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Longitudinal aspects of obsessive compulsive cognitions in a non-clinical sample: A five-year follow-up study

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ABSTRACT

The cognitive behavioural models of Obsessive Compulsive Disorder (OCD) have stressed the role of cognitions, not only in aetiology but also in maintenance of the disorder. Little is known about the temporal relations between obsessive-compulsive cognitions and OCD symptoms. The aim of this study was to carry out a prospective assessment of OCD related beliefs and symptoms in a non-clinical sample. A total of 99 university students completed the Obsessive Beliefs Questionnaire (OBQ), Padua Inventory (PI), Beck Anxiety Inventory (BAI), Beck Depression Inventory (BDI) and Worry Domain Questionnaire (WDQ) one, three and five years after baseline administration. Structural modelling predicting scores at later time periods and growth curve modelling were used to analyze the data. The results showed that obsessive-compulsive cognitions varied significantly over time. It was also found that the OBQ predicted symptom scales (Impaired Mental Control, Contamination and Checking) only at baseline. However symptom scores remained stable at each time point, as shown by the subscales of Impaired Mental Control, Contamination and Checking of the PI and the BAI, BDI and WDQ. Implications for future research and the cognitive model of OCD are discussed.

1. Introduction

Contemporary cognitive-behavioural conceptualizations of Obsessive-Compulsive Disorder (OCD) suggest that the disorder arises from a particular set of dysfunctional beliefs and attitudes that are considered to be crucial factors, not only in aetiology, but also in the maintenance of symptoms (Clark, 2004; Frost & Steketee, 2002; Salkovskis, 1996). According to this model, those with OCD evaluate their cognitive intrusions as significant and important from the viewpoints of both content and frequency of occurrence, as a result of their own dysfunctional beliefs (Rachman, 1998; Salkovskis, 1985, 1989).

Obsessive-compulsive phenomena typically occur in the general population (e.g. Rachman & de Silva, 1978; Salkovskis & Harrison, 1984; Purdon & Clark, 1993) and it is commonly believed that studying non-clinical samples can be informative regarding the processes underlying the condition (e.g. Burns, Formea, Keortge, & Sternberger, 1995). The cognitive models of OCD (Rachman, 1998; Salkovskis, 1996) suggest that symptoms fall along a continuum ranging from intrusive thoughts and normal rituals to the point of reaching highly distressing obsessive thoughts and compulsive rituals (Rachman & de Silva, 1978).

An international research group (the Obsessive Compulsive Cognition Working Group: OCCWG) constructed a questionnaire (the Obsessive Beliefs Questionnaire: OBQ) with the aim of measuring the belief domains which are hypothesized to underlie OCD. There were originally six theoretically derived constructs: Inflated responsibility, Overimportance of thoughts, Control of thoughts, Overestimation of threat, Intolerance of uncertainty, and Perfectionism (OCCWG, 1997, 2001, 2003). Due to the considerable overlap between the constructs, in 2005 the OCCWG revised and shortened the questionnaire, producing the OBQ-44, which reduced the six constructs to three domains derived from factor analysis: Responsibility/Threat estimation, Perfectionism/Certainty, and Importance/Control of thoughts. The factorial composition of the OBQ has been further examined with the following factor structures identified: one factor (Faull, Joseph, Meaden, & Lawrence, 2004), four factors (Myers, Fisher, & Wells, 2008; Woods, Tolin, & Abramowitz, 2004), and three factors that only partially overlapped with that of the OBQ-44 (Wu & Carter, 2008). The importance and representativeness of the constructs may vary according to cultural context (De Vellis, 1991; Ebel & Frisbie, 1991). The Italian version of the same scale

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(Dorz, Novara, Pastore, Sica, & Sanavio, 2009) has led to a five-factor solution, by confirmatory factor analysis, with the following factors: Perfectionism, Responsibility for harm, Responsibility for omission, Importance of thoughts, and Control of thoughts.

According to the cognitive behavioural model of OCD, dysfunctional beliefs and attitudes play a functional role not only in development but also in the stability of the obsessive compulsive symptoms. However, there is no consensus among researchers on relations between maladaptative cognitions and OCD symptoms. According to Tolin, Worhunsky, and Maltby (2006), the relation between dysfunctional beliefs and OCD symptoms is demonstrated in three major ways. The first is general, and involves an association between the various symptom subtypes and obsessive-compulsive cognitions (generality). The second implies a congruency of content between obsessive compulsive cognitions and OCD symptoms (congruence), and the third states that OCD patients have more obsessive compulsive cognitions than patients with other anxiety disorders (specificity). In one of the first cross-sectional studies examining the relation between beliefs and OCD symptoms (Steketee, Frost, & Cohen, 1998), the authors found high correlations between cognitive and behavioural measures, even after controlling for depression, anxiety and worry. They also found that OCD subjects obtained higher scores on cognitive measures than those with anxiety disorders and controls. The same results were obtained by the OCCWG (2003, 2005), in whose studies cognitive and symptom-based measures were well correlated, and the constructs believed to be specific to OCD seemed to have higher discriminatory power between subjects with OCD anxiety disorders and controls. In a study with an Italian sample (Sica et al., 2004), the discriminatory capacity of cognitive measures in OCD and the Generalized Anxiety Disorders (GAD) clinical groups appeared to be good, and similar to that found for symptom-based measures. More recently, examining large populations of OCD patients, Taylor et al. (2006) and Calamari et al. (2006) identified a subgroup of individuals with OCD who do not endorse dysfunctional beliefs (low-beliefs subgroup). In practice, they appear to be comparable to the normal population with respect to scores on dysfunctional beliefs, but do not differ from the OCD population in symptom severity.

The studies reviewed to this point emphasize single time point assessments of the relation between dysfunctional cognitions and symptom severity in OCD. However, a robust test of this relationship would necessarily involve the stability of beliefs and symptom severity. This relationship, if present, would shed light on the degree that these dysfunctional beliefs may maintain symptoms rather than simply a mood-dependent condition. This, in turn, would provide verification of the temporal stability of maladaptive cognitions associated with obsessive compulsive symptoms and would provide more information on the strength of the cognitive model in general, as well as on the three factors defined by Tolin et al. (2006).

To the best of our knowledge, all longitudinal studies have focused on assessing the temporal stability of obsessive compulsive symptoms, but none has considered the stability of dysfunctional beliefs. Most studies confirm the stability of obsessive compulsive symptomatology. Rettew, Swedo, Leonard, Lenane, and Rapoport (1992) studied OC symptoms in adolescents with OCD for a period of 2–7 years and found that whereas symptoms were not temporally stable, there was consistency in major presenting subtype of the disorder. In a later study, assessing an adult OCD population for two years, Mataix-Cols et al. (2002) reached the same conclusion, (i.e., that patients rarely changed subtype) and found that the best predictor of a symptom was having the same symptom in the past (Mataix-Cols, Rosario-Campos, & Leckman, 2005). Again, the same conclusion of stability of symptoms was reached by Rufer, Grothusen, Mass, Helmut, and Iver (2005) in a longitudinal six-year study on adult OCD patients.

The aim of the present study was to examine the temporal stability of cognitive and symptom-based constructs OC related and to explore the temporal relation between dysfunctional beliefs and symptoms. Therefore, in the hypothesis that dysfunctional beliefs play a role in maintaining obsessive compulsive symptoms, we predicted that cognitive constructs would remain stable and that dysfunctional cognitive characteristics could predict behavioural ones even over time. In addition, according to previous studies, we expected that OC subtypes would remain stable in time. It was also predicted that obsessive compulsive beliefs as assessed at baseline would predict symptoms at later time points.

2. Method

2.1. Participants

102 undergraduate students (13 men, 89 women) aged 19–30 ($M = 23.76$ SD = 2.18) taking courses in psychology at the University of Padova were recruited in the present study. All participants gave their written informed consent, following a full explanation of the study procedure. It was stressed that the fundamental aspect of this study was to compile a battery of questionnaires covering a period of five years.

The first test session took place, in a group, in a university classroom, and the following ones were by mail. The order of the questionnaires was counterbalanced, in order to limit order effects.

2.2. Measures

All participants completed an information sheet, to assess main demographic data, and the following questionnaires:

2.2.1. The Obsessive Beliefs Questionnaire (OBQ)

The Italian version was used for this study (Dorz et al., 2009), which was derived from an exploratory factor analysis on a sample of 364 university students, 160 of them women (43.9%), mean age 21.2 (SD = 2.4) with 14.3 years of education (SD = 2.1). The scale is comprised of 77 items. Prior research with the OBQ revealed six factors that explained 39.6% of variance. The extracted factors were: Perfectionism, Responsibility for commission, Overestimation of danger, Control of thoughts, Responsibility for omission, and Thought-Action fusion (TAF). A total score can also be computed. Cronbach's alpha for the six scales was good, and ranged between 0.76 and 0.87.

2.2.2. The Padua Inventory

The Padua Inventory (PI; Sanavio, 1988) is an Italian self-report instrument for assessing obsessive and compulsive symptoms. It consists of 60 items, with a total scale and four subscales: 1) Impaired Mental Control, 2) Contamination, 3) Checking, and 4) Impulses and Impaired Motor Activity. Each item is rated on a 5-point scale ranging from 0 (not at all) to 4 (very much). A total score is computed by summing all the items of the inventory. The Italian version of the PI showed very good internal consistency for the total scale (Cronbach's alpha = 0.94), a range from 0.70 to 0.90 for the four subscales, and a 30-day retest reliability of 0.84–0.87.

2.2.3. The Beck Anxiety Inventory

The Beck Anxiety Inventory (BAI; Beck & Steer, 1990) is a self-report inventory for measuring clinical anxiety states. It consists of 21 items which assess the severity of the most frequent physiological and cognitive anxiety symptoms. Beck and Steer (1990) reported excellent internal consistency (Cronbach's alpha = 0.92) and a 1-week retest reliability coefficient of 0.75. The validation of the Italian version of the BAI showed good internal consistency (Cronbach's alpha = 0.89) and a 1-week retest reliability of 0.62 (Sica & Ghisi, 2007).

2.2.4. The Beck Depression Inventory II

The Beck Depression Inventory II (BDI II; Beck & Steer, 1987) is a widely used self-report inventory for assessing the severity of depression. It consists of 21 items, each consisting of descriptions in increasing order of severity, regarding affective, cognitive, motivational and physiological symptoms of depression. The items of the questionnaire derive from clinical observations of symptoms and attitudes most frequently found in depressed patients. The total score (from 0 to 70) is computed by summing all items of the inventory. The validation of the Italian version of the BDI showed good internal consistency (Cronbach's alpha = 0.80) and a 30-day retest reliability of 0.76 (Sica & Ghisi, 2007).

2.2.5. The Worry Domains Questionnaire

The Worry Domains Questionnaire (WDQ; Tallis, Eysenck, & Mathews, 1992) is a self-report inventory for assessing the content of worries. It is composed of 25 items. Each item is rated on a 5-point scale ranging from 0 (not at all) to 4 (very much). The total score (from 0 to 100) is computed by summing all the items of the inventory, which give general indications about the frequency of worries. The Italian version of the WDQ showed good internal consistency for the total scale (Cronbach's alpha = 0.90) and the five subscales (Cronbach's alpha coefficients ranging from 0.65 to 0.80) (Morani, Pricci, & Sanavio, 1999) and a 30-day retest reliability of 0.71–0.86 (Joormann & Stöber, 1997).

3. Results

On the basis of scores on the Padua Inventory, three subjects (3.06%), with scores equal to or higher than 180 were excluded. This is in accordance with prior recommendations that studies involving non-clinical participants exclude those screened who are suspected of having clinically elevated scores on salient study measures (Mataix-Cols, Vallejo, & Sanchez-Turet, 2000). Further, these participants were statistical outliers. The demographic and clinical characteristics of participants at baseline are listed in Table 1.

There were no gender differences in the sample, either in clinical or in demographic variables, except for age ($F(1,97) = 10.86$ $p < 0.001$). Given the similarities across the variables, the data were treated as a single homogeneous group, and analyses were not corrected for demographic variables.

Tests were administered four times: at baseline, and at one, three and five years later. The sample initially consisted of 99 students (after excluding the three with elevated PI scores), and 61 remained at the final retest (see Table 2). There were no differences between completers and non-completers at baseline for the demographic variables (age, education), nor for any of the clinical variables and their sub scales (see Table 3).

Table 1
Demographic and clinical characteristics distinguishing men and women, at baseline.

	Men($N = 12$)	Women ($N = 87$)	*p*
Age	25.54 (2.81)	23.51 (1.95)	<0.001
Education	16.23 (3.05)	15.59 (2.63)	ns
BDI	5.69 (5.28)	7.58 (7.56)	ns
BAI	6.76 (3.72)	10.00 (7.57)	ns
WDQ	34.15 (16.00)	33.01 (13.45)	ns
P I tot	22.15 (14.23)	25.50 (19.01)	ns
OBQ tot	172.07 (38.94)	166.68 (40.77)	ns

Note: BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory; WDQ = Worry Domain Questionnaire; PI tot = Total Score of the Padua Inventory; OBQ tot = Total Score of the Obsessive Beliefs Questionnaire.

Table 2
Means and standard deviations for clinical variables across time periods.

	Baseline Means (SD) $N = 99$	1-Year Means (SD) $N = 87$	3-Year Means (SD) $N = 65$	5-Year Means (SD) $N = 61$
Padua Tot	26.05 (19.32)	22.39 (17.33)	21.82 (17.55)	19.91 (16.45)
Mental contr.	9.64 (7.47)	7.96 (6.70)	7.62 (6.71)	6.86 (6.59)
Cleaning	4.91 (4.18)	4.11 (4.29)	4.59 (4.31)	4.44 (4.43)
Checking	4.42 (4.46)	3.49 (3.80)	4.18 (4.67)	3.61 (3.15)
Impulse	1.91 (2.70)	1.81 (2.11)	1.67 (2.27)	1.27 (1.81)
OBQ tot	166.90 (43.76)	154.05 (52.93)	138.96 (47.15)	137.39 (38.28)
Threat Est.	25.87 (9.73)	24.21 (9.26)	21.63 (9.10)	22.12 (8.64)
Control of Th.	30.89 (11.40)	26.58 (11.27)	24.32 (9.90)	22.50 (9.42)
TAF	10.78 (3.90)	10.50 (5.90)	8.85 (3.07)	8.73 (3.47)
Omission	12.14 (4.83)	11.08 (4.87)	9.23 (4.34)	9.69 (3.66)
Commission	50.10 (12.38)	43.90 (13.80)	41.81 (14.65)	41.92 (12.38)
Perfectionism	37.01 (14.59)	36.85 (16.38)	32.19 (15.49)	32.85 (14.01)
BDI	6.26 (5.90)	7.61 (8.94)	5.36 (5.34)	5.63 (5.79)
BAI	10.08 (7.35)	9.93 (6.95)	8.24 (5.85)	9.22 (7.97)
WDQ	34.41 (14.63)	29.53 (15.92)	29.51 (15.07)	24.25 (15.24)

Note: BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory; WDQ = Worry Domain Questionnaire; PI tot = Total Score of the Padua Inventory; OBQ tot = Total Score of the Obsessive Beliefs Questionnaire; TAF = Thoughts Action Fusion.

3.1. Temporal stability

We analyzed the five questionnaires with five multilevel models for repeated measures.

Multilevel models were used as a method of analysis of longitudinal data in place of the analysis of variance for repeated measures since these retain the fluctuations of each individual over time. Therefore, multilevel models provide greater statistical power and generate richer data regarding the temporal changes in scores over time.The fitted models were defined using notation similar to that of Heck and Thomas (2000):

Varying-intercept model with no predictors (or null model, m0):
$$Y_{ij} = \beta_{0j} + \epsilon_{ij}$$

Table 3
Demographic and clinical variable baseline comparison between completers and non-completers.

	Completers Mean (SD) $N = 61$	Non-completers Mean (SD) $N = 38$	F (1,98)*
Age	23.57 (2.04)	24.05 (2.35)	1.17
Education	15.46 (2.50)	16.00 (2.93)	0.98
Padua Tot	26.00 (18.95)	23.69 (17.79)	0.38
Mental control	9.75 (7.33)	8.73 (6.00)	0.55
Cleaning	4.59 (4.14)	4.36 (3.90)	0.07
Checking	4.16 (4.25)	3.97 (3.86)	0.05
Impulse	1.90 (2.65)	1.54 (2.58)	0.45
OBQ tot	169.22 (42.31)	164.60 (37.70)	0.31
Threat Estimation	26.01 (9.44)	25.02 (7.91)	0.30
Control of Thoughts	31.47 (11.28)	32.34 (11.70)	0.14
TAF	10.86 (4.12)	11.21 (4.76)	0.15
Omission	12.39 (4.62)	10.73 (4.12)	3.43
Commission	51.06 (12.21)	50.68 (11.86)	0.25
Perfectionism	37.40 (14.16)	34.60 (13.47)	0.96
BDI	6.85 (7.07)	6.14 (7.81)	0.29
BAI	9.68 (6.85)	9.43 (7.72)	0.68
WDQ	33.91 (14.81)	32.02 (12.00)	0.46

Note: BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory; WDQ = Worry Domain Questionnaire; PI tot = Total Score of the Padua Inventory; OBQ tot = Total Score of the Obsessive Beliefs Questionnaire; TAF = Thoughts Action Fusion.
*All F-ratios were non-significant.

Varying-intercept model (m1): $Y_{ij} = \beta_{0j} + \beta_1 X_{ij} + \epsilon_{ij}$

Varying intercept and slope model (m2): $Y_{ij} = \beta_{0j} + \beta_{1j} X_{ij} + \epsilon_{ij}$

where Y_{ij} is the observed score for subject j on occasion i, $\beta_{0j} = \gamma_{00} + u_{0j}$, $\beta_{1j} = \gamma_{10} + u_{1j}$, γ_{00}, γ_{01} are fixed parameters, and u_{0i} and u_{1i} are random effects.

The advantage of this approach involves the ability to examine individual growth (or change) patterns for participants. Given the central importance of obsessive compulsive beliefs in the cognitive model of obsessive-compulsive disorder, it would be expected that scores on these beliefs would be stable (i.e., linear) over time if there are no interventions.

m0 yields an estimated mean for each subject, and tests the hypothesis that all subjects have the same mean test scores. m1 introduces the fixed relationship between time (X) and the dependent variable. In order to test whether there is a linear relationship between time and test scores, we regressed scores on time in a model with a random intercept. m2 allows slopes to vary randomly. The random slope model was tested by adding the linear effect for time as a random effect (for more details, see Raudenbush & Bryk, 2002; Heck & Thomas, 2000; Gelman & Hill, 2007).

Before running the model, visual inspection regarding the linearity of the data was made as suggested by Singer and Willet (2003). We concluded that the data have a linear trend (see Figs. 1 and 2)[1]. The following likelihood ratio tests were considered for comparing the models. The Intraclass Correlation Coefficient (ICC) (Bliese, 2000) indicates the proportion of variance in any individual is explained by the characteristics of the individual who provided the rating. The Akaike Information Criterion (AIC; Akaike, 1974) and Bayesian Information Criterion (BIC; Schwarz, 1978) respectively were computed for each model tested. In addition to these fit indexes, the Chi square fit index was also calculated, and used to examine improvement in fit for lower and higher order models. In practice, when this test is statistically significant, it indicates that the second model has a better fit than the first one.

We repeated the analysis twice: Table 4 lists the results of the subjects for which all data were complete for all four time points ($N = 31$). Table 5 illustrates the growth curve for participants who completed at least two time points ($N = 99$). It is important to note that, in a fixed effects model such as that used in the present analyses, there is a neglible bias associated with small sample size (Raudenbush & Bryk, 2002). We applied multiple imputation for missing data, also as recommended by Raudenbush and Bryk (2002). This approach is one widely accepted approach to handling missing data in hierarchical linear models due to its flexibility, particularly when applied to a limited set of variables (i.e., fewer than 10) (Schafer, 2001) as is the case in the present study.

The PI yielded an ICC index of 0.75. The first model indicates that subjects do not differ in first test scores but, as tests progress, greater variability appears. The OBQ resulted in an ICC index of 0.68. The first model indicates a starting score that differs among the subjects with greater variability at later time points.

3.2. Predicting obsessive compulsive symptoms from obsessive compulsive beliefs

Structural equation models (SEM) were used in order to predict obsessive compulsive symptoms as a function of obsessive compulsive cognitions. SEM was used instead of a multiple regression analysis because it allows a more accurate estimate of the strength of the relationship between beliefs and symptoms and because the error is separated from the true score variability in the model. Furthermore,

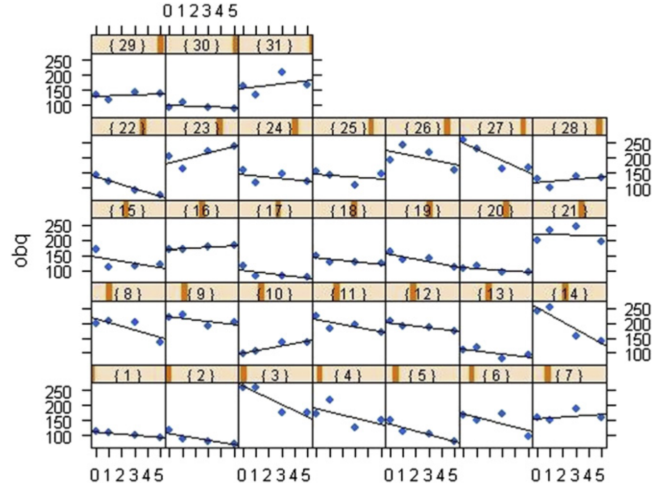

Fig. 1. Individual curves and best fit regression lines for completers across five years – Obsessive Beliefs Questionnaire Total Score.

the SEM approach was used because it can simultaneously examine the relationships between beliefs and symptoms across different time administrations. In light of the linear (i.e., stable) scores obtained for the OBQ, we used the baseline level of obsessive compulsive beliefs in predicting later time points for obsessive-compulsive symptoms. As a further examination of the specificity of obsessive compulsive beliefs, we also conducted structural equation analyses for the baseline obsessive compulsive beliefs in predicting depression, anxiety, and worry. Recent analyses have suggested that, in the case of longitudinal datasets, stable parameter estimates may be obtained with small samples (Curran & Bollen, 2001), particularly for multiple time point analyses (Hertzog, von Oertzen, Ghisletta, & Lindenberger, 2008).

Models were analyzed using LISREL 8.54 (Jöreskog & Sörbom, 1996). In order to evaluate goodness of fit, the following indices were examined: Root Mean Square Error of Approximation (RMSEA; Steiger, 1989) with 90% Confidence Interval; Comparative Fit Index (CFI; Bentler, 1990), Non-normed fit index (NNFI; Tucker & Lewis, 1973; Bentler & Bonett, 1980), Standardized root mean square residual (SRMR; Jöreskog & Sörbom, 1981; Bentler, 1995) and the AIC. Hu and Bentler (1999) recommended an RMSEA ≤ 0.06 as the

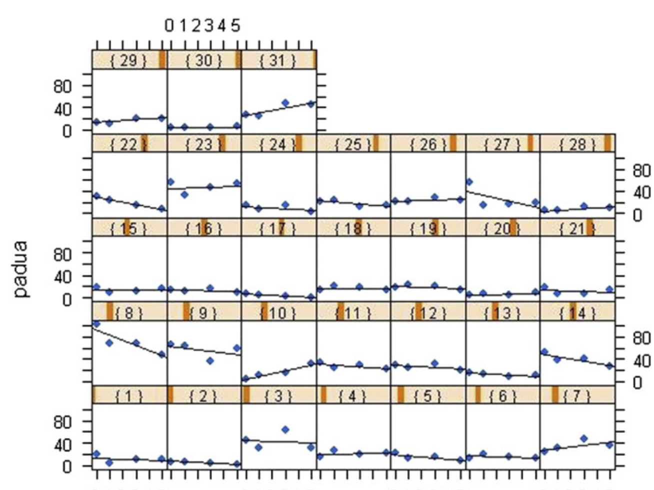

Fig. 2. Individual curves and best fit regression lines for completers across five years – Padua Inventory Total Score.

[1] Interested readers may obtain the other graphical displays by contacting the corresponding author.

Table 4
Likelihood ratio test for comparing the considered models in each variable ($N = 31$).

	Df	ICC	AIC	BIC	logLik	Chisq	Chi Df	Pr(>Chisq)
BDI								
m0	3	0.535	770.78	779.24	−382.39			
m1	4		770.90	782.19	−381.45	1.88	1	0.171
m2	6		769.16	786.08	−378.58	5.75	2	0.057
BAI								
m0	3	0.353	773.87	782.33	−383.94			
m1	4		773.47	784.75	−382.73	2.41	1	0.121
m2	6		771.93	788.85	−379.97	5.54	2	0.063
WDQ								
m0	3	0.534	978.42	986.88	−486.21			
m1	4		966.86	978.14	−479.43	13.56	1	<0.001
m2	6		968.51	985.43	−478.26	2.35	2	0.310
PI tot								
m0	3	0.753	976.19	984.65	−485.10			
m1	4		974.88	986.16	−483.44	3.32	1	0.069
m2	6		970.53	987.46	−479.27	8.34	2	0.015
OBQ tot								
m0	3	0.686	1244.73	1253.19	−619.36			
m1	4		1226.06	1237.34	−609.03	20.67	1	<0.001
m2	6		1222.91	1239.83	−605.46	7.14	2	0.028

Note: BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory; WDQ = Worry Domain Questionnaire; PI tot = Total Score of the Padua Inventory; OBQ tot = Total Score of the Obsessive Beliefs Questionnaire. m0 = null model; m1 = intercept model; m2 = intercept and slope model; ICC = Intraclass Correlationn Coefficient; AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion.

cut-off for adequate model fit. The CFI and NNFI should be greater than 0.9 and SRMR under 0.05 for adequate model fit (Byrne, 2001). An AIC close to zero reflects good fit and, between two AIC measures, the lower one reflects the model with the better fit.

In the SEM models, we used the BAI, BDI, WDQ and OBQ scales as exogenous values and the PI scales (Impaired Mental Control; Contamination; Checking; Impaired Motor Activity) in the various tests) as endogenous variables. Fig. 3a, b and c show the results of the three tested model, with relative t-values. Gamma (γ) was used to define parameters identifying the relationship between exogenous and endogenous variables, and beta (β) those between endogenous variables (i.e., administration of the scales in the four moments in time).

The following fit indices were obtained in the Impaired Mental Control model: $\chi2$ (12) = 7.18 (n.s.); RMSEA = 0.01 (90% CI: [0.00–0.11]); CFI = 1.00; NNFI = 1.04; SRMR = 0.04; AIC = 55.18. The OBQ only significantly predicted the baseline of the IMC (i.e., $\gamma 11$ is statistically significant, $t = 2.02$). All the betas in this model were significant: $\beta 10 = 0.83$ ($t = 5.02$), $\beta 21 = 1.09$ ($t = 6.70$), $\beta 32 = 0.62$ ($t = 4.92$).

The following fit indices were obtained in the Contamination model: $\chi2$ (12) = 6.07 (n.s.); RMSEA < 0.01 (90% CI: [0.00–0.07]); CFI = 1.00; NNFI = 1.10; SRMR = 0.03; AIC = 54.07. OBQ significantly predicts the baseline of Cont ($\gamma 11 = 0.05$, $t = 2.67$), whereas BAI, BDI and WDQ do not. All the betas of this model were significant: $\beta 10 = 0.55$ ($t = 2.84$), $\beta 21 = 1.21$ ($t = 6.28$), $\beta 32 = 0.76$ ($t = 5.02$).

The Checking model resulted in the following fit indices: $\chi2$ (12) = 12.61 (n.s.); RMSEA = 0.04 (90% CI: [0.00–0.20]); CFI = 0.97; NNFI = 0.94; SRMR = 0.04; AIC = 60.61. The OBQ only significantly

Table 5
Likelihood ratio test for comparing the considered models in each variable ($N = 99$).

	Df	ICC	AIC	BIC	logLik	Chisq	Chi Df	Pr(>Chisq)
BDI								
m0	3	0.442	2024.86	2036.06	−1009.43			
m1	4		2023.25	2038.19	−1007.62	3.61	1	0.056
m2	6		2024.19	2046.59	−1006.10	3.05	2	0.21
BAI								
m0	3	0.515	2006.08	2017.30	−1000.04			
m1	4		2002.01	2016.97	−997.00	6.07	1	0.013
m2	6		1990.81	2013.24	−989.40	15.20	2	0.0005
WDQ								
m0	3	0.458	2536.02	2547.33	−1265.01			
m1	4		2505.52	2520.60	−1248.76	32.49	1	<0.001
m2	6		2505.69	2528.32	−1246.84	3.83	2	0.14
PI tot								
m0	3	0.415	2583.49	2594.81	−1288.74			
m1	4		2569.10	2584.19	−1280.55	16.39.	1	0.0001
m2	6		2561.32	2583.95	−1274.66	11.78	2	0.0028
OBQ tot								
m0	3	0.423	3135.74	3146.95	−1564.87			
m1	4		3087.49	3102.44	−1539.74	50.24.	1	<0.001
m2	6		3085.70	3108.12.	−1536.85	5.79	2	0.055

Note: BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory; WDQ = Worry Domain Questionnaire; PI tot = Total Score of the Padua Inventory; OBQ tot = Total Score of the Obsessive Beliefs Questionnaire. m0 = null model; m1 = intercept model; m2 = intercept and slope model; ICC = Intraclass Correlationn Coefficient; AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion.

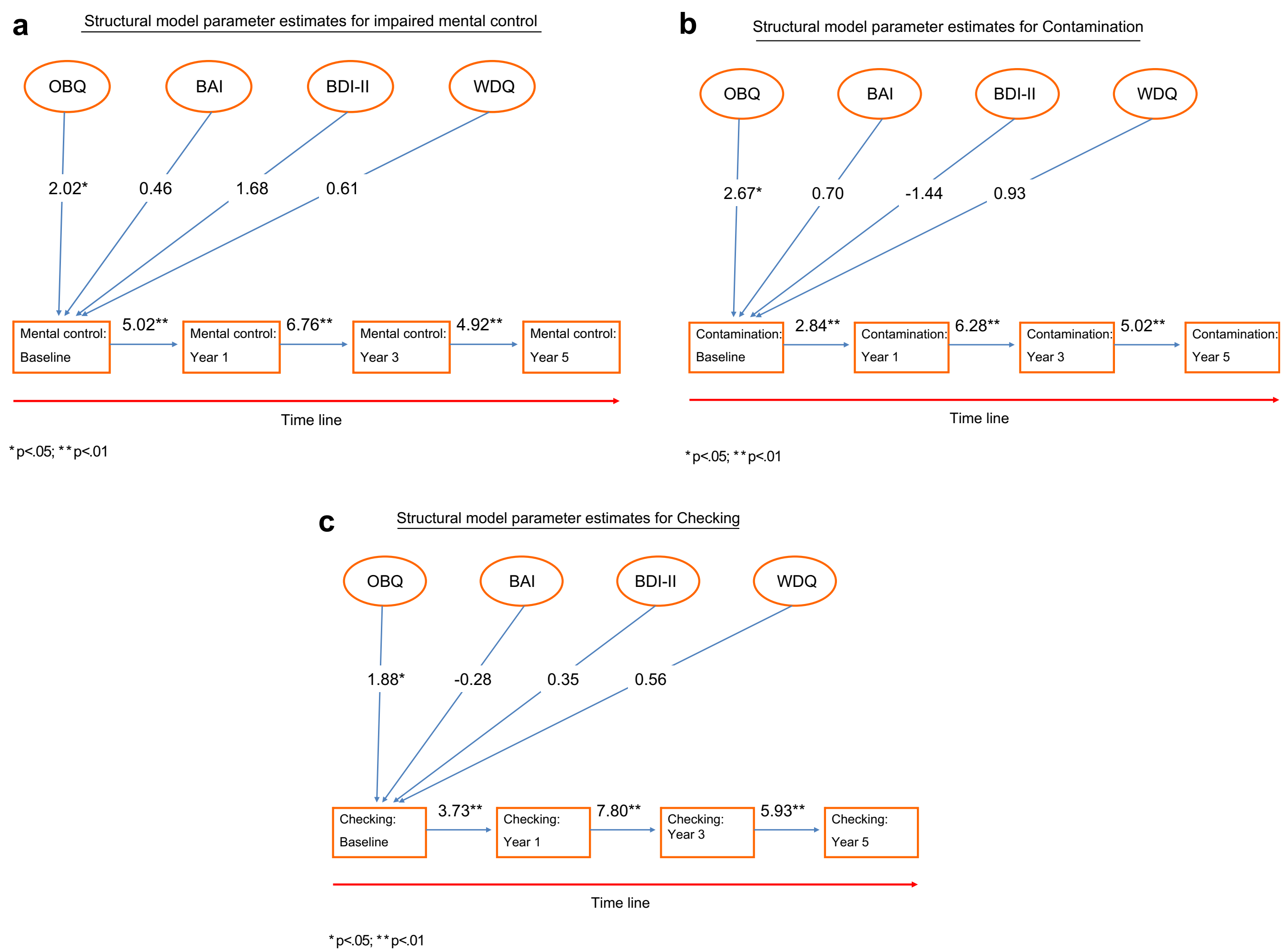

Fig. 3. a: Structural model parameter estimates for Impaired mental control, b: Structural model parameter estimates for Contamination, c: Structural model parameter estimates for Checking.

predicted the baseline of the Check ($\gamma11 = 0.05$, $t = 1.88$). All the beta values were significant: $\beta10 = 0.65$ ($t = 3.73$), $\beta21 = 1.47$ ($t = 7.80$), $\beta32 = 0.60$ ($t = 5.93$).

The Impaired Motor Activity model resulted in a poor global fit: $\chi2$ (12) = 20.12 (n.s.); RMSEA = 0.16 (90% CI: [0.00–0.28]); CFI = 0.91; NNFI = 0.78; SRMR = 0.08; AIC = 68.19. $\gamma13$ (relationship between BDI and baseline of IMA) was statistically significant ($t = 2.90$). All the parameter estimates were significant: $\beta10 = 0.53$ ($t = 3.75$), $\beta21 = 0.80$ ($t = 5.14$), $\beta32 = 0.86$ ($t = 8.40$). See Fig. 3a–c for graphical illustrations of the SEM analyses.

4. Discussion

The aim of our study was to verify the stability of obsessive compulsive symptoms and cognitions using a longitudinal design, and to assess the capacity for prospectively predicting obsessive compulsive cognitions of obsessive compulsive symptoms. A non-clinical sample was examined based on a dimensional view of obsessive compulsive symptoms and cognitions.

To the best of our knowledge, this is the first study that examines the stability of obsessive compulsive symptoms and cognitions together. For the PI, the best model was the varying intercept and slope model (m2; $\chi2 = 8.34$*), which means that subjects, although starting with initially similar scores, move along different paths in time; for the OBQ, subjects had initially different (intercept) (m1; $\chi2 = 20.67$**), scores and different trends (slopes) (m2; $\chi2 = 7.14$*). However, the SEM models showed that, when the single scales of the PI were examined for constructs Mental Control, Contamination and Checking, the best predictor of scores for the first, third and fifth years was that of the previous test (see Fig. 3a–c). For the Impulse scale, the SEM model did not fit the data. These results may seem contradictory: there was instability over time for the total PI, but when the single scales were examined, the results suggested that some OCD symptoms are stable over time, even in a non-clinical population. Previous longitudinal studies have also shown a stable trend when symptoms were conceptualized as subtypes (e.g. Fullana et al., 2007). One explanation is that obsessive-compulsive symptoms are highly heterogeneous (e.g. McKay et al., 2004; Calamari, Wiegartz, & Janeck, 1999; Calamari et al., 2006; Taylor et al., 2006), but as noted previously, symptom severity is typically less stable while overall presenting subtype tends to persist.

According to our results on the total OBQ scores, subjects' trends at the various test times were extremely variable (see OBQ m2 in Table 4)- a fact which is not in favour of the stability of obsessive compulsive cognitions. However, the means of the single OBQ subscales did show greater stability (see Table 2). One possibility is that among non-clinical participants, obsessive compulsive beliefs lack stability since they are not predictive of clinically relevant symptoms because these beliefs are not regularly activated in response to coping with problematic obsessive compulsive behaviours. Future research on the stability of obsessive-compulsive cognitions is warranted to clarify this issue. It is reasonable to suggest that the results found here would be replicated at least partially as there are individuals diagnosed with OCD who do not endorse obsessive-compulsive cognitions (Taylor et al., 2006).

This study also highlights the importance of obsessive compulsive cognitions in the prediction at baseline of the symptoms of Mental Control, Contamination and Checking, but not of Obsessive Impulses, independent of worries, anxiety and depression (see Fig. 3a–c). This is consistent with the results of many studies that have found that dysfunctional beliefs measured by the OBQ can predict some but not all the symptom-based subscales (Julien, O'Connor, Aardema, & Todorov, 2006; Tolin, Woods, & Abramowitz, 2003). One explanation is that it is a question of severity of symptoms: the subscale Impulses in the PI is not considered representative of the normal Italian population, particularly among females (Mancini, Gragnani, Orazi, & Pietrangeli, 1999). This is noteworthy since there were more females in this sample than males. Another interpretation is that other dysfunctional beliefs that are not measured by the OBQ may play a role in predicting the fear of losing control of oneself and one's behaviour. Future research is warranted to bear this out.

From a longitudinal viewpoint, dysfunctional beliefs do not appear to influence OC symptoms in later follow-ups. These results seem to contradict those of Abramowitz, Khandker, Nelson, Deacon & Gygwall (2006), who made a prospective assessment in a non-clinical group of future parents of the influence obsessive compulsive cognitions had on obsessive compulsive symptoms after a potentially stressing event such as the birth of a first child. The study showed not only the capacity of dysfunctional beliefs to predict the development of obsessive and compulsive symptoms at an average interval of seven or eight months after the first test, but above all, dysfunctional beliefs are risk factors in the development of obsessions and compulsions following stressful events. The main limitation of the present study is that we had no information on our participants' lives throughout the follow-up period. However, it may be that the contradiction is more closely related to the problem associated with a single acute stressor, as was the case in the Abramowitz, Khandker, Nelson, Deacon, and Rygwall (2006) study. On the other hand, the findings reported here is consistent with the expression of symptoms expected in general, since a wide range of stressors are associated with OCD, with some individuals showing considerable endorsement of obsessive compulsive beliefs while still others do not. The finding that dysfunctional beliefs infrequently predict OC symptoms at any point in follow-up suggests that nothing important or "stressful" had occurred in their lives, to the extent of consolidating the relation between interpretative tendencies and OC-related symptoms. Another explanation is that the students who took part in the study were well advanced in their university curriculum and at an unusually difficult time in their lives. It is therefore possible that the relation between OC beliefs and symptoms may have been observed only in this "problematic" phase and that the natural later decrease in symptoms did not really demonstrate any relation. The literature does show that, in the mid-20s, there is a peak in OC symptoms and a natural fall in the following years (Mancini et al., 1999; Sanavio, 1988). Finally, it should be noted that, whereas practice effects could influence performance on a number of measures, prior research has suggested that measures of obsessive-compulsive symptoms do not tend to show significant change due simply to retesting (i.e., Fullana et al., 2007).

Our study thus revealed stability in obsessive compulsive symptoms conceptualized as categories and a close relation between dysfunctional beliefs in general and symptomatology associated with Impaired mental control, Contamination and Checking. These results further support the literature, both because category stability has been verified in a non-clinical population and because the generality factor (Tolin et al., 2006) has been verified in a different cultural context. A limitation of this study involves the potential impact of negative life events on obsessive compulsive symptoms, and in turn, related cognitions. Recent research has suggested that negative life events exacerbate obsessive-compulsive symptoms in non-clinical samples (Coles, Pietrefesa, Schofield, & Cook, 2008). This requires further examination in non-clinical and clinical samples. Future longitudinal research may examine a clinical population, with the aim of assessing the temporal trend of relations between cognitions and behaviours or assess the time trend of obsessive compulsive cognitions in a non-clinical population, while also assessing stressors, in order to identify vulnerability factors associated with the full range of obsessive-compulsive symptoms and associated beliefs.

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