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ORIGINAL EMPRICAL STUDY

Construct validity of "Not Just Right Experiences": results from a picture-based assessment procedure

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Abstract

It has been contended that research about "Not Just Right Experiences" (NJREs) would be biased by the type of measures prevalently utilized to assess such phenomenon. That is, items intended to assess a construct conceptualized as a possible vulnerability factor of obsessive–compulsive (OC) symptoms may have tapped the symptoms themselves. In the current study, a picture-based measure of NJREs (NJR-PM) not derived from OC themes was administered to two samples of undergraduate students along with questionnaires of OC symptoms, general distress, and NJREs (the NJRE-Q-R). Exploratory and confirmatory factor analyses in these undergraduate samples showed that the NJR-PM had a unidimensional structure. The total score derived by the sum of ratings to each picture proved insensitive to gender. The NJR-PM was more strongly associated with the NJRE-Q-R than to general distress. Commonality analysis showed that the NJR-PM and the two NJRE-Q-R indices predicted OC symptoms both conjointly and in a distinct way. In addition, the NJR-PM predicted all common types of obsessive–compulsive disorder (OCD) symptoms over and beyond general distress and discriminated individuals with high scores in OC symptoms from low-score counterparts. NJREs can be measured also without reference to patients' symptoms and may therefore be useful in advancing our understanding of obsessive–compulsive disorder.

Keywords Not Just Right Experiences · Assessment · Obsessive–compulsive symptoms · Construct validity · Commonality analysis

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Introduction

Obsessive–compulsive disorder (OCD) is a serious mental condition characterized by the presence of persistent, intrusive, and distressing obsessions or compulsions, with marked impairment in quality of life (Eisen et al. 2006; Kugler et al. 2013; Parkin 1997). OCD represents one of the most incapacitating psychiatric disorders owing to its intensity, the continuous and unchanging or deteriorative course of its symptoms, and the disturbance in psychosocial functioning that they cause (Albert et al. 2010; Mancebo et al. 2008; Visser et al. 2014).

Despite several decades of research, OCD still remains elusive in its etiopathogenetic components (e.g., Sica et al. 2010). Moreover, many studies have provided strong evidence that OCD is clinically heterogeneous, and this clinical heterogeneity is likely due to etiologic heterogeneity (e.g., Abramowitz and Jacoby 2015; Bloch et al. 2008; McKay et al. 2004). A major consequence of this for research is that while many psychological OCD-relevant constructs have been identified (e.g., perfectionism, beliefs, guilt), far fewer OCD-specific mechanisms have been elucidated (e.g., Steketee et al. 2002; Taylor 2011, 2012).

In the last 10 years, however, research has accumulated about a psychological process that seems to play an important role in this severe disorder: the "Not Just Right Experience" (NJRE, Sica et al. 2015). As nicely illustrated by Ecker et al. (2013), the multitude of description levels of NJREs (mental and/or physical state, feeling, type of perfectionism, absence of emotion, etc.) highlights the complexity and heterogeneity of this phenomenon. Therefore, a brief conceptual overview of such construct is warranted.

NJREs: what are they?

The concept of NJREs was first introduced by Janet (1908). He described the experience of NJREs as follows: "they feel that actions that they perform are incompletely achieved or that they do not produce the sought-for satisfaction" (Pitman 1987, p. 226). Based on his pioneering clinical observations, Janet proposed that NJREs play an important role in OC symptoms. Importantly, Janet regarded NJREs as something that cannot be simply reduced to a failure to achieve personal standards defined by one's perfectionistic beliefs.

Janet's definition of NJREs was broad, encompassing concepts that would be known today as alexithymia, depersonalization, derealization, and impaired psychological mindedness. In line with this, a few scholars consider now some manifestation of OCD as "an altered self-experience during or just before/after a compulsive act and spoke of 'incompleteness related to oneself': Those afflicted feel 'not really there', alienated from themselves, as if in a trance, as if dreaming, 'standing next to themselves', observing themselves from the outside, or acting mechanically, 'like robots'" (Ecker et al. 2013, p. 2).

Other contemporary investigators (Coles et al. 2003; Rasmussen & Eisen, 1992; Summerfeldt, 2004), on the other side, define more narrowly NJREs: a sense or feeling that one's actions, intentions, or experiences have not been properly achieved; that is, the experience that something is not "just right." Similarly to Janet, such authors have proposed that NJREs is not simply the by-product of perfectionistic beliefs (i.e., a cognitive phenomenon or a personality trait): NJREs appears to be a "perceptually tinged" phenomenon. In this narrow sense, NJREs seem to reflect the sensory dysregulation problem that several scholars consider at the heart of OCD psychopathology (i.e., McGovern and Sheth 2017; Riesel et al. 2015; Russo et al. 2014; Subirà et al. 2015).

Many studies from several independent research groups have confirmed the role of NJREs (narrowly defined as specified above) in OCD (e.g., Belloch et al. 2016; Bottesi et al. 2017; Coles et al. 2003; Cougle et al. 2013; Ferrão et al. 2012; Ghisi et al. 2010; Hellriegel et al. 2017; Salkovskis et al. 2016; Summerfeldt et al. 2014)[1].

To illustrate, in such studies, cross-sectional and longitudinal associations between NJREs and OCD or obsessive–compulsive (OC) symptoms have been found for both nonclinical and clinical adult samples (e.g., Ferrão et al. 2012; Ghisi et al. 2010; Sica et al. 2012, 2013, 2016; Taylor et al. 2014) and in pediatric OCD populations (Lewin et al. 2015). In addition, several studies have demonstrated that NJREs elicited in the laboratory predict OC symptoms (Belloch et al. 2016; Cougle et al. 2013; see also, Summers et al. 2014). Moreover, preliminary evidence suggests that NJREs could be somewhat *specific* to OCD (e.g., Cameron et al. 2019; Coles et al. 2005; Ecker and Gönner 2008; Ghisi et al. 2010; Taylor et al. 2014; Sica et al. 2015). For instance, NJREs were significantly more strongly correlated with OC symptoms than other domains of psychopathology (e.g., perfectionism, social anxiety, worry, depression; Coles et al. 2003; Coles et al. 2005; Ghisi et al. 2010; Taylor 2012). Sica et al. (2015), who found that a group of OCD patients reported higher levels of NJRE severity than groups of patients with either gambling (GD) or eating disorders (EDs), corroborated this evidence. Similarly, no significant association between NJREs and autistic traits was found (Hellriegel et al. 2017). Lastly, in a very recent study, structural equation modeling (SEM) was used to examine the extent to which NJREs and disgust proneness (DP) were associated with OC symptoms in a sample composed of college students in a model which also included OC-related beliefs and negative affect. The results showed that NJREs and OC beliefs, but not DP, were related to overall OC symptom severity. Moreover, in this study, NJREs were associated with all the main OC symptom dimensions (washing, checking, ordering, obsessing, and mental neutralization; Sica et al. 2019).

Additionally, the relative merits of the broad versus narrow conceptualizations of NJREs have been directly investigated by Ecker et al. (2013) and by Taylor et al. (2014). Ecker et al. (2013) developed the Questionnaire on Self-Related Incompleteness (QSI-12), describing depersonalization, robot-like self-experience, lack of lively feelings, and derealization. They administered the QSI-12 along with measures of narrow NJREs, OC symptoms, and depersonalization/derealization to a sample of OCD patients. The authors found that self-related incompleteness and NJREs *uniquely and independently* contribute to the prediction of OCD symptom severity and show differential relationships to depersonalization/derealization and obsessive–compulsive personality traits. Taylor et al. (2014) found that narrow NJREs (defined as above) are more specific to OC symptoms than broad counterpart (defined as a general factor composed by indicators of psychological mindedness, alexithymia, and derealization/depersonalization), in that the latter was more strongly related to general distress than the former. They concluded that narrow conceptualization of NJREs would seem more useful than the broad conceptualization for understanding why OC symptoms arise.

[1] Despite some slight differences in NJRE definition (e.g., lack of a sense of satisfaction, a sensation of "incompleteness," or the subject's underlying impression that "something is wrong"), almost all these studies used the same indicators to assess NJREs, so we can reasonably assume that they all refer to the same phenomena.

In sum, considering the number of empirical demonstration of the value of NJREs narrowly defined as well as the results of the studies by both Ecker et al. (2013) and Taylor et al. (2014) who confirmed that broad and narrow definitions of NJREs are not overlapping (that is, they represent two distinct phenomena), we elected to define NJREs in this paper simply as "A subjective sense that something isn't just as it should be, something in the world perceived as not right."

Assessment of NJREs

The scholars who elected to investigate NJREs in its narrow meaning typically utilized two questionnaires: the Not Just Right Experiences-Questionnaire-Revised (NJRE-Q-R; Coles et al. 2005) and the Obsessive–Compulsive Core Dimension Questionnaire-Trait Version (OC-TCDQ; Summerfeldt et al. 2014)[2].

The NJRE-Q-R has 19 items and is made up of three parts. The first part presents 10 NJREs (e.g., "I have had the sensation after getting dressed that parts of my clothes did not feel just right") and instructs respondents to indicate whether they experienced these within the past month. The second part (two 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 (seven 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 NJRE-Q-R yields two indices: the *NJRE-Q-R total* (i.e., the sum of the first 10 items) and the *NJRE-Q-R severity scale* (i.e., the sum of ratings for the last seven items; see, for instance, Taylor 2012).

Coles et al. (2003, p. 684) stated that "NJREs were developed based on clinical experience, input from clients with OCD, suggestions from individuals with OCD via the internet, and pilot work." They also explicitly affirmed that "efforts were made to include NJRE situations that were not from typical domains of OCD concerns to avoid complete overlap with OCD symptom content" (Coles et al. 2003, p. 684).

On the other side, the 20-item OC-TCDQ questionnaire was developed to assess harm avoidance (HA) and incompleteness (INC), a feature which may be considered very close to NJREs. In fact, in the validation study, the authors state (p. 84): "The affective component (of OCD) is characterized by a tormenting sense of dissatisfaction or discomfort with one's current state (…) a profound feeling of imperfection—not just right[ness]." Items are rated on a five-point Likert scale from 1 (never applies to me) to 5 (always applies to me). Items corresponding to each construct are summed to yield scale scores. Confirmatory factor analysis provides support for the two-factor structure in nonclinical student samples, thus substantiating the separability of these two constructs (Pietrefesa and Coles 2008; Summerfeldt et al. 2014). According the authors, "The initial item pool was based upon the following: (a) a content analysis of the self-descriptions of 60 OCD clients (…), and (b) a literature review of authoritative references containing phenomenological descriptions of obsessive–compulsive experiences or characterizations of the same or closely related constructs" (Summerfeldt et al.

[2] Recently, an interview-based format was also developed to evaluate this construct. However, the lack of data due to the novelty of such instrument and the heterogeneity of the content—rather different from the usual instruments to assess NJREs—do not allow to take it in consideration as a standard measure of NJREs.

2014, p. 86). The authors noted also that "In order to ensure that the primary focus was the subjective experience associated with symptoms, rather than symptoms or behaviors per se, careful attention was made to item wording to avoid reference to specific symptom content or behavioral indicators" (p. 88; see their study for other details). Nonetheless, HA and INC are not independent; Summerfeldt et al. (2014) reported correlations between these two dimensions of .36 for clinical participants and .70 for nonclinical counterparts. Even greater overlap between the two trait dimensions in nonclinical respondents (r = .76) was reported by Pietrefesa and Coles (2008).

In sum, it is not entirely clear whether these two instruments sufficiently capture the NJRE phenomenon. First, both measures were developed in reference to patients' narratives and/or symptoms; therefore, it is not possible to exclude content contamination wherein items intended to assess constructs conceptualized as putative vulnerability factors of symptoms may have unintentionally tapped the symptoms themselves. Second, as we have seen above, the NJRE-Q-R strongly relies on the participant's recall. Such recall may be influenced by many factors, including current mood, concentration problems, and difficulty in distinguishing past NJREs from other sensory phenomena (e.g., disgust). Third, the high association between HA and INC reported for the OC-TCDQ casts doubt on construct validity of this instrument.

As such, it has been contended that most of the studies may have reached a biased conclusion, as a consequence of how the NJREs had been measured. It has been argued that customary NJRE measures may simply represent an alternative way to assess OC symptoms: Instead of measuring a psychological mechanism, the OCD symptoms are simply measured in a novel way (Fergus 2014; Olatunji, personal communication, June 20, 2017). In addition, since NJREs are considered a "perceptually tinged" phenomenon, it is not clear whether they can be reliably measured by classic questionnaires based on an individual's recalls of past events (i.e., by means of the methods currently used), or if a more direct—online—procedure can be more suitable to evaluate such experiences.

The current study

As we have seen, it is important to evaluate NJREs without any references to OC symptomatology. In addition, a measure not relying on participant's recalls could represent a purer method for assessing NJREs. One possible approach capable of overcoming the aforementioned limitations is the use of a picture-based procedure to evaluate the NJREs. Assessing NJREs through pictures minimizes the biases due to the language (e.g., how the individual interprets the meaning of the sentence), provides a fair direct appraisal of "not right" sensations, and avoids memory biases, while maintaining the convenience of a questionnaire format.

The present investigation aims at developing a picture-based procedure to assess NJREs. Importantly, we did not intend to develop a novel instrument capable of measuring NJREs; instead, we strived at devising a measure not directly linked to OC themes and that focuses only on the current feeling/sensations (i.e., does not rely on retrospective self-report), to demonstrate that it is possible to assess NJREs somewhat separately from OC symptoms. To this purpose, in the current study, we evaluate the internal consistency and construct validity of a picture-based measure of NJREs.

Building on previous research, we expected a picture-based measure of NJREs to be unidimensional, since from a theoretical point of view, NJREs are characterized by a

distress sensation due to the global perception of a lack of rightness. As a matter of fact, a unidimensional structure of the NJRE construct has been found both for the NJRE-Q-R and OC-TCDQ (Ghisi et al. 2010; Summerfeldt et al. 2014; Taylor et al. 2014; Sica et al. 2016). Furthermore, a picture-based measure of NJREs is expected to be more strongly associated with other NJRE measures than with different constructs (i.e., anxiety and depression; convergent and divergent validity).

Given the wealth of evidences linking NJREs to OC symptoms, this instrument is expected to be associated with OC symptoms above and beyond general distress, such as depression and anxiety symptoms (specificity). Besides that, we were also interested to investigate the unique and conjoint effects of this instrument and a classic NJRE questionnaire in predicting OC symptoms. Should this picture-based measure show a unique contribute to the prediction of OC symptoms, we can conclude that it does not simply overlap with a conventional NJRE questionnaire.

Since a few studies found a preferential link between NJREs and ordering/symmetry (e.g., Ecker and Gönner 2008; Fornés-Romero and Belloch 2017; Taylor et al. 2014), our measure should correlate with such subtype of OC symptoms. On the other side, associations with other symptom types could be expected since other studies found that the NJRE construct is associated with types of OC symptoms other than ordering/symmetry (e.g., washing, checking, ordering, etc.; Belloch et al. 2016; Ecker and Gönner 2008; Ghisi et al. 2010; Lee and Wu 2019; Sica et al. 2015; Sica et al. 2019; Taylor et al. 2014). Lastly, a picture-based measure of NJREs is expected to discriminate between individuals high and low in OC symptoms, as a demonstration of discriminant validity, since NJREs are considered a dispositional liability for OCD.

To test our hypotheses, a picture-based measure of NJREs, along with the NJRE-Q-R and measures of general psychopathology and OC symptoms, were collected from two different samples of college students (see below). We chose nonclinical samples because we believe that, in the context of OCD, this population has specific advantages compared with its clinical counterpart. First of all, since individuals seeking treatment for OCD represent a minority of the OCD population (Grabe et al. 2000), they likely differ from nonhelp seekers on social, economic, attitudinal, and personality factors. Confounding factors such as comorbidity also pose challenges for studies of OC phenomena in clinical populations. Also of importance, OCD is a chronic disorder, especially if not treated in the appropriate way (Sica et al. 2010): The long-term psychological (and neurobiological) effects of a chronic OCD are unknown. Finally, the dimensionality of OC symptoms suggests that studies with nonclinical samples can provide useful information on the different underlying mechanisms of OCD (Grabe et al. 2000). In keeping with this, researchers have successfully pursued various forms of analogue research in order to better understand OC phenomena (for a review, see Abramowitz and Jacoby 2014).

Material and methods

Participants

Two samples of undergraduates enrolled in Northern and Central Italy (University of Firenze and University of Padova) participated to the current study. Part of the first

sample (sample 1) was enrolled for a study on NJREs and disgust (Sica et al., submitted) and part for the current study. It consisted of 310 Caucasian, all single, individuals (48.7% females; mean age = 23.5, SD = 4.2; range = 18–35) with a mean education of 15 years (SD = 2.3). The second sample (sample 2) was enrolled for a study on intrusive thoughts and consisted of 256 Caucasian, all single, individuals (71% females; mean age = 22.0, SD = 1.9; range = 18–30) with a mean education of 14.1 years (SD = 1.9).

Participants were approached during lectures by faculty members in 2016. They were given a general description of the purpose of the study, signed a consent form, and were invited to complete online a series of measures, besides providing personal background information. At least the 90% of students agreed to participate; this figure is similar to rates in our previous studies with other college-recruited samples (e.g., Arrindell et al. 2013; Sica et al. 2016).

The study was carried on in accordance with the Declaration of Helsinki. All participants provided their informed consent for potential research analysis and anonymous reporting of findings in aggregate form, in accordance with Italian legal and ethical requirements. In light of the noninvasive nature of the study, an ethics review process was not required. All participants were informed in detail about the aims of the study, the voluntary nature of their participation, and their right to withdraw from the study at any time and without being penalized in any way. All participants were recruited on a voluntary basis, and no incentives were offered for participation. A professional psychologist was available in any phase of the study for assisting the participants in their needs. No participants needed to be referred for any clinical problems.

Measures

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

The *Not Just Right Picture-Based Measure* (NJR-PM) was developed in several steps. To generate an initial pool of items, five PhD-level psychologists interviewed 30 Italian individuals from community about their NJREs[3]. The psychologists gave an initial definition of NJREs as follows: "A subjective sense that something isn't just as it should be, something in the world perceived as not right. Such feeling/sensation is somewhat unpleasant and bothersome. Examples of this kind of phenomena are: a feeling that you get when you think you haven't done something in the right way or a feeling that something in the world around you does not work/appear in just the right way." Definitions were purposely generic and not too detailed to avoid suggesting any particular experience to participants; rather, the five psychologists stressed the dimensions of "feeling" and "sensation." Participants were then asked to describe their own experiences of such phenomena, and these interviews were recorded.

In the second step, the psychologists reviewed the results of the interviews in a supervisory meeting and agreed that four general themes emerged in the majority of NJREs: incompleteness (e.g., a pot without a handle), untidiness (e.g., messy desk),

[3] Consistent with the theory, it has been observed that NJREs are present in more than 80% of individuals

asymmetry (e.g., a floor covered of tiles put in asymmetric way), and the violation of expected rules (e.g., a clock moving backwards).

Subsequently, 24 pictures (six for each identified theme) for different everyday contexts were prepared using Adobe Photoshop. Forty individuals from community (different from those interviewed previously) were then requested to rate the degree of discomfort or annoying feelings evoked by each picture, on a five-point Likert scale ranging from 0 (not at all) to 4 (extreme). Comments by each participant about the picture were also recorded.

For each of the four themes, we retained only the pictures that received a mean rating of 1 or more[4]. In addition, some pictures were excluded because they evoked feelings of repulsion or estrangement (e.g., a person with upside-down eyes, a mouth with crooked tooth, etc.) which are extraneous to the current measure. As a result, we obtained a set of 15 pictures depicting everyday and common contexts that evoke NJRE feelings[5]. Below each picture, a five-point Likert scale was positioned. A separate sheet was used to provide the following instructions: "In the next pages you will see some pictures of everyday objects and/or situations. Please, focus your attention on each picture and rate how much discomfort/annoyance it provokes in you. To provide your rating, use the following numbers: 0 = no discomfort/annoyance at all; 1 = a little discomfort/annoyance; 2 = somewhat discomfort/annoyance; 3 = much discomfort/annoyance; 4 = extreme discomfort/annoyance. There are no wrong or right answers. Try to record the first sensation you feel when watching each picture without thinking too much about it."

The *Not Just Right Experiences-Questionnaire-Revised* (*NJRE-Q-R*; Coles et al. 2005) has 19 items in three parts, as described above. This measure yields two overall indices: the *NJRE-Q-R total* (i.e., the sum of the first 10 items) and the *NJRE-Q-R severity scale* (i.e., the sum of ratings for the last seven items; see, for instance, Taylor 2012). The Italian version of the NJRE-Q-R demonstrated good psychometric properties in several studies (e.g., Ghisi et al. 2010; Sica et al. 2012, 2013, 2015). For instance, Cronbach's alpha for the NJRE-Q-R severity scale was high in both an undergraduate (.87) and a OCD sample (.89); a test–retest reliability at a 1-month interval was good (.76; Ghisi et al. 2010). In the current study, Cronbach's alphas for the NJRE-Q-R severity scale were sample 1 = .91, sample 2 = .93, combined sample = sample 1 + sample 2 = .92. Alphas for the NJRE-Q-R total were sample 1 = .66, sample 2 = .67, combined sample = sample 1 + sample 2 = .70.

The NJRE-Q-R was preferred over the OC-TCDQ since it is the most common questionnaire to assess NJREs; moreover, a validated version of the OC-TCDQ was not available in Italian language.

The *Obsessive–Compulsive Inventory-Revised* (OCI-R; Foa et al. 2002) is a widely used 18-item self-report questionnaire assessing the severity of OC symptoms on five-point Likert scale. Items are grouped into six subscales (washing, checking, ordering, obsessing, hoarding, and mental neutralizing). 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,

[4] We used this threshold to select a wide range of NJREs. As per our general goal, we wanted to develop a method derived by common experiences of laypeople.

[5] A description of each item is provided in Supplementary material.

and adequate to high test–retest stability (Foa et al. 2002). The Italian version of OCI-R indicates good internal consistency and test–retest reliability, as well as good convergent, divergent, and criterion validity (Sica et al. 2009). In the current study Cronbach's alpha for the OCI-R subscales (combined sample) was washing = .76, checking = .76, ordering = .86, obsessing = .88, mental neutralizing = .80, total score = .91. The hoarding subscale was excluded as hoarding symptoms appear to represent a separate type of mental health problem (e.g., Pertusa et al. 2010).

The *Depression Anxiety Stress Scale-21* (DASS-21; Lovibond and Lovibond 1995) is a 21-item measure assessing depression (lack of incentive, low self-esteem, and dysphoria), anxiety (somatic and subjective symptoms of anxiety as well as acute responses of fear), and stress (irritability, impatience, tension, and persistent arousal) over the previous week on a four-point Likert scale. A total score, summing up all the 21 items, is also computed. Good psychometric properties have been reported for the Italian version of this instrument (see review by Bottesi et al. 2015). For instance, in the Italian validation study, Cronbach's alpha coefficients exceeded .70 for all scales both in a community and clinical samples; 2-week test–retest reliability values computed on an undergraduate student sample were large for all the DASS-21 scale scores (Bottesi et al. 2015). In the current study, Cronbach's alphas (combined sample) for depression, anxiety, stress, and total score scales were .88, .81, 87, and .93, respectively.

Statistical analyses

In each sample, less than 5% of answers were missing. Based on missing data procedures recommended by Graham (2009), maximum likelihood estimates of the missing data (EM algorithms) were then computed and used for all the subsequent analyses (Little and Rubin 2002; Schafer 1997).

Exploratory and confirmatory factor analyses (EFA and CFA) were conducted to examine the unidimensionality of the NJR-PM. EFA was performed on sample 1. According to established guidelines (Zwick and Velicer 1986), we retained the number of factors suggested by the scree plot (Cattell 1966), parallel analysis (PA; Horn 1965), and the minimum average partial correlation (MAP) statistic (Velicer 1976).

CFA was carried out on sample 2, with rating scores from the pictures being used as indicators of the latent factor. To determine the fit of the CFA models, we considered the χ^2 test statistic, the comparative fit index (CFI), the Tucker–Lewis index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). The χ^2 test statistic tests the null hypothesis that the differences between the elements of the population covariance matrix and the model-implied covariance matrix are all zero. The χ^2 test statistic, however, is strongly affected by the sample size: Plausible models are easily rejected based on a significant χ^2 statistic, even for negligible differences between the sample and the model-implied covariance matrix, if the sample size is large enough. The CFI and TLI compare the current model with an unstructured baseline model. CFI ranges from 0 to 1, with 0 indicating poor fit and 1 indicating a perfect fit, while TLI can in some cases exceed 1. Generally, CFI and TLI values larger than 0.90 are taken to indicate acceptable fit, although values greater than .95 are desirable (Hox et al. 2010). The RMSEA is a measure of the error of approximation of the specified covariance and mean structures to the covariance and mean structures in the population. RMSEA

values lower than .05 indicate close fit; values between .05 and .08 indicate acceptable fit; values between .08 and .10 indicate mediocre fit, and values greater than .10 indicate poor fit (Cudeck and Browne 1992). SRMR values range from 0 to 1.0, with well-fitting models obtaining values smaller than .05 (Byrne 1998); however, values as high as .08 are deemed acceptable (Hu and Bentler 1999). A second CFA was then conducted on all participants belonging to the two samples to provide more reliable data on the internal structure of our measure.

Pearson correlations were used to examine the associations among the measures under scrutiny. Following Cohen's (1988) classification, large correlations were defined as 0.50 and above, medium correlations between 0.30 and 0.49, and small correlations between 0.10 and 0.29. To test for differences of correlations between measures, Steiger's z transformation was adopted. Linear regression analyses were also conducted to investigate whether the NJR-PM uniquely predicted OC symptoms.

We used commonality analysis to investigate the contribution of NJR-PM, NJRE-Q-R severity, and NJRE-Q-R total in predicting the OC symptoms. Before running this analysis, the outcome variable (i.e., OCI total score) was regressed onto the DASS-21 total score, to control for depressive, anxiety, and stress symptoms. We then proceeded as follows. First, we regressed the OCI total score residuals on NJRE-Q-R severity, NJRE-Q-R total, and NJR-PM; second, to ensure the trustworthiness and replicability of our findings, we performed 10-fold cross-validation analysis. In detail, we computed a predictive R^2_{CV} using repeated 10-fold cross-validation (10-fold cross-validation repeated under 10 different randomizations). Importantly, R^2_{CV} is empirically estimated by resampling the data and indicates the amount of variance in new data that the model is expected to explain (James et al. 2013). Third, we performed commonality analysis, which is a method to decompose model fit (R^2) into nonoverlapping uniquely and commonly explained partitions (Marchetti et al. 2018; Marchetti et al. 2016). When dealing with three predictors, commonality analysis yields seven partitions, but for the sake of clarity and conciseness, in our study, we considered only unique partitions (U) and the second-order overlapping partition (C_{123}; Fig. 3). U partitions represent the proportion of variance uniquely explained by the related predictor (i.e., *specificity*), while C_{123} indicates the proportion of variance that can be explained interchangeably by one of the three predictors (i.e., *overlap*, see Fig. 3).

Regression analyses were also performed to test to what extent NJR-PM was differently related to different types of OC symptoms while controlling for anxiety, depression, and stress scores.

Lastly, covariance analysis was performed to compare the NJR-PM scores between participants with low and high OC symptoms while controlling for general distress (i.e., DASS total score). In line with the current guidelines, we reported eta-squared (η^2) as effect size to inform our ANCOVAs. According to Cohen (1988), η^2 = .01 corresponds to a small effect size, η^2 = .06 to a medium effect, and η^2 = .14 to a large effect size.

For the CFAs, we used the SEM approach as implemented in the LAVAAN package for the R statistical computing environment (version 3.3.2), whereas for the commonality analysis, we used the YHAT package for R. All the other statistical analyses were conducted using IBM SPSS statistics, version 25.

Results

Exploratory factor analysis

Exploratory factor analysis was performed by using principal-axis extraction. The inspection of the scree plot, the parallel analysis, and the MAP test (average partial correlation = .017) strongly supported the one-factor solution, which explained 39.13% of the variance in the unrotated matrix (Fig. 1). All items loaded in a satisfactory way on the common factor (mean value = .56; range .40–.74). In fact, according to Stevens (2002), for sample sizes of 300 subjects, only loadings greater than .30 should be interpreted.

Confirmatory factor analyses

The CFA performed on the data of the second sample was consistent with the hypothesis of a single common factor structure for all 15 indicators. All the fit indices were adequate: χ^2/DF ratio = 2.3, CFI = .98, TLI = .98, RMSEA = .06, SRMR = .08.

We then combined the two samples (N = 566), and we conducted another CFA to provide further support for the unidimensionality of the NJR-PM. Result showed that

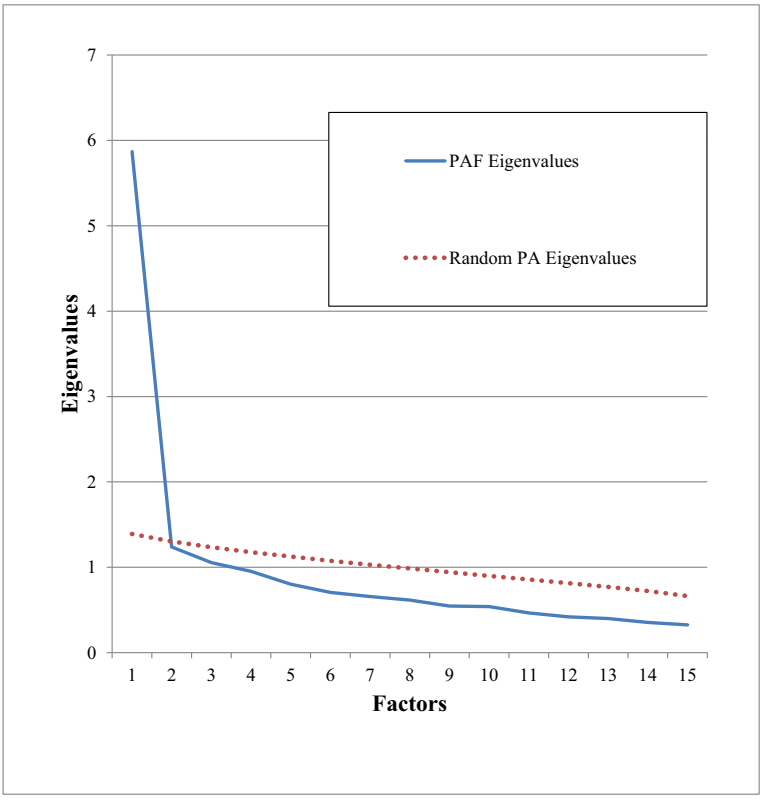

Fig. 1 Exploratory factor analysis with PAF method performed on sample 1: scree plot and parallel analysis outcome

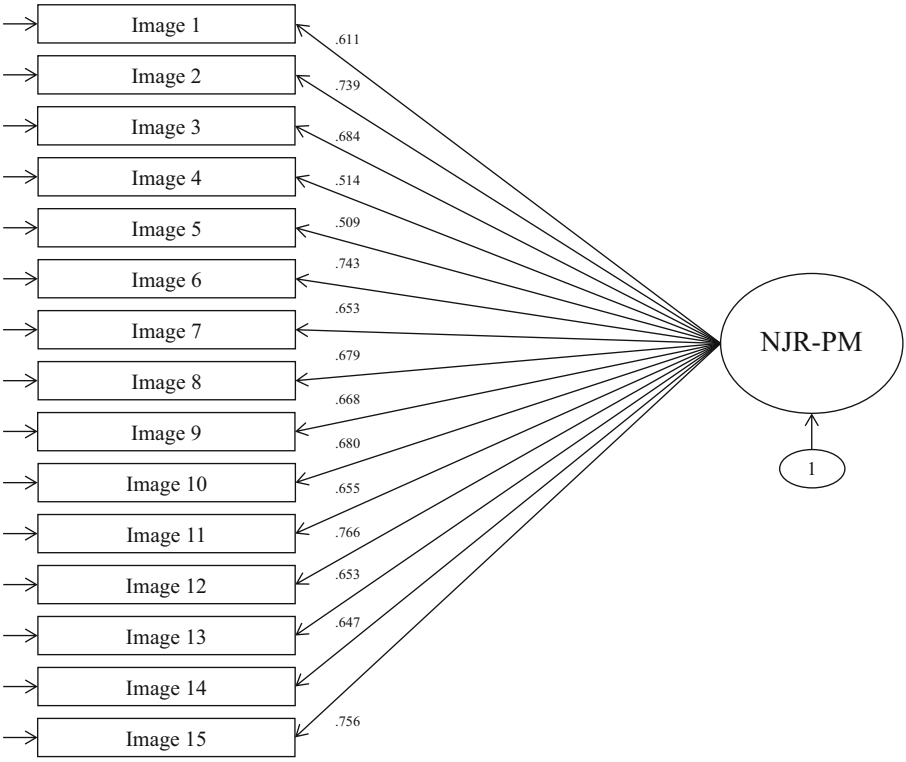

Fig. 2 Confirmatory factor analysis performed on combined sample (N = 566). NJR-PM Not Just Right Picture-Based Measure

all 15 indicators loaded significantly on to the common factor; all fit indices were adequate: χ^2/DF ratio = 3.6, CFI = .98, TLI = .98, RMSEA = .07, SRMR = .071 (Fig. 2)[6].

Descriptive statistics

For the combined sample of 566 individuals, the descriptive statistics for the NJR-PM are shown in Table 1. The value of Cronbach's alpha for the total score (i.e., the sum of ratings to the 15 pictures) was .90 (mean interitem correlations = .56). Lastly, there were no differences between males (mean = 14.1; SD = 9.9) and females (mean = 12.5; DS = 9.9) in NJR-PM total score (t_{564} = 1.94; p = .06).

Convergent and divergent validity

Table 2 shows the correlations between NJR-PM, NJREs, anxiety, depression, and stress for the combined sample (N = 566). The correlations between the NJR-PM and the two NJRE-Q-R indices were of medium size, whereas the correlations between the NJR-PM and the DASS-21 scales were small, except that for the stress scale. The

[6] For the sake of clarity, covariances among items are not shown. They are available on request.

Table 1 Descriptive statistics for the NJR-PM

	M (SD)	*S*	*K*	Range
Image 1	.80 (1.06)	1.27	.79	0–4
Image 2	.93 (.99)	.90	.13	0–4
Image 3	.62 (.90)	1.55	2.02	0–4
Image 4	.85 (1.06)	1.20	.77	0–4
Image 5	.52 (.86)	1.85	3.20	0–4
Image 6	1.11 (1.11)	.78	− .23	0–4
Image 7	.84 (1.04)	1.16	.60	0–4
Image 8	.78 (1.07)	1.32	.85	0–4
Image 9	.90 (1.17)	1.19	.44	0–4
Image 10	1.49 (1.24)	.36	− .88	0–4
Image 11	.69 (.96)	1.52	1.93	0–4
Image 12	.77 (1.02)	1.23	.74	0–4
Image 13	.59 (.95)	1.67	2.19	0–4
Image 14	1.28 (1.20)	.58	− .67	0–4
Image 15	.95 (1.06)	.84	− .26	0–4
Total score	13.14 (9.92)	.83	.36	0–55

S skewness, *K* kurtosis

association between NJR-PM and NJRE-Q-R severity was significantly higher than the correlations between NJR-PM and DASS-21 depression ($z = 3.3$), anxiety ($z = 3.9$), and stress ($z = 2.2$) scales. The correlation between NJR-PM and NJRE-Q-R total was significantly higher than the correlations between NJR-PM and DASS-21 depression and the correlation between NJR-PM and DASS-21 anxiety scales ($z = 1.99$ and $z = 2.6$, respectively).

Table 2 Correlations between the NJRE-PM, the NJRE-Q-R scores, and the DASS-21 scales

	NJRE-Q-R total	NJRE-Q-R severity	DASS-21 anxiety	DASS-21 depression	DASS-21 stress
NJR-PM	.38**	.43**	.26**	.29**	.35**
NJRE-Q-R total		.57**	.29**	.32**	.35**
NJRE-Q-R severity			.37**	.40**	.43**
DASS-21 anxiety				.58**	.63**
DASS-21 depression					.68**

NJR-PM Not Just Right Picture-Based Measure, *NJRE-Q-R* Not Just Right Experiences-Questionnaire-Revised, *DASS-21* Depression Anxiety Stress Scale-21

**$p < .01$

Conjoint and unique effects of NJR-PM and NJRE-Q-R indices in predicting OC symptoms

Table 3 shows that NJRE-Q-R severity, NJRE-Q-R total, and NJR-PM were all significantly and positively related to OC symptoms, even after controlling for depressive symptoms, anxiety symptoms, and stress. For the above regression models, R^2 was about .22; cross-validation analysis suggests that the above-described results are likely to generalize to new data (i.e., R^2_{CV} = .20).

As expected, commonality analysis revealed that about 28% of model fit could be explained by the three predictors interchangeably. Interestingly, a similar proportion of model fit (28%) was explained by NJR-PM in a unique fashion, whereas NJRE-Q-R total and NJRE-Q-R severity accounted uniquely for the outcome to a modest-to-negligible extent (12% and 3%, respectively; see Table 3 and Fig. 3).

Association between the NJR-PM and different types of OC symptoms

To examine the contribution of the NJR-PM score in predicting specific OC symptoms, we ran six multiple regression analyses with washing, checking, ordering, obsessing, mental neutralizing, and OCI-R total score as dependent variable and NJR-PM score and the three scales of the DASS as the independent variables (statistics indicated that multicollinearity was not a problem). Tables 4 and 5 show that in all analyses, the NJR-PM predicted all the OC symptoms measured by the OCI-R as well as the total score. Except for the obsession symptoms, the NJR-PM was more strongly associated with OC symptoms than measures of depression, anxiety, and stress.

Discriminant power of the NJR-PM

Two small groups of students belonging either to sample 1 or sample 2 were selected with high or low OCI-R total scores. The symptomatic group (SG; n = 37, males = 11; females = 26; 14.4% of all students) included those who scored 20 or higher on the OCI-R total score. This threshold corresponds to the 90th percentile for Italian OCI-R norms (Marchetti et al. 2010). The control group (CG; n = 49, males = 11; females =

Table 3 Regression and commonality analysis results using the OCI-R total score as the criterion, after regressing depressive, anxiety, and stress symptoms out (i.e., DASS-21)

Predictor	*B*	*β*	Fit	Specificity	Overlap
NJRE-Q-R severity	0.11*	0.10		U_1 = 2.87%	
NJRE-Q-R total	0.82**	0.20		U_2 = 11.91%	
NJR-PM	0.27**	0.28		U_3 = 28.44%	C_{123} = 28.20%
			R^2 = .220**		
			R^2_{CV} = .20 [0.18, 0.22]		

R^2 = model fit; R^2_{CV} = predictive model fit (i.e., 10-fold cross-validation); U_i = proportion of model fit (R^2) explained uniquely by the i; C_{123} = proportion of model fit (R^2) explained interchangeably by one of the three predictors

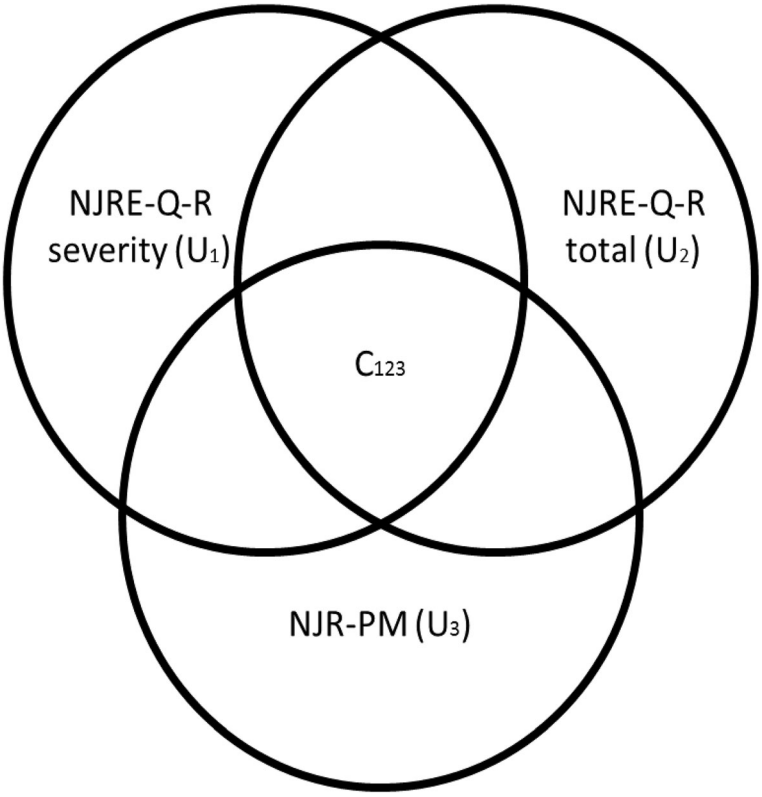

Fig. 3 Commonality analysis with NJRE-Q-R severity, NJRE-Q-R total, and NJR-PM used as predictors and OCI-R total score as outcome. *U*: variance explained uniquely (i.e., specificity) by NJRE-Q-R severity (U_1), NJRE-Q-R total (U_2), and NJR-PM (U_3), respectively; C_{123}: variance explained interchangeably (i.e., overlap) by NJRE-Q-R severity or NJRE-Q-R total or NJR-PM

38) was composed of individuals who scored 2 or less on the OCI-R total score (such threshold of two or less corresponds to the 30th percentile for Italian OCI norms; Marchetti et al. 2010). Such strategy of selection proved useful in a previous study for selecting individuals high and low in OC symptoms (Sica et al. 2016). As shown in Table 1 of the Supplementary material, the two groups were equivalent in gender proportion and age, but the SG exhibited a higher level of OCD, anxiety, and depression symptoms due to the sampling procedure.

A multivariate analysis of variance (MANOVA) was then performed using the NJR-PM total and the single-item score as the dependent variables, group as the independent variable, and the DASS-21 total score as a covariate. This assessed sample effects on NJR-PM, controlling for general distress. The MANOVA resulted significant (Pillai's $F_{(15,69)} = 3.1, p < .001$). Therefore, a series of covariance analyses (with DASS-21 total score as covariate) was performed on NJR-PM total and the single-item scores.

Results showed that the SG scored significantly higher than CG on the NJR-PM total score. The magnitude of such difference was large. Moreover, despite the small sample size, eight items discriminated the two groups; the magnitude of such differences was medium to large (6, 8, 10, 11, 12, 13, 14, 15; see Table 2 of the Supplementary material).

Table 4 Summary of regression statistics for the DASS-21 scales and the NJR-PM total score on OC symptoms as measured by the OCI-R washing, checking, and ordering subscales

	OCI-R washing					OCI-R checking					OCI-R ordering				
Predictors	*B*	SE *B*	*β*	*T*	*p*	*B*	SE *B*	*β*	*t*	*p*	*B*	SE *B*	*B*	*t*	*p*
DASS-21 anxiety	.04	.03	.07	1.32	.19	.06	.03	.09	1.89	,06	− .009	.04	− .01	− .25	.80
DASS-21 depression	− .006	.03	− .01	− .24	.81	.02	.03	.03	.56	.58	− .003	.03	− .005	− .10	.92
DASS-21 stress	.07	.03	.14	2.42	.02	.10	.03	.18	3.10	.002	− .13	.03	.20	3.87	< .001
NJR-PM	.06	.009	.29	6.99	< .001	.07	.01	.29	7.25	< .001	.14	.01	.47	12.50	< .001

DV = OCI-R washing: R^2 = .16; adjusted R^2 = .15. DV = OCI-R checking: R^2 = .21; adjusted R^2 = .21. DV = OCI-R ordering: R^2 = .32; adjusted R^2 = .31

OCI-R Obsessive–Compulsive Inventory-Revised, *DASS-21* Depression Anxiety Stress Scale-21, *NJR-PM* Not Just Right-Picture Method

Table 5 Summary of regression statistics for the DASS-21 scales and the NJR-PM total score on OC symptoms as measured by the OCI-R obsessing and mental neutralizing subscales and the OCI-R total score

	OCI-R obsessing					OCI-R mental neutralizing					OCI-R total				
Predictors	*B*	SE *B*	β	*t*	*p*	*B*	SE *B*	β	*t*	*p*	*B*	SE *B*	β	*T*	*p*
DASS-21 anxiety	.08	.04	.09	2.03	.04	.06	.03	.12	2.21	.03	.29	.13	.10	2.22	.03
DASS-21 depression	.17	.03	.25	5.14	< .001	.005	.02	.01	.21	.84	.27	.11	.11	2.41	.02
DASS-21 stress	.16	.04	.23	4.48	< .001	.04	.03	.10	1.70	.09	.61	.12	.25	5.09	< .001
NJR-PM	.06	.01	.18	4.94	< .001	.05	.008	.27	6.43	< .001	.43	.04	.38	11.02	< .001

DV = OCI-R obsessing: R^2 = .35; adjusted R^2 = .35. DV = OCI-R mental neutralizing: R^2 = .15; adjusted R^2 = .14. DV = OCI-R total: R^2 = .42; adjusted R^2 = .41

OCI-R Obsessive–Compulsive Inventory-Revised, *DASS-21* Depression Anxiety Stress Scale-21, *NJR-PM* Not Just Right-Picture Method

For sake of comparison, such analyses were also repeated by using either the NJRE-Q-R total or NJRE-Q-R severity (and the respective items score) as independent variables. The MANOVA resulted significant both for the NJRE-Q-R total (Pillai's $F_{(10,74)} = 3.7$, $p < .001$) and the NJRE-Q-R severity (Pillai's $F_{(7,76)} = 7.8$, $p < .001$). The covariance analyses (with DASS-21 total score as covariate) showed that SG scored significantly higher than CG on the NJRE-Q-R total; the magnitude of such difference was large. Also, seven items out of 10 discriminated the two groups; most of such differences were of medium size. Likewise, SG scored significantly higher than CG on the NJRE-Q-R severity and all its items. The magnitude of such differences was typically large (see Tables 3 and 4 of the Supplementary material).

Discussion

The aim of the current study was to demonstrate that NJREs can be assessed through pictures depicting everyday situations not devised to tap onto clinical phenomenology of OCD. The main findings are as follows: (1) the factor analysis results showed that all 15 indicators of common everyday NJREs significantly loaded on a single dimension; (2) the NJR-PM total score was more strongly associated with a well-established measure of NJREs than to anxiety and depression scores; (3) when NJR-PM total score and the two NJRE-Q-R indices were simultaneously evaluated in predicting OC symptoms, the NJR-PM uniquely contributed to such prediction; (4) the NJR-PM total score predicted all the type of symptoms measured by the OCI-R, even when anxiety, depression, and stress scores were controlled; (5) the NJR-PM total score discriminated individuals with high levels of OC symptoms from individuals with no OC symptoms.

The EFA and CFA analyses robustly demonstrated that the evaluations to our pictures all converged in a single dimension. Interestingly, despite the heterogeneous content of the various pictures, they all seem to be indicators of the same underlying factor. In addition, the total score derived by the sum of ratings to each picture proved insensitive to gender differences. All these pieces of evidence seem to indicate a possible unitary nature of the NJREs as also showed by the unidimensional structure of the measures currently used to assess NJREs (Ghisi et al. 2010; Summerfeldt et al. 2014). Notwithstanding, it is important also to stress that the different themes emerged by our interviews could differentially contribute to a definition of NJREs (see below the discussion of the study limitations).

The NJR-PM total resulted associated with another conceptually similar measure (the NJRE-Q-R; convergent validity). Predictably, such associations were of medium magnitude, given the different way to assess NJREs and the different development process of the two measures. Moreover, the association between the NJR-PM and the NJRE-Q-R total (i.e., the sum of the first 10 items describing specific NJREs; $r = .38$) suggests that the content of the pictures of the NJR-PM is somewhat different from that of the NJRE-Q-R. Similar results emerged from commonality analysis. From one side, the overlap among the three predictors (i.e., NJR-PM, NJRE-Q-R total, NJRE-Q-R severity) in explaining concurrent OC symptoms was substantial (28% of model fit), suggesting that the different indices may map onto the same construct. From the other side, the NJR-PM accounted for a large proportion of the model fit in a unique way, suggesting that such measure has its own specificity in explaining OC symptoms.

Again, such results confer robustness to the concept of NJREs, given that NJR-PM was developed without reference to OC themes.

The divergent validity of the NJR-PM was supported by weaker associations between the NJR-PM and the three scales of the DASS-21 compared with the associations with the NJRE-Q-R indices. The only exception was the lack of difference of the associations between the NJR-PM and the NJR-Q-R total and the NJR-PM and the DASS-21 stress subscale. Since five indices out of six demonstrated the divergent validity of our measure, this result could be considered spurious; alternatively—and complementing the previous result about the convergent validity—it is possible that the somewhat weak association between the NJRE-Q-R total and the NJR-PM is mainly responsible for this lack of difference. Notwithstanding this, it is reasonable to conclude that the NJR-PM measures a type of discomfort which is not an artifact due to general distress.

The predictive power demonstrated by the NJR-PM towards OC symptoms extended to all the OCI-R subscales. This confirms previous studies which found NJREs associated with all OC symptom categories. For example, Taylor et al. (2014) also found that NJREs significantly predicted OC symptoms even after controlling for harm avoidance in nonclinical samples; Sica et al. (2016) found that in a group of nonclinical individuals with high OC symptom scores, NJREs were robustly associated with all the OC domains (see also Coles et al. (2003) and Ghisi et al. (2010)). Also, Sica et al. (2019) found that NJREs associated with all OC symptom categories even when disgust proneness, OC cognitions, and negative affect were controlled for.

Lastly, the total score of the NJR-PM discriminated a group with high OC symptoms score from a group with no OC symptoms. Such results paralleled those obtained with the two NJRE-Q-R indices and added another evidence about the validity of our picture-based method.

When considered in the context of the existing literature, the present findings suggest that a picture-based method to index NJREs may nicely complement the existing tools, bearing in mind that it does not rely on retrospective self-report. Even more important, we demonstrated that a conceptually derived measure of NJREs without any reference to OCD patients' narratives and/or symptoms appeared equally reliable or valid than traditional measure such as the NJRE-Q-R.

Among the strengths of the current study is the use of well-validated instruments, a relatively large sample of individuals balanced by gender and a selection of an analogue sample based on established criteria. Notwithstanding this, there are a few limitations as well. Our sample was relatively restricted in educational level, ethnic background, and socioeconomic status. Likewise, the content of pictures was selected on the basis of reports of a relatively small group of individuals. In addition, one might say that since the instructions for completing the NJR-PM are relatively wide ranging, they could elicit any type of OCD fear. Actually, we can reasonably rule out the possibility that our measure evoked simply OC fears for two reasons. First, at least three out four facets emerged in our interviews are not OC symptoms (incompleteness, untidiness, violation of expected rules, and also asymmetry in a strict sense is not a symptom of course). Second, in the present study, the correlation between the NJR-PM and the OC symptoms was in the moderate range.

More in general, our definition of NJREs, albeit narrow, is by no means exhaustive. For instance, other concepts, overlapping to varying degrees, have been discussed in

reference to NJREs, including messiness, state of wrongness, feelings of indecision and doubt, and abnormal absence of a "terminator emotion" (Ecker et al. 2013; Ghisi et al. 2010; Szechtman and Woody 2004). In addition, in our interviews, we found four themes characterizing NJREs: Future study should ascertain whether such themes can be considered as relevant as we found also in other populations.

Also, it is essential that our results need to be replicated on clinical samples and tested for their specificity. In fact, current studies on NJREs do not exclude the possibility that NJREs may play a role in OC-related disorders such as those described in DSM-5 "Obsessive-Compulsive and Related Disorders" section (i.e., body dysmorphic disorder, hoarding disorder, hair pulling disorder, excoriation disorder). Interestingly, a recent study of 5409 female members of UK twins found that the disorders listed in this DSM-5 category were influenced by two distinct liability factors. One of these factors was common to all disorders, and another was exclusive to hair pulling disorder and excoriation disorder (Monzani et al. 2014). Perhaps NJREs are responsible for only part of an alternative phenotypic expression of OCD (i.e., the OC-related disorders); the full-blown disorders may depend on other factors different from NJREs. Likewise, NJRE-like experiences have been also frequently reported as one of the features of tic disorders, as phenomenological descriptions suggest that many tics are preceded by a sensory phenomenon often referred to as a "premonitory urge" which patients perceive as aversive or unpleasant (e.g., Woods et al. 2005). Recent research on patients with Tourette syndrome (TS) with the NJRE-R-Q severity scale found that patients diagnosed with TS and comorbid OCD or OC symptoms reported a significantly higher number of NJREs compared with TS patients without OCD/OC symptoms. The authors concluded that the higher frequency in the context of comorbid OCD/OC symptoms suggested that they were more related to compulsions than to tics (Neal and Cavanna 2013; see also Eddy and Cavanna 2014). More research is therefore needed to clarify the role of NJREs in DSM-5 OC-related disorders and tic disorders.

Lastly, more study is needed to ascertain whether an association between narrowly defined NJREs and OC personality disorder exists (see Lee and Wu 2019; Ecker et al. 2013).

As a final note, this study was cross-sectional in nature; therefore, the temporal dynamics of the associations cannot be defined. Longitudinal research will prove valuable in further clarifying the extent to which NJREs measured with a simple picture method are related to OCD and OC symptoms.

Conclusions

In sum, we showed that NJREs are not an epiphenomenon or a symptom of OCD. Moreover, our alternative assessment procedure added validity to the concept of NJREs since it was explicitly based on sensations or feelings evoked "here and now" by specific stimuli. In conclusion, we hope that the current study helps dissipate the doubts about the measures of NJREs and encourage efforts to further clarify the role of this construct in a difficult and serious condition such as OCD.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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