18	3.4 (3.7)	0-20	1.4	1.7
OCI-D	1.6 (1.9)	0-9	1.3	1.4	1 (1.6)	2.4	4	0-11	1.2 (1.7)	0-8	1.6	2.5
OCI-MN	2.6 (2.7)	0-15	1.8	3.1	2.1 (2.4)	2.1	4.1	0-14	2.2 (2.3)	0-13	1.5	2.7

Notes: S = Skewness; K = Kurtosis; NJRE-Q-R= Not Just Right Experiences-Questionnaire-Revised; OBQ= Obsessive Beliefs Questionnaire; BAI= Beck Anxiety Inventory; OCI-T= Obsessive-Compulsive Inventory-Total; OCI-W= Obsessive-Compulsive Inventory- Washing; OCI-C= Obsessive-Compulsive Inventory- Checking; OCI-OR= Obsessive-Compulsive Inventory-Ordering; OCI-OBS= Obsessive-Compulsive Inventory-Obsessing; OCI-D= Obsessive-Compulsive Inventory-Doubting; OCI-MN= Obsessive-Compulsive Inventory-Mental Neutralizing

Table 2. Bivariate correlations between OC-related constructs (NJREs and OC beliefs), anxiety, and OC symptoms within offspring, mothers and fathers.

	Offspring		Mothers		Fathers	
	NJRE-Q-R	OBQ	NJRE-Q-R	OBQ	NJRE-Q-R	OBQ
BAI	.28	.28	.27	.21	.35	.25
OCI-T	.47	.51	.52	.54	.40	.49
OCI-W	.24	.27	.30	.40	.30	.33
OCI-C	.38	.40	.39	.46	.27	.44
OCI-OR	.44	.44	.34	.43	.28	.32
OCI-OBS	.33	.41	.45	.35	.39	.40
OCI-D	.37	.43	.43	.36	.33	.38
OCI-MN	.35	.32	.42	.33	.34	.43

Notes: all correlations are significant at p level <.01; NJRE-Q-R= Not Just Right Experiences-Questionnaire-Revised; OBQ= Obsessive Beliefs Questionnaire; BAI= Beck Anxiety Inventory; OCI-T= Obsessive-Compulsive Inventory-Total; OCI-W= Obsessive-Compulsive Inventory- Washing; OCI-C= Obsessive-Compulsive Inventory- Checking; OCI-OR= Obsessive-Compulsive Inventory-Ordering; OCI-OBS= Obsessive-Compulsive Inventory-Obsessing; OCI-D= Obsessive-Compulsive Inventory-Doubting; OCI-MN= Obsessive-Compulsive Inventory-Mental Neutralizing

Table 3. Correlations between NJRE-Q-R Severity scale, OC beliefs, and OC symptoms of offspring (and separately for sons and daughters) and NJRE-Q-R Severity, OC beliefs and OC symptoms of their parents

	Mothers (N=318)	Fathers (N=288)	both parents (N=224)		Mothers (N=180)	Fathers (N=153)	both parents (N=116)		Mothers (N=138)	Fathers (N=134)	both parents (N=108)
Offspring				**Sons**				**Daughters**			
NJRE-Q-R	.20**	.21**	.32**	NJRE-Q-R	.16*	.25**	.32**	NJRE-Q-R	.28**	.13	.33**
	(.18**)	(.30**)	(.30**)		(.13)	(.37**)	(.32**)		(.26**)	(.16)	(.26**)
OBQ	.27**	.10	.28**	OBQ	.26**	0	.23**	OBQ	.28**	.20*	.34**
	(.35**)	(.10)	(.27**)		(.38**)	(0)	(.22*)		(.30**)	(.19)	(.29**)
OCI-T	.17**	.26**	.25**	OCI-T	.21*	.19*	.17	OCI-T	.15	.29**	.38**
OCI-W	.14*	.28**	.18**	OCI-W	.18*	.35**	.25**	OCI-W	.11	.11	.12
OCI-C	.18**	.22**	.21**	OCI-C	.16*	.14	.02	OCI-C	.22**	.27**	.43**
OCI-OR	.23**	.17**	.30**	OCI-OR	.21**	.12	.22*	OCI-OR	.29**	.19*	.44**
OCI-OBS	.10	.14*	.16*	OCI-OBS	.16*	.15	.22*	OCI-OBS	.03	.10	.09
OCI-D	.07	.09	.02	OCI-D	.12	0	-.05	OCI-D	.05	.15	.19*
OCI-MN	.08	.20**	.15*	OCI-MN	.10	.22**	.06	OCI-MN	.04	.17*	.15

**p<.001; *p<.05; in parenthesis, bivariate correlations after partialling out the parents' anxiety score. Notes: NJRE-Q-R= Not Just Right Experiences-Questionnaire-Revised; OBQ= Obsessive Beliefs Questionnaire; OCI-T= Obsessive-Compulsive Inventory-Total; OCI-W= Obsessive-Compulsive Inventory-Washing; OCI-C= Obsessive-Compulsive Inventory- Checking; OCI-OR= Obsessive-Compulsive Inventory-Ordering; OCI-OBS= Obsessive-Compulsive Inventory-Obsessing; OCI-D= Obsessive-Compulsive Inventory-Doubting; OCI-MN= Obsessive-Compulsive Inventory-Mental Neutralizing. Score for both parents was computed as mean of the mother's and father's score.

Not just right experiences in family

Table 4

Summary of final regression statistics for parents' anxiety symptoms, OC beliefs and the NJRE-Q-R severity scale on offspring's OC symptoms as measured by the OCI Total score

	Offspring (N=223)						Sons (N=115)						Daughters (N=107)				
	β	R	sr	p	R^2		B	r	sr	p	R^2		β	r	sr	p	R^2
BAI-M	.02	.02	.01	.81		BAI-M	.06	.06	.06	.53		BAI-M	0	.0	0	.84	
BAI-F	.02	.02	.02	.77		BAI-F	-.08	-.07	-.07	.43		BAI-F	.10	.10	.09	.32	
OBQ-M	.13	.12	.11	.07		OBQ-M	.15	.14	.13	.14		OBQ-M	.15	.14	.13	.16	
OBQ-F	.04	.04	.04	.55		OBQ-F	0	0	0	.73		OBQ-F	.14	.12	.11	.21	
NJREs-M	.02	.02	.02	.77		NJREs-M	0	.0	.0	.58		NJREs-M	.12	.12	.11	.22	
NJREs-F	.21	.19	.18	.006	.09	NJREs-F	.30	.27	.27	.004	.09	NJREs-F	.11	.09	.08	.34	.16

Notes: r = partial correlation; sr = semi-partial correlation; Anova for final model - Offspring $F_{(6,217)}$=3.4, p<.002; Anova for final model - Sons $F_{(6,109)}$=2.6, p<.03; Anova for final model - Daughters $F_{(6,101)}$= 3.4, p<.004.

BAI= Beck Anxiety Inventory; OBQ= Obsessive Beliefs Questionnaire; NJRE-Q-R= Not Just Right Experiences-Questionnaire-Revised (for all measures, "M" refers to mothers' scores and "F" to fathers' scores)

Table 5. Summary of final regression statistics for parents' anxiety symptoms, OC beliefs and the NJRE-Q-R severity scale on sons' OC symptoms as measured by the OCI Washing, Checking, and Ordering subscales

		OCI-Washing						OCI-Checking						OCI-Ordering			
	β	R	sr	p	R^2		B	R	sr	p	R^2		β	r	sr	p	R^2
BAI-M	0	0	0	.66		BAI-M	.02	.02	.02	.85		BAI-M	.02	.02	.02	.85	
BAI-F	0	0	0	.94		BAI-F	-.08	-.08	-.07	.41		BAI-F	-.06	-.06	-.06	.53	
OBQ-M	.10	.09	.09	.34		OBQ-M	.25	.24	.23	.01		OBQ-M	.07	.07	.07	..47	
OBQ-F	0	0	0	.96		OBQ-F	-.14	-.14	-.13	.14		OBQ-F	.07	.07	.07	.49	
NJREs-M	.04	.04	.03	.67		NJREs-M	-.07	.-.07	-.06	.48		NJREs-M	.04	.04	.03	.71	
NJREs-F	.33	.31	.30	.001	.12	NJREs-F	.27	.25	.24	.01	.05	NJREs-F	.24	.21	.21	.03	.07

Notes: r = partial correlation; sr = semi-partial correlation; N=115; Anova for final model - Washing $F_{(6,109)}=2.6$ p<.03; Anova for final model - Checking $F_{(6,109)}=2.2$, p<.05; Anova for final model - Ordering $F_{(6,109)}= 2.2$, p<.05

BAI= Beck Anxiety Inventory; OBQ= Obsessive Beliefs Questionnaire; NJRE-Q-R= Not Just Right Experiences-Questionnaire-Revised (for all measures, "M" refers to mothers' scores and "F" to fathers' scores)

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Table 6. Summary of final regression statistics for parents' anxiety symptoms, OC beliefs and the NJRE-Q-R severity scale on sons' OC symptoms as measured by the OCI Obsessing, Doubting, and Mental Neutralizing subscales

	OCI-Obsessing						OCI-Doubting						OCI-Mental Neutralizing				
	β	R	Sr	p	R^2		B	R	Sr	p	R^2		β	r	sr	p	R^2
BAI-M	.09	.08	.08	.39		BAI-M	.16	.15	.14	.13		BAI-M	.13	.12	.12	.19	
BAI-F	.02	.02	.02	.86		BAI-F	-.11	-.10	-.10	.28		BAI-F	-.11	-.10	-..09	.29	
OBQ-M	.14	.13	.13	.17		OBQ-M	.08	.08	.07	.43		OBQ-M	0	0	0	.75	
OBQ-F	0	0	0	.93		OBQ-F	-.14	-.14	-.13	.17		OBQ-F	-.05	-.04	-.04	.63	
NJREs-M	-.12	-.10	-.10	.27		NJREs-M	.07	.07	.06	.47		NJREs-M	-.11	-.10	-.09	.30	
NJREs-F	.15	.14	.14	.15	.04	NJREs-F	.13	.12	.12	.19	.01	NJREs-F	.21	.18	.18	.05	.06

Notes: r = partial correlation; sr = semi-partial correlation; N=115; Anova for final model - Obsessing $F_{(6,109)}$=1, p=.50; Anova for final model - Doubting $F_{(6,109)}$=1.2, p=.27; Anova for final model – Mental Neutralizing $F_{(6,109)}$= 2.2 , p<.05

BAI= Beck Anxiety Inventory; OBQ= Obsessive Beliefs Questionnaire; NJRE-Q-R= Not Just Right Experiences-Questionnaire-Revised (for all measures, "M" refers to mothers' scores and "F" to fathers' scores)