



ORIGINAL ARTICLE

Are “not just-right experiences” trait and/or state marker for obsessive-compulsive disorder?

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Abstract

Background and objectives: “Not Just Right Experiences” (NJREs) are common phenomena in individuals with obsessive-compulsive disorder (OCD), involving a feeling that something is ‘not right’ or as it should be. Some evidence suggests that NJREs may be an endophenotypic marker. This study aimed to investigate whether NJREs are a trait marker present in unaffected first-degree relatives of OCD and/or a state marker associated with obsessive-compulsive symptoms. **Methods:** The study included 51 OCD patients, 47 first-degree relatives and 45 healthy controls. Not Just Right Experiences Questionnaire Revised (NJRE-QR), Frost Multidimensional Perfectionism Scale (FMPS), and Dimensional Obsessive-Compulsive Scale (DOCS) were administered to the participants.

Results: There was no significant difference between the first-degree relatives and healthy controls in respect of NJRE-total and NJRE-severity scores. In the hierarchical regression analysis performed in OCD group, the severity of NJREs were associated with the severity of obsessive-compulsive symptoms and the ‘doubts about actions’ dimension of perfectionism.

Conclusions: This is the first study investigating NJREs in relatives of a clinical OCD group. The results of this study support the view that NJREs are state markers for OCD.

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Introduction

Obsessive-Compulsive Disorder (OCD) is a psychiatric disorder characterized by obsessions and compulsions. Obsessions

and compulsions take up a large proportion of an individual’s time, and may lead to significant impairment of daily functions in occupational and social areas.¹ In recent years, several researchers have suggested that there is a relationship between obsessions/compulsions and the feeling of dissatisfaction and doubt. These experiences have been termed “feelings of incompleteness, imperfection” or “not just right experiences” (NJREs) and defined as “a subjective feeling

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that something is not exactly as it should be".² NJREs can also be defined as a "sensory" regulatory problem when the need is felt to undertake a compulsion until satisfied that the action has been performed completely correctly.^{3,4} Coles et al. (2003) and Summers et al. (2014) reported that NJREs could be related to perfectionism in non-clinical populations.^{5,6} NJREs have been linked to a greater risk of relapse in a large pediatric naturalistic study.⁷

It has been shown that there is a close relationship between both severity and the total number of NJREs and the severity of obsessive-compulsive symptoms.^{5,8,9} Similarly, in two studies by Coles et al in 2003 and 2005, a significant correlation was found between NJREs and obsessive-compulsive symptoms, and there was no significant correlation with psychopathology unrelated to OCD, such as anxiety, social phobia, and depressive symptoms.^{5,10} In a prospective study with three assessments at 6-month intervals, NJREs predicted changes in obsessive-compulsive symptoms, after control of general stress.⁹ These findings suggest that NJREs may be a 'state' characteristic of OCD. On the other hand, Sica et al (2012) proposed that NJREs could be a psychological endophenotype (trait characteristic) for OCD.⁹ An endophenotype represents a genetic risk for the disorder (mediates between genetic factors and phenotypic symptoms), and hence may be present during asymptomatic phases of the disorder, as well as in first-degree relatives of affected individuals, more than in the general population.¹¹

To the best of our knowledge, only two studies have investigated NJREs in unaffected family members of individuals with obsessive-compulsive symptoms. One study on undergraduate students and their parents investigated the relationship between the NJRE severity of parents, the NJRE severity of offspring and obsessive-compulsive symptoms.¹² The results showed that the NJRE severity of the parents was correlated with that of the offspring, and there was a relationship between the NJRE severity of the fathers and the severity of the obsessive-compulsive symptoms of the offspring. In a later study by the same researchers on undergraduate students and their parents, self-report on the Obsessive-Compulsive Inventory (OCI) was used to classify offspring of parents with greater obsessive-compulsive symptoms ("risk group", $n = 141$) and offspring of parents with mild or no obsessive-compulsive symptoms ("control group", $n = 115$). After controlling for depression and anxiety, the NJRE total score was observed to be higher in the risk group, with the NJRE-severity score at a level close to significance. The authors concluded that NJREs could be a candidate endophenotypic marker in OCD. Although both studies included large samples, they included non-clinical participants evaluated on self-report without clinical interviews.¹³

This is the first study investigating NJREs in relatives of OCD patients. The aim of this study was to investigate whether NJREs are a trait marker related to the genetic mechanisms in OCD, and/or a state marker related to clinical characteristics. To investigate the relationship with genetic mechanisms of these sensory experiences, first-degree relatives of OCD patients were included in the study. The hypotheses of the study were (1) the severity of NJREs would be greater in the first-degree relative group than in the healthy control group, and (2) there would be a relationship between NJREs and the severity and dimensions of

obsessive-compulsive symptoms. An exploration of NJREs in relation to clinical symptoms and related traits may contribute to a deeper understanding of the etiology of OCD with regard to cognitive, genetic and neurobiological mechanisms.

Methods

Participants and procedure

The study included a total of 51 individuals diagnosed with OCD according to DSM-5 criteria who presented to the Outpatients Clinic between March 2019 and February 2020, 47 first-degree relatives of these OCD patients, and a control group of 45 healthy individuals matched to the relatives group in terms of gender, age and educational status, with no family history of psychiatric disorder, selected from hospital staff or neighbors. One or more relatives for each patient were included in the relatives group and the group consisted of mothers, fathers, siblings and children. All participants were between the ages of 18-65. Patients with schizophrenia or related psychotic disorders, bipolar disorder, mental retardation, organic mental syndromes, those who had received electroconvulsive therapy (ECT) or transcranial magnetic stimulation (TMS) therapy in the last 6 months and those with a Hamilton Depression Rating Scale (HDRS) score of ≥ 17 were excluded from the study. In line with the exclusion criteria, a total of 16 patients were excluded; 5 with comorbid bipolar disorder, 2 with comorbid psychotic disorder, 6 who had received TMS treatment in the last 6 months, and 3 with HDRS score > 17 . A face-to-face interview was conducted with all patients, first-degree relatives, and the healthy control group. Experienced clinicians (MD psychiatrists) administered diagnostic interviews.

Measures

Not just right experiences questionnaire revised (NJRE-QR)

The NJRE-QR is a 19-item self-report questionnaire. The first 10 items present sample NJREs and respondents are asked to indicate whether or not they experienced each NJRE within the past month. After rating the occurrence of each NJRE, respondents are asked to indicate which NJRE occurred most recently and when it last occurred (from within the past few hours to within the past month). Then, thinking of that particular NJRE, respondents are asked to complete seven ratings, which examine frequency, intensity, immediate distress, delayed distress, rumination, urge to respond, and responsibility. Scores from the NJRE-QR are assessed in two different ways, as the total number of experiences in the past month and as the severity of the most recent experience.⁵ The NJRE-QR has previously shown good psychometric properties in various studies^{5,9,13} and has been translated into Turkish. In this study, the Cronbach alpha coefficient for the NJRE-severity score was 0.91 in the OCD group, 0.95 in the relative group, and 0.95 in the control group.

The Yale-Brown obsessive-compulsive scale (Y-BOCS)

Y-BOCS,¹⁴ is a clinician-rated scale, consisting of 10 items to assess the severity of obsessions and compulsions in respect

of time spent, interference, distress, resistance, and control. Each item is rated by the clinician from 0 (no symptoms) to 4 (extreme symptoms) (total range 0–40). The validity and reliability study of the Turkish version has been established and found to be strong.¹⁵

Hamilton depression rating scale (HDRS)

HDRS was used to evaluate the severity of depression.¹⁶ The scale consists of 17 items rated by the clinician from 0 to 4 or 0 to 2 (total range 0–51). A total score ≥ 17 indicates that the patient may be experiencing major depression. The validity and reliability of the Turkish HDRS has been established and found to be adequate.¹⁷

Hamilton anxiety rating scale (HARS)

The HARS is a 4-point Likert-type scale consisting of 14 items used to determine the anxiety levels and the distribution of symptoms of patients.¹⁸ The points obtained from each item are totaled and the total score obtained ranges between 0 and 56. The validity and reliability of Turkish HARS has been established and found to be adequate.¹⁹

The Frost multidimensional perfectionism scale (FMPS)

The FMPS is a 35-item scale designed to assess perfectionistic beliefs with a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).²⁰ The scale measures 6 dimensions: concern over making mistakes (9 items), setting high personal standards (7 items), perceived parental expectations (5 items), parental criticism (4 items), doubts about actions (4 items), and the tendency to be organized (6 items). Higher scores indicate higher levels of perfectionism. It is recommended that the ‘tendency to be organized’ subscale should not be included in the total scoring, as it shows a weak correlation with other subscales. The validity and reliability of Turkish version has been established and found to be strong.²¹

The dimensional obsessive-compulsive scale (DOCS)

The DOCS²² is a 20-item self-report scale developed to better capture dimensional aspects of OCD severity and it assesses four dimensions of OC symptoms: (1) contamination (2) responsibility (3) unacceptable thoughts (4) symmetry. Each factor is measured across five items related to time, avoidance, distress, impairment, and resistance, with items rated on a 0–4 ordinal scale. The reliability and validity of

the Turkish language version have been established and found to be strong.²³

Statistical analysis

Data obtained in the study were analyzed statistically using SPSS (Statistical Package for Social Sciences) version 22.0 for Windows software. Group differences in categorical variables were computed through the Chi-square test. The One-Way ANOVA Test was used to compare the quantitative variables and Bonferroni Correction was used for post-hoc comparisons. Correlations between clinical variables were assessed using Pearson correlation analysis, and multiple regression analyses to investigate causal relationships. To compare NJRE-severity and NJRE-total scores between the three groups, the ANCOVA test was applied by controlling the age variable. Statistical significance levels were set at $p < 0.05$.

Results

The comparisons of the groups in terms of sociodemographic data showed that there was no significant difference between the groups in terms of gender and education levels, except that the mean age of the OCD group was lower than the first-degree relative and control groups ($p < 0.001$ for both groups) (Table 1).

Examination of the treatment protocols revealed use of SSRI only ($n = 19$), SNRI only ($n = 1$), clomipramine with SSRI ($n = 4$), antidepressant with antipsychotic ($n = 25$); and 2 patients had not yet received treatment. The mean daily drug doses were as follows: sertraline ($n = 22$) 131.81 ± 71.62 mg, fluvoxamine ($n = 5$) 140 ± 54.77 mg, fluoxetine ($n = 8$) 40 ± 15.11 mg, citalopram ($n = 5$) 46 ± 24.08 mg, escitalopram ($n = 2$) 20 mg, paroxetine ($n = 2$) 55 ± 7.07 mg, clomipramine ($n = 8$) 118.75 ± 71.65 mg, venlafaxine ($n = 4$) 132.25 ± 37.50 mg, vortioxetine ($n = 1$) 20 mg, trazodone ($n = 2$) 50 mg, risperidone ($n = 5$) 1.30 ± 0.44 mg, quetiapine ($n = 4$) 193.75 ± 155.95 mg, aripiprazole ($n = 19$) 10.78 ± 7.07 mg, olanzapine ($n = 1$) 5 mg, and amisulpride ($n = 1$) 100 mg.

In the comparison of the three groups in terms of NJRE total and severity scores, DOCS subscale scores, FMPS total scores, HDRS and HARS total scores, statistically significant

Table 1 Comparison of OCD patient, first-degree relative and healthy control groups with regard to sociodemographic and clinical features.

		OCD ($n = 51$)	Relatives ($n = 47$)	Controls ($n = 45$)	Test statistics	df	p
		n (%)	n (%)	n (%)	χ^2		
Gender	Female	33 (64.7)	28 (59.6)	29 (64.4)	0.340	2	0.844
	Male	18 (35.3)	19 (40.4)	16 (35.6)			
		Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	F		
Age		32.45 $\pm$ 11.20	43.80 $\pm$ 13.21	41.86 $\pm$ 10.55	13.256	2	<0.001
Duration of education (year)		11.78 $\pm$ 4.25	10.51 $\pm$ 4.30	11.53 $\pm$ 4.09	1.225	2	0.297
Age onset of OCD		23.39 $\pm$ 9.23	—	—	—	—	—
Duration of illness		9.05 $\pm$ 8.33	—	—	—	—	—
Hospitalization number		0.41 $\pm$ 0.89	—	—	—	—	—
Obsessive-Compulsive Disorder (OCD).							

Table 2 Comparison of HDRS, HARS, DOCS, NJRE and FMPS scores between OCD, first-degree relative and healthy control groups.

	OCD	Relatives	Controls	F	df	p	Post-hoc comparison
	Mean±SD	Mean±SD	Mean±SD				
HDRS	5.66±3.86	2.55±2.21	1.75±2.52	23.313	2	<0.001	OCD>R,C
HARS	10.5±8.77	4.48±5.40	3.26±5.55	15.811	2	<0.001	OCD>R,C
DOCS-Total	28.70±16.23	6±7.77	6.97±8.33	59.731	2	<0.001	OCD>R,C
DOCS-contamination	9.23±5.39	1.68±2.97	2.20±3.15	53.398	2	<0.001	OCD>R,C
DOCS-responsibility	7.19±6.01	1.48±2.14	2.17±3.14	27.25	2	<0.001	OCD>R,C
DOCS-unacceptable thoughts	5.29±5.85	1.29±2.60	0.91±1.63	18.86	2	<0.001	OCD>R,C
DOCS-symmetry	6.98±5.83	1.53±1.95	1.51±2.35	32.22	2	<0.001	OCD>R,C
NJRE-Total	4.62±2.42	1.32±1.79	1.71±1.67	39.89	2	<0.001	OCD>R,C
NJRE-Severity	36.17±10.39	12.34±13.05	15.60±13.35	54.69	2	<0.001	OCD>R,C
FMPS-Total	89±21.70	71.27±20.64	74.53±20.48	9.97	2	<0.001	OCD>R,C
FMPS-Concern over making mistakes	29.39±9.63	19.34±8.19	21.35±7.57	19.03	2	<0.001	OCD>R,C
FMPS-Doubts about actions	14.60±4.10	7.78±3.65	9.33±4.36	38.46	2	<0.001	OCD>R,C
FMPS-Setting high personal standards	23.82±6.27	21.80±5.40	21.84±5.24	2.02	2	0.136	—
FMPS-Perceived parental expectations	12.84±5.51	13.31±5.05	14.04±5.81	0.58	2	0.560	—
FMPS-Parental criticism	9.37±4.25	8.97±4.42	7.95±3.97	1.41	2	0.248	—
FMPS-Tendency to be organized	24.19±5.30	24.82±5.88	23.88±4.67	0.38	2	0.686	—

Obsessive Compulsive Disorder (OCD), First-degree relatives (R), Healthy Controls (C), Standard Deviation (SD), Hamilton Depression Rating Scale (HDRS), Hamilton Anxiety Rating scale (HARS), Dimensional Obsessive-Compulsive Scale (DOCS), Yale-Brown Obsessions and Compulsions Scale (Y-BOCS), Not Just Right Experiences (NJRE), Frost Multidimensional Perfectionism Scale (FMPS).

differences were found between the groups. In post-hoc comparisons, the scores of the OCD group were significantly higher than those of the first-degree relative and control groups (for both groups $p < 0.001$). There was no significant difference between the first-degree relative and control group scores. When the FMPS subscales were compared between the groups, only the 'concern over mistakes' and 'doubts about actions' scores were significantly higher in the OCD group than those of the first-degree relative and control groups (Table 2). The mean scores of the Y-BOCS obsessions and compulsions subscales in the OCD group were 10.78 ± 3.82 and 10.17 ± 4.10 , respectively. NJRE total and severity scores did not differ significantly between men and women in all three groups (Table 3).

At least one of the 10 NJREs described in the NJRE-QR was reported to have been experienced by 98% ($n = 50$) of the OCD group, 53% ($n = 25$) of the first-degree relative group, and 68% ($n = 31$) of the control group. The mean NJRE total score was 4.62 ± 2.42 in the OCD group, 1.31 ± 1.79 in the first-degree relative group, and 1.71 ± 1.67 in the control group. For all three groups the most common NJRE was "When locking the door to my house I have had the sensation that the feel of the lock locking wasn't just right" (72% in the OCD group, 38% in the

first-degree relative group and 35% in the control group). The other most commonly experienced NJREs were: "After washing my hands once, I have had the sensation that they did not feel just the way clean hands are supposed to feel" (58% OCD group), and "When placing a book back onto the shelf I have had the sensation that it did not look just right with the other books" (52% OCD group; 26% control group) "When talking to people, I have had the sensation that my words did not sound just right" (19% first-degree relative group; 24% control group), and "I have had the sensation while organizing my desk that my papers and other things didn't look just right" (14% first-degree relative group).

In the comparisons of NJRE-severity scores amongst the 3 groups with ANCOVA after adjusting for age, there was a statistically significant difference between the OCD (mean = 35.77, standard error=1.82, 95% CI = 32.17-39.37), first-degree relative (mean = 12.63, standard error=1.84, 95% CI=8.99-16.26) and control groups (mean = 15.77, standard error=1.85, 95% CI=12.11-19.42) ($p < 0.001$). In post-hoc comparisons, NJRE-severity scores in the OCD group were significantly higher than in both the first-degree relative ($p < 0.001$) and control groups ($p < 0.001$). No significant difference was found between the first-degree relative

Table 3 Comparison of NJRE total ve NJRE severity scores with regard to gender.

	NJRE Total				NJRE Severity			
	Female	Male	F	p	Female	Male	F	p
	Mean±SD	Mean±SD			Mean±SD	Mean±SD		
OCD	4.69±2.48	4.50±2.38	0.075	0.785	37.69±10.83	33.38±9.17	2.042	0.159
Relative	1.71±0.93	0.73±2.12	3.542	0.066	14.32±13.83	9.42±11.55	1.617	0.219
Control	1.82±1.58	1.50±1.86	0.390	0.536	17.24±12.46	12.62±14.76	1.239	0.272

Obsessive Compulsive Disorder (OCD), all df=1.

and control groups in terms of NJRE-severity scores ($p = 0.67$).

Correlation analysis between clinical variables, depression, and anxiety levels, OCD symptom dimensions, and perfectionism in OCD, first-degree relative and control groups are given in Table 4. In the OCD group, age ($r = 0.417$, $p = 0.002$), and duration of illness ($r = 0.280$, $p = 0.046$) correlated with NJRE-severity. Also in this group, Y-BOCS total score was significantly and positively correlated with HARS ($r = 0.529$, $p < 0.001$), HDRS ($r = 0.535$, $p < 0.001$), 'doubts about actions' dimension of perfectionism ($r = 0.477$, $p < 0.001$) and NJRE-severity ($r = 0.657$, $p < 0.001$).

Hierarchical multiple regression analysis was performed to examine the predictors of NJRE-severity. The NJRE-severity score was taken as the dependent variable, and age, HARS, HDRS, 'concern over making mistakes' and 'doubts about actions' dimensions of perfectionism, and Y-BOCS scores were taken as independent variables. To control the effects of age, HARS and HDRS total scores, these variables were taken in the first step with the enter method. 'Concern over making mistakes' and 'doubts about actions' dimensions of perfectionism, and Y-BOCS scores were taken in the second step with the stepwise method. In the third model age, Y-BOCS-total score and 'doubts about actions' dimension of FMPS significantly contributed to the variance in NJRE-severity score (Table 5).

Discussion

This study investigated whether or not NJREs are a "trait" marker related to genetic mechanisms and/or a "state" marker related to symptoms of OCD. The results showed that the total number and severity of NJREs were significantly greater in the OCD group than in the first-degree relative group and the control group, and there was no difference between the relative and control groups. In all three groups, the severity and total number of NJREs were correlated with the dimensions of almost all the obsessive-compulsive symptoms. In the hierarchical regression analysis, NJRE-severity was related to age, OCD symptom severity and the 'doubts about actions' dimension of perfectionism.

In the current study, NJREs were not found to be more frequent or more severe in the unaffected relatives than in the healthy control group, and hence the hypothesis that NJREs may be an endophenotype related to the genetic mechanisms of OCD was not supported. Earlier studies have proposed NJREs as an endophenotype based on the increased number and severity of NJREs in offspring of parents with a

risk for OCD (defined as parents scoring 85th percentile or greater on the OCI in a non-clinical sample).¹³ Another study by the same group¹² reported that the NJRE severity of the parents was correlated with that of the offspring, and there was a relationship between the NJRE severity of the fathers and the severity of the obsessive-compulsive symptoms of the offspring. However both the above studies utilized self-report data in non-clinical samples, in contrast to the clinical sample in this study. These results suggest a need for further studies including relatives of those with clinical OCD to examine the role of NJREs as an endophenotypic marker for OCD.

NJREs were significantly greater in number and severity in the OCD group compared to the first-degree relatives and control groups. It is interesting that 68% of our healthy control group had experienced at least one of the NJREs. This is similar to previous research,¹³ and suggests that NJREs may be part of the range of normal experience, but are significantly heightened in the OCD symptomatic state. NJREs were correlated with the severity of obsessive-compulsive symptoms within all three of our study groups. The finding that NJREs are related to obsessive-compulsive symptoms is generally consistent with the current literature on the subject.^{5,8,9,24,25} In a prospective study by Sica et al (2012), it was reported that after control of general stress, NJREs predicted changes in obsessive-compulsive symptoms.⁹ In parallel, Coles and Ravid (2016) showed that a decrease in obsessive-compulsive symptoms in OCD patients after cognitive behavioral therapy was related to a decrease in NJREs.²⁶ Sica et al (2015) found that the relationship between NJREs and ordering and neutralization symptoms was greater in OCD patients than in those with obsessive-compulsive related disorders, and it was suggested that NJREs could be specific to OCD.²⁷ The findings of the current study were consistent with the literature and showed a relationship between NJREs and obsessive-compulsive symptoms, independent of the severity of perfectionism, depression and anxiety.

In the hierarchical regression analysis applied in the current study, there was no evidence of a unique relationship between NJRE severity and anxiety and depression. These findings strengthen the hypothesis that NJREs are specific to OCD. However, there is no consistent evidence showing that these experiences are specific to certain symptom dimensions within OCD. Studies on the types of OCD symptoms associated with NJREs, conducted on both clinical and sub-clinical samples, have generally shown a relationship between NJREs and the majority of OCD symptom types.^{4,9,24-26,28} In the current study too, the relationship of

Table 4 Correlation analysis between clinical variables, depression, and anxiety levels, OCD symptom dimensions, and perfectionism.

	OCD				Relative				Control			
	NJRE Severity		NJRE Total		NJRE Severity		NJRE Total		NJRE Severity		NJRE Total	
	r	p	r	p	r	p	r	p	R	p	r	p
HARS	0.409	0.003	0.242	0.088	0.443	0.002	0.514	<0.001	0.240	0.113	-0.011	0.942
HDRS	0.375	0.007	0.153	0.284	0.379	0.009	0.480	0.001	0.060	0.693	-0.157	0.303
Y-BOCS-Total	0.657	0.001	0.302	0.031	—	—	—	—	—	—	—	—
DOCS-Total	0.449	0.001	0.597	<0.001	0.613	<0.001	0.613	<0.001	0.440	<0.001	0.402	0.006
DOCS-Contamination	0.571	<0.001	0.169	0.236	0.433	0.002	0.456	0.001	0.287	0.056	0.240	0.113
DOCS-Responsibility	0.227	0.110	0.484	<0.001	0.504	<0.001	0.365	0.012	0.466	0.001	0.402	0.006
DOCS-Unacceptable thoughts	0.157	0.271	0.425	0.002	0.580	<0.001	0.672	<0.001	0.392	0.008	0.248	0.101
DOCS-Symmetry	0.329	0.019	0.580	<0.001	0.456	0.001	0.452	0.001	0.329	0.027	0.454	0.002
FMPS-Total	0.266	0.059	0.479	<0.001	0.346	0.017	0.305	0.037	0.285	0.058	0.191	0.209
<i>FMPS-Concern over making mistakes</i>	0.314	0.025	0.504	<0.001	0.275	0.061	0.208	0.160	0.251	0.096	0.119	0.435
<i>FMPS-Doubts about actions</i>	0.443	0.001	0.524	<0.001	0.426	0.003	0.339	0.020	0.291	0.052	0.038	0.803
<i>FMPS-Setting high personal standards</i>	0.080	0.577	0.483	<0.001	0.087	0.561	0.130	0.385	0.256	0.090	0.259	0.086
<i>FMPS-Perceived parental expectations</i>	0.094	0.513	0.100	0.484	0.255	0.084	0.310	0.034	0.171	0.261	0.265	0.078
<i>FMPS-Parental criticism</i>	-0.035	0.807	0.109	0.447	0.364	0.012	0.253	0.086	0.083	0.589	-0.016	0.919
<i>FMPS-Tendency to be organized</i>	0.087	0.420	0.181	0.203	-0.138	0.355	-0.057	0.706	0.175	0.251	0.385	0.009

Obsessive Compulsive Disorder (OCD), Hamilton Depression Rating Scale (HDRS), Hamilton Anxiety Rating Scale (HARS), Yale-Brown Obsessions and Compulsions Scale (Y-BOCS), Dimensional Obsessive-Compulsive Scale (DOCS), Not Just Right Experiences (NJRE) Frost Multidimensional Perfectionism Scale (FMPS).

Table 5 Multiple hierarchical regression analysis that demonstrates the predictors of NJRE-Severity in OCD patients.

Model	B	SE	Beta	t	p
1. Model					Adjusted R ² =0.300
(constant)	18.376	4.067		4.519	<0.001
Age	0.369	0.111	0.397	3.328	0.002
HDRS	0.384	0.185	0.324	2.070	0.044
HARS	0.318	0.423	0.118	0.751	0.456
2. Model					Adjusted R ² =0.452
(constant)	12.586	3.919		3.211	0.002
Age	0.240	0.104	0.259	2.315	0.025
HARS	0.178	0.173	0.150	1.027	0.310
HDRS	-0.071	0.389	-0.026	-0.181	0.857
Y-BOCS	0.683	0.183	0.512	3.738	0.001
3. Model					Adjusted R ² =0.504
(constant)	3.995	5.141		0.777	0.441
Age	0.311	0.103	0.336	3.023	0.004
HARS	0.285	0.170	0.240	1.670	0.102
HDRS	-0.411	0.396	-0.153	-1.039	0.304
Y-BOCS	0.485	0.192	0.363	2.525	0.015
FMPS-Doubts about actions	0.770	0.318	0.304	2.425	0.019

Standart Error (SE), Hamilton Anxiety Rating scale (HARS), Hamilton Depression Rating Scale (HDRS), Yale-Brown Obsessions and Compulsions Scale (Y-BOCS), Frost Multidimensional Perfectionism Scale (FMPS).

NJREs was not specific to any obsessive-compulsive symptom dimensions.

Perfectionism, particularly the ‘doubts about actions’ and ‘concern over making mistakes’ dimensions, have showed the strongest relationship with the frequency and intensity of NJREs,⁵ corroborated by the present study. In addition to these two dimensions of perfectionism, Summers et al. (2014) reported that the organization dimension showed a relationship with NJREs.⁶ Further analysis of our findings showed that the ‘doubts about actions’ dimension was related to NJRE severity independently of depression, anxiety, and the severity of obsessive-compulsive symptoms. This also converges with findings of hyperactive error monitoring in OCD.²⁹ Other studies have also suggested that incompleteness (a construct related to NJREs) may explain OCD rituals through a dysfunction of ‘stop signals’.³⁰ It is possible that NJREs, present as a normal tendency in the general population, may be mediated by perfectionism and exaggerated during OCD symptom states due to a dysfunction of stop signals. This also corroborates hypotheses of impaired response inhibition in OCD.³¹ Other studies in the literature that have suggested that NJREs are not specific to OCD and could be a common phenotype of different disorders with deficits in the inhibitory control system, highlighting the need for further studies in this area.^{32–34}

In the current study, a positive correlation was found between age and NJRE severity in the OCD patients, similar to the previous study.²⁷ NJREs are also noted in children, and sometimes more severe than adolescents.³⁵ In a naturalistic study of 317 children and adolescents with OCD, NJREs were present in 97.8% of the sample.³⁶ This rate is almost the same as the rate (98%) found in adult OCD patients in the current study. Gender differences in NJREs have been suggested in the literature - NJREs were associated with characteristics more common in males in some previous studies.³⁷ Fathers’ (but not mothers’) NJRE severity

predicted OC symptoms only in sons; daughters’ OC symptoms were unrelated to parents’ psychological variables.¹² The current study did not focus on the association of fathers’ with sons’ symptoms. However, there were no significant gender differences in NJRE scores. To support our findings, no evidence for gender differences in the number of NJREs or severity were found in other studies of OCD,²⁶ nonclinical samples of children and adolescents³⁵ or adults.³⁸ The relationship between age, gender, NJRE number and severity therefore appears unclear. There is a clear need for further studies to shed light on the mechanisms of emergence or maintenance of NJREs, and progression over time, in relation to the course of OCD.

There were some limitations to this study, primarily that the cross-sectional design may have limited conclusions about the defined relationships. The relatively small size of the sample may have decreased the power of the statistical tests. Another limitation of this study was that the majority of the OCD patients were using medication. Despite there being no evidence related to the effect of medication on NJREs, it is likely that these experiences are affected by medication treatment. Also, in this study, a one-to-one matching of OCD patients with first-degree relatives was not done. Hence it was not possible to examine specific comparisons with mother, father, sibling or child.

The results of this study showed that NJREs were related to obsessive-compulsive symptoms and could be a state marker in OCD patients. The findings did not support the view that NJREs are a trait marker related to the genetic mechanisms of the disease.

Ethical considerations

All participants gave informed consent to participate in the study after the study protocols had been fully explained. All the study procedures were in compliance with the

Declaration of Helsinki. The necessary permissions to conduct the study were received from the local Ethics Committee prior to the initiation of the research.

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Declaration of competing interest

None to declare by the authors.

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