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Cross-sectional and prospective relations between dysfunctional cognitive beliefs and obsessive-compulsive symptoms during late childhood and early adolescence: a test of two aetiological models

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Background: Obsessive-compulsive symptoms (OCS) often emerge during childhood and adolescence, and two aetiological models have been proposed. According to the first model, maladaptive cognitive beliefs facilitate the transformation of transient intrusive thoughts into OCS. The second model suggests that dysfunctional cognitive beliefs develop in response to increased levels of OCS. Few studies have contrasted these models, and no study has used a prospective design. **Methods:** In this study, dysfunctional cognitive beliefs, OCS, depressive symptoms, and anxiety symptoms were measured repeatedly on three occasions during a year in a sample of 950 late-childhood children and early adolescents (M_{age} = 10.80 [*SD* = 1.23], 51% female). Network analysis was used to examine cross-sectional between-person associations, and a random-intercept cross-lagged panel model was used to examine prospective within-person associations. **Results:** Cross-sectional network analyses indicated that dysfunctional cognitive beliefs were uniquely linked to OCS and significantly more strongly linked to these symptoms than to depression and anxiety. Prospective data did not support either model, but OCS and anxiety symptoms uniquely predicted each other. Sex-stratified analyses showed that dysfunctional cognitive beliefs predicted all types of symptoms at later time points in boys, while in girls, OCS and anxiety symptoms predicted each other. Assumptions of the two aetiological models of OCD were supported by cross-sectional but not prospective data. **Conclusions:** During late childhood and early adolescence dysfunctional cognitive beliefs may play a more prominent role in the emergence of mental health symptoms in boys than in girls, but more prospective studies are needed. **Keywords:** Obsessive-compulsive disorder; anxiety; child development.

Introduction

Early manifestations of obsessive-compulsive symptoms (OCS) in late childhood and early adolescence have received increasing attention during the last two decades, as research demonstrates that OCS generally increase with age (Barros et al., 2021; Fullana et al., 2009). The increase coincides with critical developmental milestones, such as identity formation, underlining the importance of early identification (Barcaccia et al., 2022; Jagannathan, Ginger, Yu, Chasson, & Leventhal, 2024). As OCS tend to onset during the first two decades of life (Cervin, 2023; Cervin et al., 2020), research on their progression in childhood and adolescence is crucial.

The prevalence of subclinical OCS in youth ranges from 2% to 38.2% in community samples (Barcaccia et al., 2022; Barzilay et al., 2019; Sun, Boschen, Farrell, Buys, & Li, 2014; Zijlmans et al., 2017). Indeed, addressing OCS in youth holds the promise to improve overall quality of life and reduce the risk of comorbid conditions later in life (Fineberg et al., 2019; Liu & Fan, 2023), although research on prevention is only in its early stages.

Two major aetiological models attempt to explain the onset and progression of OCS during childhood and adolescence, each proposing a different causal relation between dysfunctional cognitive beliefs and OCS. The first model (hereinafter, the cognitive model) posits that dysfunctional cognitive beliefs, alongside the normal occurrence of intrusive and distressing cognitions (common in all people), drive the emergence of OC symptoms (Clark, 2004; Rachman, 1997; Salkovskis, 1985). According to the model, these beliefs result in compulsive behaviours performed to reduce the distress associated with intrusive thoughts or preventing negative outcomes, maintaining OCS (Mancini & Barcaccia, 2014; Rachman, 1997, 2002; Rachman & Hodgson, 1980; Salkovskis, 1985).

Specific categories of dysfunctional beliefs have been identified by the Obsessive Compulsive Cognitions Working Group (OCCWG, 1997, 2001, 2005) and are assessed by the Obsessive Beliefs

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Questionnaire (OBQ-44; OCCWG, 2005) and include inflated sense of responsibility, overestimation of threat, need for control, perfectionism, importance of thoughts, and intolerance of uncertainty. A key factor among these may be an inflated sense of responsibility and guilt (Barcaccia, Tenore, & Mancini, 2015; Gangemi & Mancini, 2017; Mancini & Gangemi, 2015; Salkovskis et al., 2000; Salkovskis & Forrester, 2002; Salkovskis & Freeston, 2001). In this perspective, compulsive behaviours would be carried out as purposeful, goal-directed actions aimed at reducing the likelihood of threat, of feeling hyper-responsible or even guilty, and providing relief (Albert et al., 2015; Mancini & Barcaccia, 2014).

Dysfunctional beliefs appear to be closely related to specific dimensions of OCS. For example, overestimation of threat and inflated responsibility are primarily associated with checking behaviours, while perfectionism and intolerance of uncertainty are associated with ordering and symmetry-related behaviours (Miegel, Daubmann, et al., 2023). While cross-sectional in nature, these findings align with cognitive models positing that OCS are linked to maladaptive interpretations of intrusive thoughts and a desire to neutralise perceived threats (Olatunji, Christian, Brosof, Tolin, & Levinson, 2019). However, the strength of these associations varies across symptom dimensions.

Although beliefs appear to be associated with OCS (Sunde et al., 2021), the nature of their relation with anxiety remains uncertain. Comparative studies reveal mixed results regarding whether these beliefs are unique to OCS or features common to other types of symptoms (Cervin et al., 2022). Literature shows a lack of specificity of obsessive beliefs in relation to OCS (Avard & Garratt-Reed, 2021; Bahceci et al., 2014; Inozu et al., 2022; Tolin, Worhunsky, & Maltby, 2006; Viar, Bilsky, Armstrong, & Olatunji, 2011; Wahl, Hofer, Meyer, & Lieb, 2020). Wahl et al. (2020), for example, found that obsessive beliefs were not specifically associated with OC symptoms. In particular, the obsessive domain of importance/control of thoughts was associated with depressive symptoms over and above pre-existing depressive symptomatology. In addition, the obsessive domains of responsibility/threat and perfectionism/certainty were associated with anxiety, even when controlling for baseline levels of depression and anxiety.

Importantly, a vast majority of studies have been cross-sectional, precluding any inference about cause and effect. This is particularly concerning for children and adolescents, as OCS typically emerge during this period (Luke et al., 2021; Macul Ferreira de Barros et al., 2021). Indeed, no prospective studies have been conducted in this age group to test aetiological models or examine developmental trajectories of cognitive beliefs and OCS.

The second model (hereinafter, the habitual model) suggests that engaging in OC behaviours may lead to the development of dysfunctional beliefs. In particular, behavioural models of OCS have challenged the traditional view that dysfunctional cognitive beliefs are the primary antecedents of the disorder. Gillan and Robbins (2014) proposed that OCS may lead to dysfunctional beliefs and that early goal-directed actions, that initially serve to alleviate distress, gradually become habitual, and that it is the very persistence of these compulsive behaviours that triggers the development of dysfunctional cognitive beliefs, such as inflated responsibility. This process could imply a post hoc form of rationalisation due to cognitive dissonance (Festinger, 1957): as individuals repeatedly engage in compulsive behaviours to reduce anxiety, they retrospectively infer that these actions must be essential for preventing the feared outcomes, thereby reinforcing and even contributing to the formation of dysfunctional beliefs, for example, concerning threat and personal responsibility. With time, these maladaptive beliefs become more deeply rooted, thereby reinforcing the ongoing cycle of OCS (Gillan & Robbins, 2014).

Nevertheless, further research is needed to better understand the complex interplay between dysfunctional beliefs and OCS. Moreover, no studies, as far as we are aware, have contrasted the two models.

Taken together, the field lacks research that tests and compares different aetiological models of OCS. Cross-sectional studies highlight clear links between dysfunctional cognitive beliefs and OCS, but offer limited insight into causal relations. The aim of this study was to use a prospective design to test and compare the cognitive and habitual models in relation to the onset and progression of OCS in late childhood and early adolescence.

Prospective designs, especially in youth, have the potential to clarify the temporal dynamics between cognitive beliefs and OCS. Overall, the multifaceted nature of OCS (Summers, Sarawgi, Fitch, Dillon, & Cougle, 2018) contributes to the ongoing challenge of unravelling their development, and further research is needed to elucidate their underlying mechanisms and progression. To date, no longitudinal study has directly contrasted these two models, leaving the temporal sequence and causal links between cognitive beliefs and symptom development insufficiently clarified.

Obsessive-compulsive symptoms in late childhood and early adolescence

Longitudinal studies have identified different trajectories of OCS: some youth experience high but remitting symptoms, while others show persistent or escalating symptoms through adolescence (Jagannathan et al., 2024). Notably, earlier development of symptoms is often associated with more severe and chronic outcomes (Luke et al., 2021). Gender differences are also observed, with males showing earlier onset of symptoms during childhood,

and females showing higher prevalence during adolescence (Jagannathan et al., 2024). Given that late childhood and early adolescence are crucial phases for emotional and cognitive development, targeting OCS during this time can provide insights into their development and progression (Thompson et al., 2020). In particular, as highlighted by Isaksen et al. (2024), further studies using longitudinal and experimental designs are needed to investigate the role of maladaptive cognitions in the development and progression of OCS. For these reasons, focusing on youth is crucial, as this developmental period is formative for establishing behavioural and cognitive patterns.

Aims of the present study

In this study, dysfunctional cognitive beliefs, OCS, depressive symptoms, and anxiety symptoms were measured repeatedly at three time points across 1 year in a large sample of late-childhood children and early adolescents: measures were administered at T_1 (baseline), T_2 (6 months), and T_3 (12 months), with each interval spaced 6 months apart.

The empirical literature on the role of obsessive beliefs in OCS in late childhood and late adolescence is rather limited, and there is no consistent evidence supporting the idea that obsessive beliefs, or only certain types of them, are more closely associated with OCS compared with anxious-depressive symptoms (both cross-sectionally and longitudinally). In light of the still scarce empirical data in the developmental period and the relatively heterogeneous evidence, our study did not have specific hypotheses but was interested in exploring both the cross-sectional association between different obsessive beliefs, OCS (and specific subtypes), and anxious-depressive symptoms, as well as the direction of these associations over time. Our study deliberately sampled a large community cohort of late-childhood children and early adolescents to explore OCS over time. Studying OCS in a nonclinical sample at this age allows us to detect meaningful variation which is essential for understanding developmental mechanisms (Fullana et al., 2009; Pagliaccio, Durham, Fitzgerald, & Marsh, 2021).

The aim was, for the first time, to empirically test the two models outlined in late childhood and early adolescence. By focusing on this specific age range, our study aims to capture early manifestations of psychological symptoms, thereby contributing to the understanding of their onset and progression.

Methods

Participants and procedure

Participants were recruited from schools located in central Italy and ranged from the fourth year of primary school to the third year of middle high school. Approval for data collection was secured from the respective headteachers and relevant school committees. The questionnaires were administered in group settings during regular school hours, under the supervision of postgraduate psychology students who had undergone specialised training.

Measures were administered at three time points across a 12-month period: T_1 (baseline), T_2 (6 months), and T_3 (12 months), with each interval spaced 6 months apart. Pupils were assured that participation was entirely voluntary, that their responses would remain anonymous, and were encouraged to complete all items. No time restrictions were imposed for completing the questionnaires. Participants received no remuneration or incentives, and no penalties were imposed for opting out. Written informed consent was obtained from parents, who signed and returned consent forms to the school. The project and the related modules had received approval from the ethics committee.

Measures of dysfunctional cognitive beliefs, OCS, depressive symptoms, and anxiety symptoms were collected repeatedly at three occasions during a year in a sample of 950 early adolescents (M_{age} = 10.80 [1.23], 51% female). The age range was 8–14 years, with 93% of the participants being in the age range of 9–12.

Measures

The Obsessive Beliefs Questionnaire-Child Version (OBQ-CV, Coles et al., 2010) is a widely utilised self-report measure for evaluating cognitive domains associated with OCD. It comprises 44 items rated on a 7-point Likert scale. It assesses the core belief domains identified by the OCCWG as central to OCD. In addition to providing scores for each belief domain, a total score is calculated by summing the individual domain scores. Cronbach's alpha (α) was high at baseline (full sample = .88; boys = .87; girls = .88).

The OCI-CV (OCI-CV, Foa et al., 2010; Pozza, Barcaccia, & Dèttore, 2017; Pozza, Barcaccia, & Dèttore, 2019) is among the most widely utilised measures for assessing OCS in children and adolescents. It comprises 21 items assessing OCS across six subscales: doubting/checking, obsessing, hoarding, washing, ordering, and neutralising (Foa et al., 2010). Respondents indicate the frequency with which they experience specific OCS on a three-point scale (0 = Never, 1 = Sometimes, 2 = Always). In our sample the Cronbach's alpha (α) was adequate at baseline (full sample = .79; boys = .78; girls = .79.).

The Spence Children's Anxiety Scale (SCAS; Spence, 1998) is a 45-item, Likert-type self-report questionnaire designed to assess anxiety symptoms in children and adolescents. The SCAS provides a total score along with six subscales: panic attacks and agoraphobia, separation anxiety, fears of physical injury, social phobia, OCS, and generalised anxiety. For the purpose of the current study, we did not include the OCD scale in the total score. In the current sample, Cronbach's alpha (without OCD items) at baseline was high (full sample = .83; boys = .82; girls = .84).

The Children's Depression Inventory (CDI) is a self-report measure designed to assess depressive symptoms in children and adolescents (Kovacs, 1992). Comprising 27 items, the CDI utilises a three-point scale (0–2) for responses. Item scores are summed, with higher totals reflecting greater symptom severity. The CDI is widely recognised as a reliable and valid tool for evaluating depression in children and adolescents. In our sample, Cronbach's alpha (α) was high at baseline (full sample = .84; boys = .84; girls = .83.).

Statistical analysis

Cross-sectional data were used to test associations among dysfunctional cognitive beliefs, OCS, anxiety symptoms, and depressive symptoms. To identify unique associations, we

used network analysis. The R library *BGGM* was used, and partial correlations were estimated accounting for all linear associations among the full set of variables. A partial correlation ranges from −1 to +1, with −1 indicating a perfect negative association and +1 a perfect positive correlation. Credible intervals (CIs) of 95% for partial correlations were used to control for false-positive rate. Unlike confidence intervals, a CI is a Bayesian concept and represents the range within which the parameter lies with 95% probability, given the data. Partial correlations whose 95% CIs did not include 0 were considered statistically significant. Variables and their partial correlations were displayed in a network graph, with each variable depicted as a circle (a node) and each significant partial correlation as a line (an edge). Strongly associated nodes were placed more closely together and nodes with many and strong associations with other nodes were placed centrally. Placement in the network graphs was conducted using the Fruchterman–Reingold algorithm.

To examine whether dysfunctional cognitive beliefs were more strongly associated with OCS than with anxiety and depressive symptoms, we computed 5,000 posterior samples of each partial correlation and compared the associations between different variable pairs. Two approaches were used to test the hypothesis. First, we computed the posterior probability (PP) for the hypothesis that dysfunctional cognitive beliefs were more strongly associated with OCS than with anxiety and depressive symptoms, respectively. A PP indicates the probability of a prespecified event happening, for example, that the edge between dysfunctional cognitive beliefs and OCS is larger than the edge between dysfunctional cognitive beliefs and anxiety symptoms. We also computed the difference between the strength of the association for each edge pair by subtracting the 5,000 estimates for the partial correlation between dysfunctional cognitive beliefs and anxiety and depressive symptoms, respectively, from the 5,000 estimates for the partial correlation between dysfunctional cognitive beliefs and OCS. Positive values resulting from such an analysis indicate that dysfunctional cognitive beliefs and OCS are more strongly associated than dysfunctional cognitive beliefs and the two other nodes, while negative values would indicate that dysfunctional cognitive beliefs are less strongly associated with OCS than with anxiety and depressive symptoms. To make inference, we computed the mean and the 95% CI for the difference scores. If the 95% CI did not include 0, we deemed the difference to be statistically significant.

To evaluate prospective associations, we used a structural equation model in the form of a random-intercept cross-lagged panel model (RI-CLPM). Data for dysfunctional cognitive beliefs, OCS, anxiety, and depressive symptoms from all three waves were analysed simultaneously in the model. An RI-CLPM includes a random intercept, which represents trait-like between-person differences over time, as well as autoregressive paths, representing within-person stability over time. It also includes cross-lagged paths (i.e. lagged associations between variables), which express the unique within-person predictive associations between variables in the model. In the present study, we further included cross-sectional covariance parameters for all variables at each time point. Hence, significant cross-lagged paths indicate that deviations around a person-specific mean are related to later deviations from this person-specific mean (Hamaker, Kuiper, & Grasman, 2015). To increase interpretability, we fixed the autoregressive and cross-lagged parameters across time point 1–time point 2 and time point 2–time point 3. Maximum likelihood estimation was used to estimate all model parameters. To interpret model/data fit, we computed the following fit indexes: Confirmatory fit index (CFI), root mean square error of approximation (RMSEA) and standardised mean square residual (SRMR). An RMSEA below 0.06, an SRMR below 0.08 and CFI and TLI estimates greater than 0.90 are indicative of acceptable model-data fit; CFI and TLI estimates above 0.95 are indicative of good model-data fit (Hox et al., 2017).

There were missing data at each time point. The total amount of missingness was 9.8%. The least amount of missingness was present at time point 1 (OBQ: 3.1%, OCI-CV: 3.2%, SCAS: 3.6%, CDI: 3.3%), followed by time point 2 (OBQ: 9.2%, OCI-CV: 9.2%, SCAS: 9.4%, CDI: 9.2%), and time point 3 (OBQ: 17.0%, OCI-CV: 17.0%, SCAS: 17.2%, CDI: 16.7%). In the cross-sectional network analyses, we accounted for missingness using pairwise deletion. In the longitudinal model, we accounted for missingness using full information maximum likelihood estimation and thus could use all available data for all participants. All analyses were conducted using the full sample as well as for boys and girls separately.

Results

Cross-sectional associations

The mean scores, standard deviations, and skewness and kurtosis values for all variables are in Table 1. The cross-sectional partial correlation networks for the full sample and for boys and girls separately across all time points are in Figure 1. Network analyses were used to test the hypothesis (postulated by both the cognitive and the habitual model) about dysfunctional cognitive beliefs being more strongly associated with OCD than with anxiety and depressive symptoms. Results are presented in Table 2 and showed that dysfunctional cognitive beliefs were significantly more strongly related to OCS than to anxiety and depressive symptoms at each time point, and this held true in the full sample and for boys and girls separately. We also tested whether the strength of the unique association between dysfunctional cognitive beliefs and OCS was different in boys and girls. This was not supported at any time point (all PPs > .07 and below < .34). In all networks, OCS and anxiety symptoms were significantly linked.

Prospective associations

The RI-CLPM had adequate fit in the full sample (RMSEA = .08, CFI = .97, TLI = .92, SRMR = .05) and in boys (RMSEA = .08, CFI = .98, TLI = .92, SRMR = .05) and girls (RMSEA = .07, CFI = .98, TLI = .95, SRMR = .05). Unique prospective associations are presented in Figure 2. In the full sample, all autoregressive paths were statistically significant, indicating that when a person is above their average level at one time point, they are expected to score above their average level also at the subsequent time point. Significant crossed paths emerged for (1) depressive symptoms as a predictor of dysfunctional cognitive beliefs, (2) OCS as a predictor of anxiety symptoms, and (3) anxiety symptoms as a predictor of OCS. This indicates that scores above person-specific means for one of these variables are associated with scores above person-specific means for the other variable at the subsequent time point. In boys, all autoregressive paths were statistically

Table 1 Means and standard deviations skewness, and kurtosis values for all study variables at all time points

	Time point 1			Time point 2			Time point 3		
	Mean (*SD*)	Skewness	Kurtosis	Mean (*SD*)	Skewness	Kurtosis	Mean (*SD*)	Skewness	Kurtosis
OBQ full sample	124.78 (20.99)	0.10	0.23	114.76 (22.43)	0.26	0.39	107.23 (24.57)	0.35	0.34
OCI-CV full sample	14.00 (5.68)	0.40	0.40	12.43 (5.86)	0.65	0.83	11.78 (6.02)	0.56	0.37
SCAS full sample	38.64 (12.60)	0.72	0.64	35.87 (12.03)	0.88	1.49	34.46 (11.80)	0.88	1.04
CDI full sample	10.63 (6.55)	1.01	1.02	9.99 (6.61)	0.97	0.76	9.33 (7.14)	1.27	2.16
OBQ males	124.62 (20.48)	0.01	0.18	114.31 (22.12)	0.27	0.43	106.89 (24.88)	0.41	0.64
OCI-CV males	14.36 (5.70)	0.35	0.43	12.77 (5.91)	0.58	0.58	11.82 (6.03)	0.60	0.37
SCAS males	37.08 (12.65)	0.78	0.84	33.76 (11.45)	1.04	1.60	32.20 (11.33)	1.11	2.05
CDI males	10.43 (6.42)	1.02	0.92	9.60 (6.40)	1.01	0.77	8.65 (6.84)	1.54	4.09
OBQ females	124.97 (21.49)	0.17	0.27	115.24 (22.74)	0.24	0.37	107.58 (24.31)	0.29	0.04
OCI-CV females	13.64 (5.64)	0.45	0.42	12.09 (5.80)	0.73	1.16	11.75 (6.02)	0.52	0.37
SCAS females	40.08 (12.38)	0.70	0.58	37.87 (12.26)	0.77	1.59	36.70 (11.84)	0.73	0.55
CDI females	10.81 (6.68)	1.01	1.10	10.37 (6.80)	0.92	0.72	9.96 (7.34)	1.05	0.93

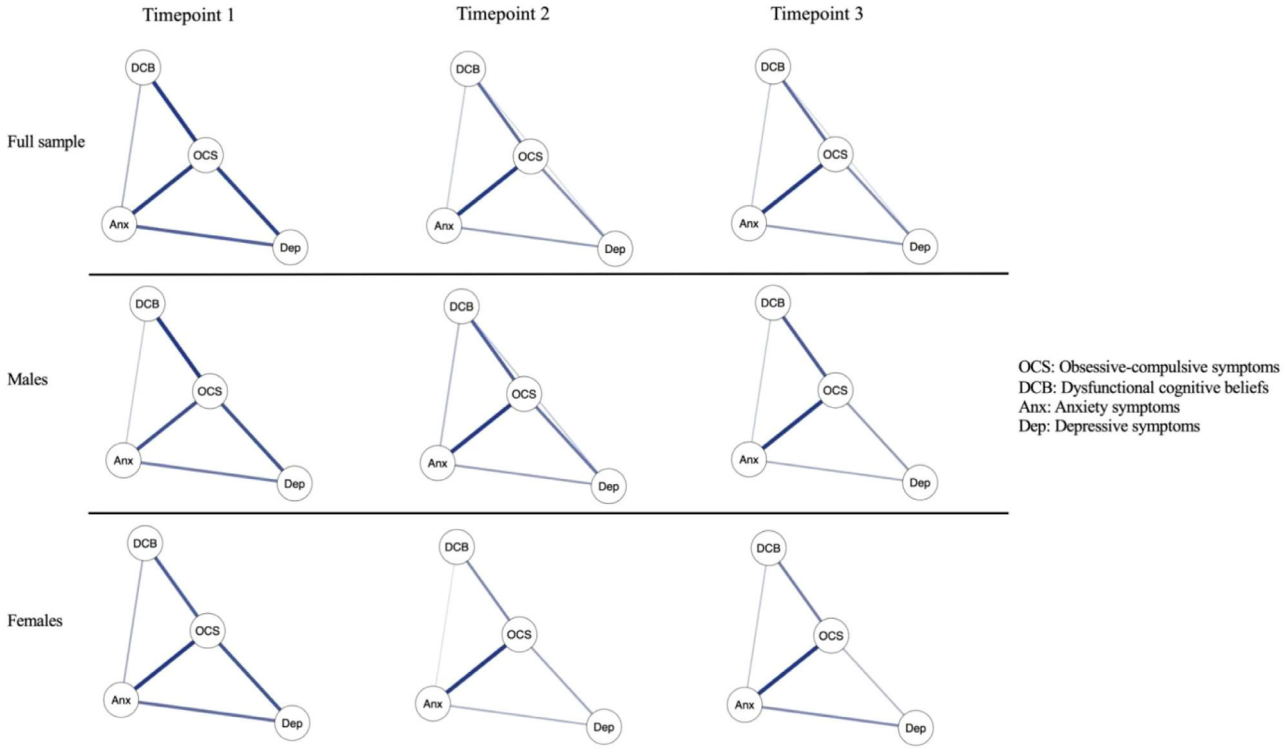

Figure 1 Cross-sectional partial correlation networks including nodes for dysfunctional cognitive beliefs, obsessive-compulsive symptoms, anxiety symptoms, and depressive symptoms for the full sample as well as for males and females separately across time points; the network layout has been averaged across networks. Each variable is represented by a circle and each significant partial correlation by a line. The width and saturation of the line represents the strength of the association with wider and more saturated lines indicating a stronger association

significant, and significant cross-lagged paths emerged between dysfunctional cognitive beliefs and each symptom type as well as between depressive symptoms and dysfunctional cognitive beliefs. In girls, all autoregressive paths were statistically significant except for dysfunctional cognitive

Table 2 Unique associations between dysfunctional cognitive beliefs (OBQ-CV), obsessive-compulsive symptoms (OCI-CV), anxiety symptoms (SCAS) and depressive symptoms (CDI) in the form of partial correlations are presented in the second column and the difference in the partial correlation between anxiety and depressive symptoms and dysfunctional cognitive beliefs compared with dysfunctional cognitive beliefs and obsessive-compulsive symptoms is in column 3. The 95% CIs of the differences, which indicate whether the differences are statistically significant, are in column 4 and the posterior probabilities, which indicate how often this pattern will emerge if we keep drawing samples from the population, are in column 5

	Partial *r* (95% CI)	Difference in partial *r* compared with OBQ – OCI-CV	95% CI for difference	PP for OBQ – OCI-CV being larger (%)
Time point 1 – Full sample				
OBQ-CV – OCI-CV	.33 (.27 to .38)[a]	–	–	–
OBQ-CV – SCAS	.13 (.07 to .20)[a]	.20[a]	.09 to .30[a]	100
OBQ-CV – CDI	.06 (−.01 to .12)	.27[a]	.17 to .37[a]	100
Time point 2 – Full sample				
OBQ-CV – OCI-CV	.32 (.26 to .38)[a]	–	–	–
OBQ-CV – SCAS	.13 (.07 to .20)[a]	.19[a]	.08 to .29[a]	100
OBQ-CV – CDI	.10 (.03 to .16)[a]	.22[a]	.12 to .32[a]	100
Time point 3 – Full sample				
OBQ-CV – OCI-CV	.34 (.28 to .40)[a]	–	–	–
OBQ-CV – SCAS	.13 (.07 to .20)[a]	.20[a]	.10 to .31[a]	100
OBQ-CV – CDI	.08 (.01 to .15)[a]	.26[a]	.16 to .36[a]	100
Time point 1 – Males				
OBQ-CV – OCI-CV	.37 (.29 to .45)[a]			
OBQ-CV – SCAS	.11 (.02 to .20)[a]	.26[a]	.12 to .40[a]	99.9
OBQ-CV – CDI	.04 (−.05 to .13)	.33[a]	.19 to .47[a]	100
Time point 2 – Males				
OBQ-CV – OCI-CV	.33 (.24 to .41)[a]			
OBQ-CV – SCAS	.16 (.06 to .25)[a]	.17[a]	.02 to .32[a]	98.7
OBQ-CV – CDI	.12 (.03 to .22)[a]	.20[a]	.06 to .35[a]	99.7
Time point 3 – Males				
OBQ-CV – OCI-CV	.36 (.27 to .44)[a]			
OBQ-CV – SCAS	.13 (.03 to .22)[a]	.23[a]	.07 to .38[a]	99.9
OBQ-CV – CDI	.10 (−.00 to .18)	.26[a]	.12 to .40[a]	100
Time point 1 – Females				
OBQ – OCI-CV	.29 (.21 to .37)[a]			
OBQ-CV – SCAS	.14 (.06 to .23)[a]	.14[a]	.00 to .28[a]	97.6
OBQ-CV – CDI	.07 (−.02 to .16)	.22[a]	.08 to .35[a]	99.8
Time point 2 – Females				
OBQ-CV – OCI-CV	.30 (.22 to .38)[a]			
OBQ-CV – SCAS	.10 (.01 to .19)[a]	.20[a]	.05 to .35[a]	99.4
OBQ-CV – CDI	.08 (−.02 to .17)	.22[a]	.08 to .36[a]	99.9
Time point 3 – Females				
OBQ-CV – OCI-CV	.31 (.22 to .39)[a]			
OBQ-CV – SCAS	.15 (.05 to .24)[a]	.16[a]	.00 to .31[a]	97.7
OBQ-CV – CDI	.07 (−.03 to .16)	.24[a]	.10 to .38[a]	100

CDI, Children's depression inventory; CI, credible interval; OBQ-CV, obsessive beliefs questionnaire-child version; OCI-CV, obsessive-compulsive inventory-child version; PP, posterior probability; SCAS, Spence children's anxiety scale.
[a]Confidence interval excludes zero.

beliefs. Further, in girls, cross-lagged paths emerged between OCS and anxiety symptoms and between anxiety symptoms and OCS.

Discussion

The present study utilised a prospective design, an approach considered essential for driving progress in this field of research (McLaughlin & King, 2015), to directly compare two competing models of the onset and progression of OCS. The cognitive model proposes that dysfunctional beliefs act as antecedents, contributing to the emergence of OCS (Rachman, 1997; Salkovskis et al., 2000). By contrast, the alternative model posits that OCS themselves may gradually give rise to such dysfunctional beliefs over time (Gillan & Robbins, 2014).

Both models propose unique associations between these constructs, yet cross-sectional data alone cannot disentangle their causal relations. By utilising a prospective approach, the current study was able to separate within-person effects from between-person associations, allowing for a more nuanced evaluation of these competing frameworks.

The first major finding was that, cross-sectionally, dysfunctional cognitive beliefs were more strongly associated with OCS than with anxiety or depressive symptoms. This pattern was robust across all three time points and in both boys and girls. These findings align with the notion that dysfunctional

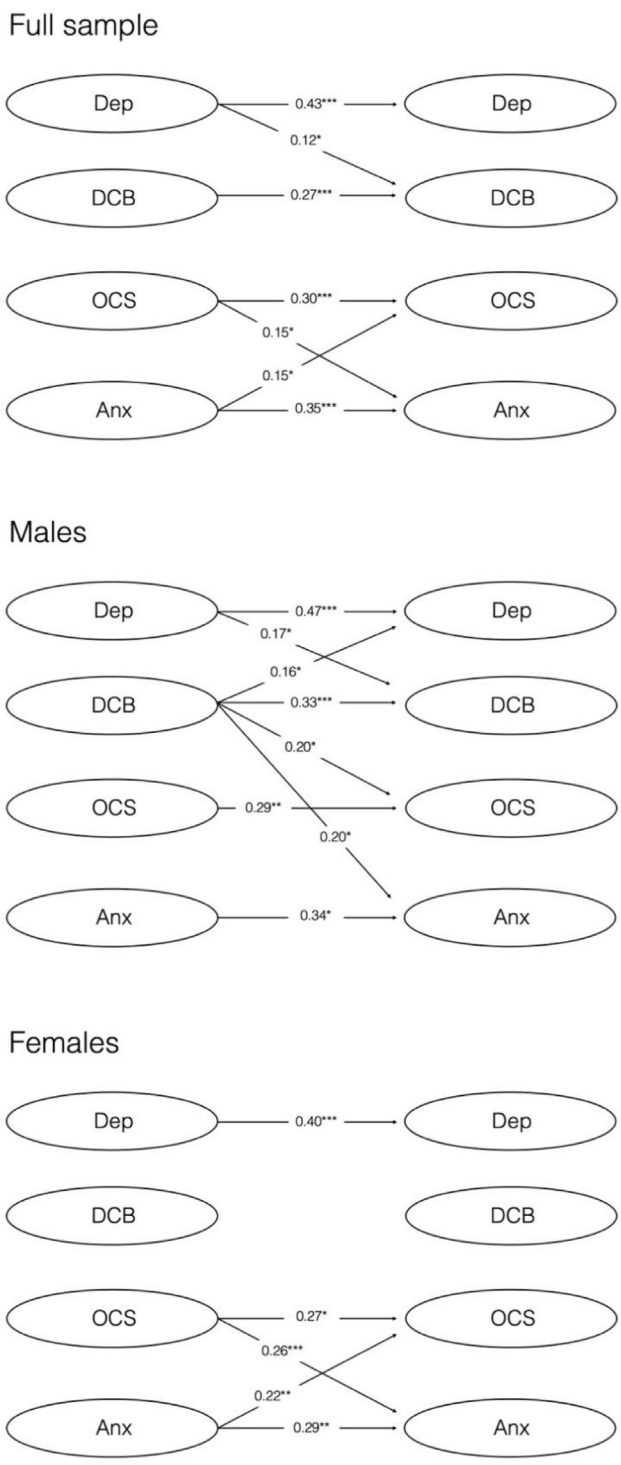

Figure 2 Results from the random-intercept cross-lagged panel model associations are expressed as standardised regression coefficients

cognitive beliefs, as assessed using the OBQ-CV, may be uniquely relevant to OCS (Cervin et al., 2022). However, this result contrasts with some earlier studies suggesting that dysfunctional cognitive beliefs may have a similar strength of association with anxiety symptoms (Tolin et al., 2006; Wahl et al., 2020). The current results suggest that during late childhood and early adolescence, a critical developmental window for the onset of OCS, the OBQ-CV captures cognitive traits that are particularly salient for OCS when considering the full range of symptoms (Foa et al., 2010).

The second major finding revealed that neither of the two aetiological models was supported when prospective data were analysed. Using a RI-CLPM, the study disentangled within-person effects crucial for testing causal relations. Results indicated no prospective associations between dysfunctional cognitive beliefs and OCS; neither did dysfunctional cognitive beliefs predict OCS, nor did OCS predict dysfunctional cognitive beliefs. Instead, anxiety symptoms and OCS showed reciprocal prospective associations, a finding consistent with previous evidence of their strong cross-sectional association (Jagannathan et al., 2024).

This finding challenges the foundational premises of both models, suggesting that dysfunctional cognitive beliefs and OCS may instead be co-occurring phenomena reflecting a broader obsessive-compulsive state. Furthermore, anxiety symptoms appear to be integral to this state, as evidenced by their prospective links with OCS. These results suggest that neither dysfunctional cognitive beliefs nor OCS is individually necessary or sufficient to account for the development of this broader condition.

The third key finding highlighted significant sex differences in prospective associations. While cross-sectional data indicated no moderation effects of sex on the relation between dysfunctional cognitive beliefs and OCS, prospective analyses revealed that dysfunctional cognitive beliefs predicted OCS, anxiety, and depressive symptoms in boys, but not in girls. While based on a nonclinical population, this finding corroborates evidence reported in a clinical context, showing that boys often experience earlier onset of OCD and distinct symptom profiles compared with girls (Krebs & Heyman, 2015; Pampaloni et al., 2022).

Sex differences in the interplay between dysfunctional cognitive beliefs and OCS remain underexplored. A recent study found that boys with high levels of specific cognitive traits, such as inflated responsibility, exhibited greater OCS severity than females within clinical OCD samples (Cervin et al., 2022). However, this effect was not observed in nonclinical samples, suggesting that developmental or contextual factors may influence these associations. In the current study, which focused on late childhood and early adolescence, the prospective association between dysfunctional cognitive beliefs and OCS was specific to boys. Interestingly, in boys dysfunctional cognitive beliefs also predicted anxiety and depressive symptoms, suggesting that these beliefs may act as transdiagnostic risk factors during this developmental stage. This finding aligns with the broader literature emphasising the transdiagnostic nature of dysfunctional cognitive beliefs (Inozu et al., 2022; Miegel, Jelinek, Yassari, Balzar, & Moritz, 2023).

Finally, we found a decline in OCS scores over the three time points, in line with previous evidence that overall psychological symptom scores tend to decrease. Indeed, in community samples downward shifts in scores of psychological symptoms across a 12-month period are both plausible from a developmental perspective (Macul Ferreira de Barros et al., 2021) and expected given measurement phenomena such as regression to the mean (Wolpert et al., 2020).

The strengths of this study include its large, prospectively followed sample of children and adolescents, a group particularly vulnerable to the development of OCS. However, several limitations merit consideration. First, extending the follow-up period into adolescence and adulthood would have allowed for a more comprehensive understanding of developmental trajectories. Second, while the intervals between assessments were relatively short, even more frequent evaluations might have uncovered finer temporal dynamics. Third, self-report measures may not be able to capture the symptoms effectively in this age group, partly due to the limited metacognitive abilities of children at this stage of development. Developmental age is, by definition, in continuous evolution, which means that the lack of confirmation regarding the specificity of beliefs typically associated with OCS, as indicated by our data, aligns with the dynamic nature of age-related development. Fourth, a limitation of the present study is the restricted participant characterisation, which was limited to age and sex. Future research could incorporate more comprehensive sociodemographic and developmental indices and could employ multi-informant assessment; such richer phenotyping would improve generalisability and allow rigorous tests of moderators, mediators, and developmental pathways. Ultimately, symptoms are still in the process of being structured, and identifying cognitive specificity in this age group is more challenging, precisely because the symptomatology has not yet stabilised. Finally, the reliance on self-reported data, though practical for large-scale studies, limits the depth of insight into both dysfunctional cognitive beliefs and symptoms. Future research would benefit from incorporating clinician-administered assessments or interviews to provide richer data.

Despite decades of research, the mechanisms underlying the onset of OCS remain incompletely understood. This study tested two dominant aetiological models: one positing that dysfunctional cognitive beliefs cause the development of OCS, and the other suggesting that OCS leads to the development of such beliefs. While cross-sectional findings supported both models, prospective analyses did not substantiate either. An exception was observed in boys, where dysfunctional cognitive beliefs predicted OCS as well as anxiety and depressive symptoms, suggesting these beliefs may act as a broader risk factor during late childhood and early adolescence in males. These findings emphasise the need for further prospective research to refine our understanding of the developmental interplay between cognitive vulnerabilities and OCS.

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Ethical consideration

Written informed consent was obtained from parents, who signed and returned consent forms to the school. The project and the related modules had received approval from the ethics committee on the 21st of March 2025 (Scuola di Psicoterapia Cognitiva SPC Ethics Committee, 8/25).

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Key points

What's known?

- The prevalence of OCS ranges from 2% to 38.2%, increasing with age and peaking in adolescence.
- There are two aetiological models of OCD: the first emphasises how dysfunctional beliefs lead to the transformation of intrusive thoughts into OCS; the second suggests that OCS leads to the development of dysfunctional beliefs.

What's new?

- The results highlight that dysfunctional beliefs are more strongly associated with OCS than with anxiety or depressive symptoms; neither of the two models was supported by the data. In males, dysfunctional beliefs predicted OCS, anxiety, and depression, but not in females.

What's relevant?

- Observing how OCS develop and evolve not only allows for improved interventions aimed at youth, consequently enhancing quality of life, but also enables early intervention before a full-blown OCD manifests.

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