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Development of a Model of Obsessive–Compulsive Symptoms Based on Thought–Action Fusion and Emotion Regulation: The Mediating Role of Intolerance of Uncertainty among University Students in Kermanshah

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A B S T R A C T

Objective: This study aimed to examine a structural model of obsessive–compulsive symptoms based on thought–action fusion and emotion regulation strategies, with the mediating role of intolerance of uncertainty.

Methods and Materials: The study employed an applied, descriptive–correlational design with a cross-sectional approach. The statistical population comprised all students enrolled in universities in Kermanshah during the second semester of the 2024–2025 academic year. A total of 200 students were selected using convenience sampling. Data were collected using the Padua Inventory for obsessive–compulsive symptoms, the Thought–Action Fusion Questionnaire, the Emotion Regulation Questionnaire (cognitive reappraisal and expressive suppression), and the Intolerance of Uncertainty Scale. Data analysis was conducted using SPSS (version 21) and SmartPLS (version 3). Partial least squares structural equation modeling was applied to evaluate the measurement and structural models, assess model fit, and test direct and indirect relationships among the study variables.

Findings: The results indicated a positive and significant direct effect of thought–action fusion on obsessive–compulsive symptoms ($\beta = 0.17$, $p < .05$) and a negative and significant direct effect of cognitive reappraisal on obsessive–compulsive symptoms ($\beta = -0.26$, $p < .01$). Intolerance of uncertainty showed a strong positive direct effect on obsessive–compulsive symptoms ($\beta = 0.39$, $p < .01$). Mediation analyses revealed that intolerance of uncertainty significantly mediated the relationship between thought–action fusion and obsessive–compulsive symptoms ($\beta = 0.15$, $p < .01$), as well as the relationship between expressive suppression and obsessive–compulsive symptoms ($\beta = 0.12$, $p < .01$). The overall structural model demonstrated acceptable fit and predictive relevance.

Conclusion: The findings support an integrative cognitive–emotional model in which maladaptive thought–action fusion beliefs and emotion regulation patterns contribute to obsessive–compulsive symptoms directly and indirectly through intolerance of uncertainty.

Keywords: *obsessive–compulsive disorder, thought–action fusion, emotion regulation, intolerance of uncertainty.*

1. Introduction

Obsessive–compulsive disorder (OCD) and subclinical obsessive–compulsive symptoms represent a highly prevalent and impairing spectrum of intrusive thoughts, urges, and repetitive behaviors that can markedly disrupt academic functioning, interpersonal relationships, and quality of life in university populations. Contemporary accounts of OCD emphasize that symptom expression is not merely the consequence of intrusive cognitions per se, but rather emerges from how individuals appraise intrusions (e.g., responsibility, threat, morality), attempt to control internal experiences, and regulate the affective arousal evoked by uncertainty and perceived risk. In this regard, cognitive-affective constructs such as thought–action fusion (TAF), emotion regulation strategies and difficulties, and intolerance of uncertainty (IU) have been repeatedly highlighted as core processes that may explain why intrusive thoughts become persistent, distressing, and behaviorally consequential. (Brakoulias, 2024; Knowles & Olatunji, 2023; Wang & Jia, 2024)

TAF refers to a cognitive bias in which an individual conflates thoughts with actions, typically in moral terms ("thinking it is as bad as doing it") or likelihood terms ("thinking increases the probability that it will happen"), and it has long been positioned as an OCD-relevant appraisal style that amplifies guilt, perceived responsibility, and threat monitoring. Early empirical work linked TAF to OCD-related phenomena such as thought suppression and symptom severity, supporting the view that fusing thoughts with actions increases distress and motivates neutralizing rituals. (Rassin et al., 2001; Shafran et al., 1996) More recent experimental and comparative evidence suggests that people with OCD may show heightened but inefficient TAF processes, indicating not only stronger endorsement of fusion beliefs but also potentially maladaptive cognitive operations when evaluating intrusive thoughts. (Lee et al., 2023) Transdiagnostic work further suggests that TAF co-occurs with related constructs such as cognitive fusion and psychological inflexibility, and that their relative contributions may differ across clinical groups (e.g., OCD vs. major depressive disorder), underscoring the value of testing TAF within broader process-based models rather than as an isolated predictor. (Lee et al., 2025)

In parallel, emotion regulation has become a central explanatory axis in OCD research, given that obsessions and compulsions are embedded in cycles of affective escalation and short-term relief. The process model of emotion regulation differentiates strategies such as cognitive reappraisal and expressive suppression, with systematic evidence that these strategies relate to well-being and psychopathology. (Gross & John, 2003) Emerging work specifically focused on OCD indicates that emotion regulation in daily life may be disrupted, with ecological momentary assessment showing clinically meaningful patterns of dysregulation, including heightened negative affect and maladaptive regulatory responses in naturalistic contexts. (Bischof et al., 2024) Complementary lines of evidence—behavioral and neurobiological—suggest that reappraisal capacity and other regulation markers are linked to measurable neural and behavioral signatures, providing plausibility for mechanistic pathways from regulation processes to symptom persistence. (Kosonogov et al., 2023; Vitolo et al., 2022) In addition, culturally grounded work emphasizes that emotion expression and regulation are embedded in sociocultural norms, making it important to validate regulation constructs across contexts and to examine their role in symptom models within specific populations. (Altakroni et al., 2023)

IU is another construct increasingly regarded as a cognitive vulnerability for OCD, reflecting dispositional difficulty tolerating ambiguous, unpredictable, or incomplete information. In OCD, uncertainty can be experienced as threatening or unacceptable, prompting reassurance seeking, repeated checking, and ritualized attempts to reduce doubt. Qualitative synthesis supports IU as a meaningful vulnerability factor, while cross-context evidence (including decision-making under probabilistic reward contingencies) indicates that IU systematically shapes how individuals respond to delayed or uncertain outcomes. (Ciria et al., 2021; Knowles & Olatunji, 2023) Neurocognitive evidence also suggests that individual differences in IU map onto structural features of frontal regions implicated in inhibitory control and threat evaluation, providing convergent support that IU is not merely a self-report artifact but a trait-like construct with plausible neurobiological correlates. (Carlson et al., 2025) Importantly, IU has shown relevance across OCD-related presentations, including perinatal obsessive–compulsive symptoms in specialized populations, highlighting its broader clinical significance. (Wang & Jia, 2024)

From a model-building standpoint, IU is conceptually positioned to operate as a mediator that translates cognitive appraisals and regulatory tendencies into symptom expression. For example, individuals with elevated TAF may interpret intrusive thoughts as dangerous or morally

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meaningful, which increases uncertainty about harm, responsibility, and control; this uncertainty then motivates compulsive behaviors aimed at achieving certainty. Similarly, maladaptive emotion regulation—such as heavy reliance on suppression or broader difficulties regulating affect—may intensify the aversiveness of uncertainty, thereby amplifying IU and strengthening obsessive–compulsive cycles. Empirical studies support the mediating and explanatory roles of related process variables in the IU–symptom link, including emotion regulation difficulties, metacognitive beliefs, and avoidance-based processes. (Amiri & Alipour, 2024; Mousavi & Najafi, 2023; Sahib et al., 2024) Longitudinal evidence further indicates that emotion regulation can mediate relations between IU and emotional difficulties over time, strengthening the logic for integrated models that place regulation pathways and IU in the same explanatory framework. (Sahib et al., 2024)

The proposed integration is also consistent with broader vulnerability frameworks emphasizing experiential avoidance and schema-level processing. For instance, IU has been linked with emotional schemas and experiential avoidance, suggesting that people who hold rigid beliefs about emotions and uncertainty may attempt to avoid internal experiences, inadvertently escalating symptoms. (Abdollahpour et al., 2025) Intervention studies likewise indicate that targeting broader cognitive-emotional processes can produce symptom improvements, including schema-focused approaches that reduce obsessive–compulsive symptoms and enhance distress tolerance. (Safaridizaj & Alipanah, 2023) Cognitive retraining and related cognitive interventions also underscore that modifying information processing and cognitive control can be clinically meaningful in OCD, supporting the applied value of models that identify modifiable cognitive-affective targets. (Pragya et al., 2023) Moreover, mindfulness-based cognitive therapy has been reported to influence rumination, perfectionism, and TAF in women with OCD, implying that TAF is a treatment-relevant process rather than a static trait. (Khadem et al., 2023) In specialized clinical pathways, tertiary OCD services have demonstrated improved outcomes for treatment-resistant or complex cases, underscoring the importance of better phenotyping and mechanistic modeling to guide stepped care and personalization. (Pilunthanakul et al., 2024)

Within the OCD literature, there is also increasing attention to heterogeneity and comorbidity, which are particularly salient in student populations where symptoms may co-occur with depression, generalized anxiety, health anxiety, trauma exposure, and COVID-19-related stressors. Studies comparing IU and related variables across diagnostic groups (e.g., OCD, depression, generalized anxiety disorder) support the relevance of uncertainty-related mechanisms across psychopathology, while also implying that symptom-specific cognitive appraisals (like TAF) may add incremental explanatory value for OCD. (Arfaie et al., 2011; Fathi Avali Gheshlaqi & Najafi, 2023) During the COVID-19 pandemic, perceived stress, COVID-19 anxiety, and IU were shown to predict symptom severity in OCD samples, and emotion regulation strategies and personality traits were implicated in OCD-related manifestations, highlighting contextual stressors as amplifiers of uncertainty and regulation demands. (Shafaei & Jafari, 2021; Sharmi Alamdari et al., 2023) Evidence also indicates that IU and trauma can be associated in OCD patients, reinforcing the need to consider emotionally salient backgrounds in models of symptom formation. (Maheshwari & Tankha, 2024) In parallel, work examining cognitive and executive correlates—such as threat magnification styles, executive function, metacognition, and TAF—supports multivariate approaches that move beyond single-predictor explanations. (Kousheshi et al., 2024)

Measurement rigor is central for testing such integrative models. The Padua Inventory remains a widely used measure for obsessive–compulsive symptoms, with established psychometric properties and local validation evidence supporting its use in student samples. (Sanavio, 1988; Shams et al., 2010) Likewise, the TAF construct has a measurement history that includes validation in both clinical and nonclinical settings and documented associations with OCD symptoms in Iranian research contexts. (Kaviani, 2010; Shafran et al., 1996) Emotion regulation is commonly operationalized via the Emotion Regulation Questionnaire, and cross-cultural adaptation studies have supported its psychometric adequacy in non-Western contexts, which is essential when emotion processes are studied in culturally diverse samples. (DelValle et al., 2022; Gross & John, 2003; Karreman & Vingerhoest, 2012; Sayyadi & Janalizadeh, 2021) IU measurement is also supported by foundational and construct-validity work demonstrating its unique relationship with worry and related affective outcomes, reinforcing its interpretability as a separable cognitive-affective vulnerability. (Buher & Dugas, 2006; Freeston et al., 1994; Partovi Piroz et al., 2022)

Because the present research seeks to evaluate a multivariate explanatory framework—linking TAF and emotion regulation to obsessive–compulsive symptoms

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through IU—structural equation modeling (SEM) provides an analytically appropriate approach to simultaneously estimate direct and indirect effects while accounting for measurement properties. Foundational guidance on evaluating SEM measurement quality emphasizes the importance of convergent validity and reliable measurement when modeling latent constructs. (Fornell & Larcker, 1981) In practice, partial least squares SEM is frequently used when distributional assumptions are violated or when the goal includes prediction-oriented modeling, with recommended evaluation criteria for measurement and structural components as well as global fit heuristics. (Henseler et al., 2009) Within OCD research, SEM and mediational testing have been used to clarify the pathways connecting IU to symptoms via emotion-related processes or belief systems, offering a precedent for the present integrative model. (Amiri & Alipour, 2024; Mousavi & Najafi, 2023; Sahib et al., 2024)

Despite converging evidence that TAF, emotion regulation, and IU are each relevant to OCD symptoms, several gaps motivate the current study. First, many studies examine these constructs in isolation, whereas real-world symptom development likely reflects the co-activation of appraisal biases (TAF), aversive uncertainty reactivity (IU), and affect regulation patterns. Second, culturally and contextually specific research remains needed, particularly in student populations where academic demands and social transitions may magnify uncertainty and emotional reactivity. Third, clarifying whether IU functions as a central mediator can inform prevention and intervention targets—suggesting, for instance, that reducing fusion beliefs or improving reappraisal may indirectly reduce symptoms by lowering IU. Emerging evidence that self-compassion may relate to obsessive–compulsive symptoms through IU further supports the centrality of IU as a bridge between broader self-related processes and symptom severity. (Kaçar-Başaran & Gökdağ, 2025) Attachment-based approaches likewise propose that emotion regulation links relational patterns to OCD symptoms, reinforcing the importance of regulation mechanisms as proximal processes in OCD models. (Nielsen et al., 2025) Moreover, youth-focused work emphasizes emotion dysregulation as a clinically relevant feature with implications for treatment planning, suggesting that similar mechanisms may be meaningfully examined in late adolescence and early adulthood. (Thoustrup et al., 2025) Finally, transdiagnostic comparisons indicate that cognitive fusion and TAF may operate differently across disorders, which further justifies testing an integrated model in nonclinical student samples where symptom levels vary dimensionally. (Asgharnejad et al., 2023; Elaine et al., 2023; Lee et al., 2025; Zhu, 2023)

Accordingly, the present study aimed to test a structural model of obsessive–compulsive symptoms based on thought–action fusion and emotion regulation, with the mediating role of intolerance of uncertainty, among university students.

2. Methods and Materials

2.1. Study Design and Participants

The present study is classified as applied research in terms of its objective, as its findings contribute to the provision of practical solutions and actionable recommendations for addressing real-world problems. With respect to the method of data collection, this study falls within the category of descriptive–correlational research, meaning that the researcher examined and explained the relationships among variables without manipulating them. In terms of the data collection approach, the present research is considered a quantitative study, indicating that the data were collected in numerical form and analyzed using statistical techniques. Structural equation modeling was employed to analyze the data and test the relational models among the variables. Additionally, in terms of the time dimension, this research was cross-sectional, meaning that the required data were collected at a specific point in time from a defined sample. The statistical population of the study consisted of all students enrolled in universities in the city of Kermanshah during the second semester of the 2024–2025 academic year, totaling approximately 50,000 individuals. To accurately estimate the sample size for testing the structural model of obsessive–compulsive symptoms based on thought–action fusion and emotion regulation with the mediating role of intolerance of uncertainty, the empirical rule based on the formula proposed by Tabachnick and Fidell (2013) was used. According to this formula, the sample size in structural equation modeling studies is calculated as $n = (m \times p) + 50$, where m represents the number of components of the predictor variables and p is a value between 5 and 15. In the present study, the total number of components was seven: three components for thought–action fusion, two components for emotion regulation, and two components for intolerance of uncertainty. By selecting $p = 15$ (the maximum recommended value to increase model accuracy and statistical power), the sample size was calculated as follows:

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n = (7 × 15) + 50 = 155. To enhance the generalizability of the results and compensate for potential sample attrition, 20% was added to this value (155 × 0.20 ≈ 31), resulting in a final sample size of 186 participants. Accordingly, the final sample size for testing the structural model was determined to be 186 and was increased to 200 participants. The sample was selected using a convenience sampling method. Inclusion criteria included enrollment in universities in Kermanshah at the time of the study, meeting the age criterion of 18 to 55 years, and providing informed consent to participate in the research. Exclusion criteria included the presence of substance-related disorders or use of psychoactive medications, withdrawal of consent to participate, concurrent participation in psychotherapy classes or psychological intervention programs, a history of academic dropout for more than one semester, and incomplete questionnaires.

2.2. Measures

The Padua Inventory is a self-report instrument designed to assess the severity and nature of obsessive thoughts and compulsive behaviors associated with obsessive–compulsive disorder (OCD). This questionnaire was originally developed by Sanavio (1988), and its revised version has been used at Washington State University. The instrument aims to measure various types of obsessive thoughts, impulses, and compulsions observed in individuals with OCD. The Persian version of the Padua Inventory consists of 39 items scored on a five-point Likert scale. Respondents are asked to indicate the degree of distress or anxiety they experience in response to each thought or behavior on a scale ranging from 0 (no distress at all) to 4 (very severe). Total and subscale scores are calculated by summing the relevant item scores, with higher scores indicating greater severity of obsessive–compulsive symptoms. The results of a study by Shams et al. (2010) demonstrated satisfactory reliability and internal consistency, with a Cronbach's alpha of 0.92, split-half reliability using the Spearman–Brown corrected correlation of 0.95, and test–retest reliability of 0.77. To assess criterion validity, the Persian Padua Inventory was compared with the Obsessive–Compulsive Inventory and the Maudsley Obsessive–Compulsive Questionnaire, yielding correlation coefficients of 0.69 and 0.58, respectively. In the present study, Cronbach's alpha for the obsessive–compulsive symptoms construct was 0.829, and the composite reliability was 0.870. The average variance extracted (AVE) for this construct was 0.464, confirming acceptable convergent validity.

Thought–action fusion was assessed using the Thought–Action Fusion Questionnaire developed by Shafran et al. (1996), which was designed and validated to measure thought–action fusion from the perspectives of moral thought–action fusion, likelihood thought–action fusion for others, and likelihood thought–action fusion for oneself. This questionnaire consists of 19 closed-ended items rated on a five-point Likert scale ranging from strongly agree to strongly disagree. Shafran et al. (1996) validated the questionnaire using both clinical and non-clinical samples, reporting internal consistency coefficients (Cronbach's alpha) ranging from 0.85 to 0.96. Rassin et al. (2001) reported a test–retest reliability coefficient of 0.52 for the total scale over a three-month interval. In a study by Kaviani (2010), correlations between the total score of the Thought–Action Fusion Questionnaire and the Padua Inventory ranged from 0.26 to 0.32, all of which were significant at the 0.01 level, and the Cronbach's alpha coefficient was reported as 0.911. In the present study, Cronbach's alpha for the thought–action fusion construct was 0.672, and the composite reliability was 0.826. The average variance extracted for this construct was 0.636, indicating confirmed convergent validity.

The Emotion Regulation Questionnaire was developed by Gross and John (2003) and consists of two subscales: cognitive reappraisal (six items) and expressive suppression (four items). Participants respond on a seven-point Likert scale ranging from strongly disagree (1) to strongly agree (7). Gross and John (2003) reported internal consistency coefficients of 0.79 for cognitive reappraisal and 0.73 for expressive suppression. Kareman and Vingerhoets (2012) reported internal consistency coefficients of 0.83 for cognitive reappraisal and 0.79 for expressive suppression. In a study by Delaveau et al. (2022), test–retest reliability was reported as 0.69 for the total questionnaire, and reliability coefficients for the subscales ranged from 0.73 to 0.79. In Iran, the psychometric adequacy of this scale was examined among students at Mohaghegh Ardabili University by Ghasempour et al. (2012, as cited in Sayyadi & Janalizadeh Chenari, 2021), who reported Cronbach's alpha coefficients of 0.79 for cognitive reappraisal, 0.52 for suppression, and 0.71 for the total scale. Furthermore, in a study by Kianfar et al. (2023), content validity, factorial validity for the two-factor structure, and concurrent validity were examined, with results confirming content validity, factorial validity for the reappraisal and suppression factors, and concurrent

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validity through correlations with a distress tolerance scale. In the present study, Cronbach's alpha for the cognitive reappraisal construct was 0.796 with a composite reliability of 0.846, while Cronbach's alpha for the expressive suppression construct was 0.683 with a composite reliability of 0.795. The AVE values were 0.481 for cognitive reappraisal and 0.515 for expressive suppression, indicating acceptable convergent validity.

The Intolerance of Uncertainty Questionnaire was developed by Freeston et al. (1994) to assess individuals' tolerance of uncertain and ambiguous situations. This scale consists of 27 items and conceptualizes intolerance of uncertainty as comprising four characteristics that distinguish anxious individuals from non-anxious individuals. Items are rated on a five-point Likert scale ranging from 1 (completely false) to 5 (completely true). The items describe individuals' reactions to uncertainty in everyday life. The minimum possible score on this scale is 27, and the maximum score is 135. Freeston et al. (1994) reported satisfactory validity for this instrument. Buhr and Dugas (2006) developed and validated the English version of the scale, reporting significant correlations with the Penn State Worry Questionnaire (r = 0.60), the Beck Depression Inventory (r = 0.59), and the Beck Anxiety Inventory (r = 0.55) at the 0.001 significance level. Buhr and Dugas (2002) reported a test–retest reliability coefficient of 0.74 over a five-week interval and a Cronbach's alpha of 0.94. In Iran, test–retest reliability was reported as 0.79 in a study by Arfaei et al. (2011), and Cronbach's alpha reliability was reported as 0.96 in a study by Partovi Pirooz et al. (2022). In the present study, Cronbach's alpha for the intolerance of uncertainty construct was 0.925, and the composite reliability was 0.964. The AVE value was calculated as 0.930, indicating a very high level of convergent validity.

2.3. Data Analysis

Data were analyzed using SPSS (version 21) and SmartPLS (version 3). Descriptive statistics were first computed to summarize the study variables, followed by inferential analyses using partial least squares structural equation modeling (PLS-SEM). The measurement model was evaluated in terms of reliability and convergent validity, and the structural model was assessed through path coefficients, coefficients of determination, predictive relevance, and overall model fit indices to test the hypothesized direct and indirect relationships among variables.

3. Findings and Results

Based on the demographic information, a total of 200 university students participated in this study. Of these, 57.5% were female and 41.5% were male; 1% did not respond to this item. In terms of age, 50% were 18–25 years old, 25% were 26–33 years old, and 16% were 34–40 years old; 9% did not respond to this item. Finally, 12% were enrolled in an associate degree program, 39.5% in a bachelor's program, 37% in a master's program, and 2.5% in a doctoral program; 9% did not respond to this item. Table 1 presents the descriptive statistics for the study variables and their components.

Table 1

Descriptive Statistics for Study Variables

Variable	Component	N	Minimum	Maximum	Mean	SD
Total score of obsessive–compulsive symptoms	—	200	39	140	71.00	22.39
Obsessive–compulsive symptoms	Contamination obsessions	200	6	28	13.14	4.81
	Washing compulsions	200	4	19	8.66	3.39
	Ordering/arranging compulsions	200	3	15	6.17	3.21
	Checking compulsions	200	10	44	19.15	7.97
	Obsessive thoughts of harm to self and others	200	5	25	8.69	4.49
	Violent obsessive thoughts	200	2	10	3.23	1.56
	Obsessive impulses to harm oneself	200	7	31	9.56	4.36
	Obsessive impulses to steal	200	2	10	2.40	1.23
Total score of thought–action fusion	—	200	21	95	60.47	14.48
Thought–action fusion	Moral thought–action fusion	200	14	60	42.73	10.61
	Likelihood thought–action fusion for others	200	4	20	9.85	4.72
	Likelihood thought–action fusion for self	200	3	15	7.89	3.54
Emotion regulation	Cognitive reappraisal	200	6	42	29.47	6.29
	Expressive suppression	200	4	28	14.96	4.95
Intolerance of uncertainty (total score)	—	200	27	135	80.92	18.75
Intolerance of uncertainty	Self-referential implications	200	15	75	45.30	10.55
	Unfairness	200	12	60	35.62	8.87

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Based on Table 1, at the total-score level, the highest mean pertained to obsessive–compulsive symptoms (M = 71.00), whereas the lowest mean was observed for thought–action fusion (M = 60.47); intolerance of uncertainty also showed a comparatively higher mean (M = 80.92) than the other variables. At the component level for obsessive–compulsive symptoms, checking compulsions had the highest mean (M = 19.15), while obsessive impulses to steal had the lowest mean (M = 2.40). Among thought–action fusion components, moral thought–action fusion had the highest mean (M = 42.73), whereas likelihood thought–action fusion for self had the lowest mean (M = 7.89). For emotion regulation components, cognitive reappraisal showed the highest mean (M = 29.47), and expressive suppression showed the lowest mean (M = 14.96). Finally, among the intolerance of uncertainty components, self-referential implications had the highest mean (M = 45.30), and unfairness had the lowest mean (M = 35.62). Overall, checking compulsions and moral thought–action fusion showed the highest means among components, whereas obsessive impulses to steal and likelihood thought–action fusion for self were at the lowest levels.

The collected data were analyzed using SPSS (version 21) and SmartPLS (version 3) at both descriptive and inferential levels. Because the data distribution was non-normal, the study hypotheses were tested using linear regression within a path-analytic framework in SmartPLS (version 3) using partial least squares (PLS). Therefore, prior to structural equation modeling, the assumptions of this statistical approach—including (1) absence of multicollinearity, (2) independence of errors, and (3) the presence of relationships among the study variables—were examined and confirmed. In addition, model fit was evaluated prior to inference. In PLS-SEM (SmartPLS 3), model fit is assessed across three parts: measurement model fit, structural model fit, and overall model fit.

Table 2

Fit Indices for the Measurement Models and Structural Model

Construct	Cronbach's α	Composite reliability	AVE	R^2	Adjusted R^2	Q^2	Redundancy (Red)
Thought–action fusion	0.672	0.826	0.636	—	—	0.350	—
Emotion regulation (cognitive reappraisal)	0.796	0.846	0.481	—	—	0.281	—
Emotion regulation (expressive suppression)	0.683	0.795	0.515	—	—	0.254	—
Intolerance of uncertainty	0.925	0.964	0.930	0.273	0.262	0.579	0.226
Obsessive–compulsive symptoms	0.829	0.870	0.464	0.397	0.385	0.308	0.164

Measurement model fit entails evaluating the reliability and convergent validity of the study constructs (Fornell & Larcker, 1981). Reliability estimates for all constructs—except thought–action fusion and expressive suppression—were above 0.70, indicating acceptable reliability for most model constructs. However, because standardized questionnaires validated in Iran were used to measure these variables, and provided that the overall model fit is adequate, lower reliability and composite reliability for some sub-constructs may be considered tolerable. The AVE values for all constructs exceeded 0.30. After obtaining factor loadings, Cronbach's alpha, composite reliability, and AVE values from the software outputs, and given that these indices for each latent variable were above the defined thresholds, the reliability and validity of the research model were considered acceptable.

The Stone–Geisser criterion indicated that the model's predictive power for cognitive reappraisal, expressive suppression, and obsessive–compulsive symptoms was at a moderate level ($0.15 < Q^2 < 0.35$), whereas for thought–action fusion and intolerance of uncertainty it was at a strong level ($Q^2 > 0.35$). Overall, the average predictive relevance of the model was in the strong and acceptable range ($Q^2 > 0.35$).

In addition, the coefficient of determination for intolerance of uncertainty was in the weak range, whereas for obsessive–compulsive symptoms it was in the strong range. In the examined model, the average R^2 value was in the strong and acceptable range ($R^2 > 0.33$).

In accordance with the PLS algorithm, after establishing the measurement models, the structural model fit was assessed. In this section, three criteria were examined for structural model evaluation: (a) the coefficient of determination (R^2), (b) the Stone–Geisser criterion (Q^2), and (c) the redundancy criterion.

To evaluate the overall model fit that simultaneously reflects both measurement and structural components, the Goodness-of-Fit (GoF) index was calculated as $GoF = \sqrt{\bar{Q}^2 \times \bar{R}^2}$. Based on this formula, the mean of the communalities/predictive relevance values (Q^2) across

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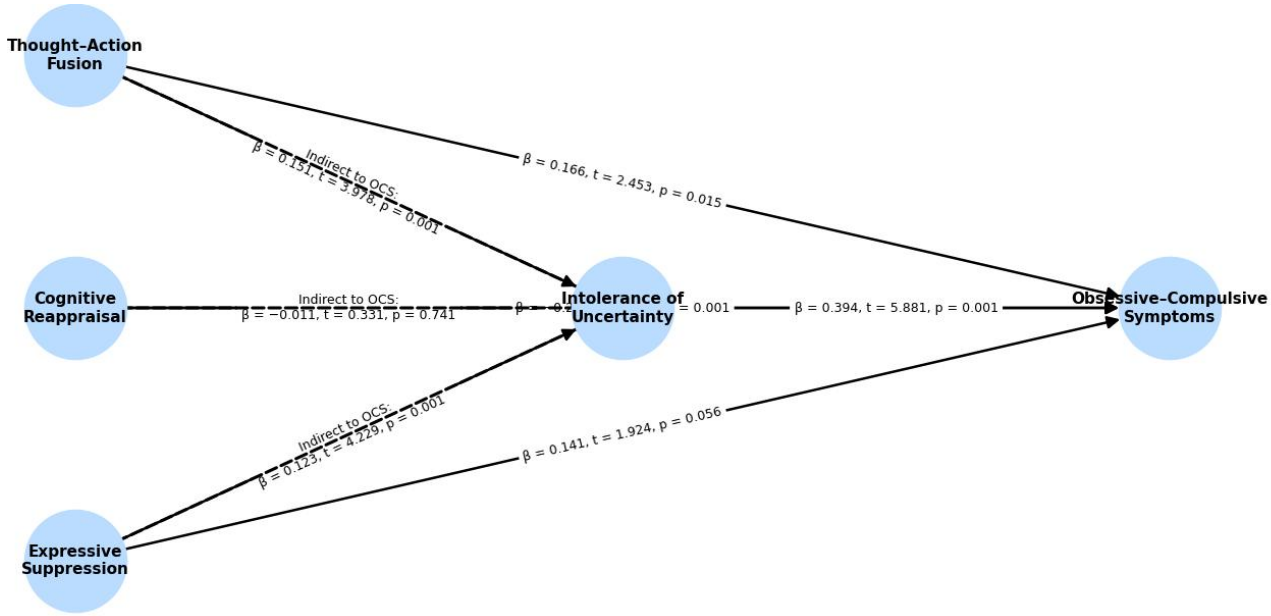
model variables was 0.354, and the mean of the R^2 values was 0.335. Therefore, $GoF = \sqrt{0.354 \times 0.335} = \sqrt{0.118} = 0.344$. Considering the three benchmark values of 0.10, 0.25, and 0.36 as small, medium, and large, respectively (Henseler et al., 2009), the obtained GoF value indicates an overall medium and acceptable fit for the proposed model. Accordingly, the specified model demonstrated satisfactory fit, and the internal relationships within the model were examined.

Figure 1

Structural model with estimated path coefficients



In this model, obsessive–compulsive symptoms served as the criterion variable, thought–action fusion and emotion regulation were the predictor variables, and intolerance of uncertainty functioned as the mediator. A summary of the estimated direct effects is provided in Table 3.

Table 3

Summary of Direct Path Coefficients

Path	Path coefficient	t-value	Significance level
Thought–action fusion → obsessive–compulsive symptoms	0.166*	2.453	0.015
Cognitive reappraisal → obsessive–compulsive symptoms	−0.260**	3.665	0.001
Expressive suppression → obsessive–compulsive symptoms	0.141	1.924	0.056
Intolerance of uncertainty → obsessive–compulsive symptoms	0.394**	5.881	0.001

* Significant at the 95% confidence level.

** Significant at the 99% confidence level.

The results of model estimation indicated a positive and significant relationship between thought–action fusion and obsessive–compulsive symptoms (β = 0.17), suggesting that higher thought–action fusion is directly associated with increased obsessive–compulsive symptoms among university students in Kermanshah ($p < .05$). In addition, cognitive reappraisal showed a negative and significant relationship with obsessive–compulsive symptoms (β = −0.260), indicating that greater use of cognitive reappraisal is directly associated with reduced obsessive–compulsive symptoms ($p < .05$). Finally, intolerance of uncertainty demonstrated a positive and significant relationship with obsessive–compulsive symptoms (β = 0.39), indicating that higher intolerance of uncertainty is directly associated with increased obsessive–compulsive symptoms ($p < .05$). A summary of the estimated indirect effects is presented in Table 4.

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Table 4

Summary of Indirect Path Coefficients

Path	Indirect effect	t-value	Significance level
Thought–action fusion → intolerance of uncertainty → obsessive–compulsive symptoms	0.151**	3.978	0.001
Cognitive reappraisal → intolerance of uncertainty → obsessive–compulsive symptoms	−0.011	0.331	0.741
Expressive suppression → intolerance of uncertainty → obsessive–compulsive symptoms	0.123**	4.229	0.001

** Significant at the 99% confidence level.

The results further indicated that the indirect path from thought–action fusion to obsessive–compulsive symptoms through intolerance of uncertainty (β = 0.15) and the indirect path from expressive suppression to obsessive–compulsive symptoms through intolerance of uncertainty (β = 0.12) were positive and statistically significant. Therefore, thought–action fusion and expressive suppression were indirectly related to obsessive–compulsive symptoms via the mediating role of intolerance of uncertainty among university students in Kermanshah ($p < .05$).

4. Discussion

The present study examined a structural model of obsessive–compulsive symptoms based on thought–action fusion (TAF) and emotion regulation strategies, with the mediating role of intolerance of uncertainty (IU), among university students. Overall, the findings support the adequacy of the proposed model and underscore the central role of cognitive–emotional processes in explaining variability in obsessive–compulsive symptomatology in a nonclinical student population. The results demonstrated that TAF and IU were positively associated with obsessive–compulsive symptoms, whereas cognitive reappraisal, as an adaptive emotion regulation strategy, was negatively associated with symptom severity. Moreover, IU emerged as a significant mediator in the relationships between TAF and obsessive–compulsive symptoms, as well as between expressive suppression and obsessive–compulsive symptoms. These findings are consistent with contemporary cognitive–behavioral and transdiagnostic models of OCD, which emphasize maladaptive appraisals of intrusive thoughts, difficulty tolerating uncertainty, and dysfunctional emotion regulation as interacting mechanisms that sustain obsessive–compulsive phenomena.

The direct positive association between TAF and obsessive–compulsive symptoms observed in this study aligns with a substantial body of prior research identifying TAF as a core cognitive distortion in OCD. Early conceptualizations proposed that when individuals believe that thoughts are morally equivalent to actions or that thinking about an event increases its likelihood, intrusive cognitions become highly threatening and distressing, thereby motivating compulsive neutralization efforts (Rassin et al., 2001; Shafran et al., 1996). More recent empirical work has shown that individuals with OCD display heightened endorsement of TAF beliefs and that these beliefs are linked to symptom severity across clinical and nonclinical samples (Asgharnejad et al., 2023; Lee et al., 2023). The present findings extend this evidence by demonstrating that even in a student population, higher levels of TAF are associated with greater obsessive–compulsive symptoms, suggesting that TAF operates dimensionally rather than categorically. This is consistent with transdiagnostic perspectives proposing that TAF and related fusion constructs reflect broader cognitive inflexibility processes that cut across diagnostic boundaries (Lee et al., 2025).

Importantly, the results further indicated that IU partially mediated the relationship between TAF and obsessive–compulsive symptoms. This finding provides empirical support for theoretical propositions that TAF may increase sensitivity to uncertainty by amplifying perceived responsibility, threat, and doubt. When intrusive thoughts are interpreted as dangerous or morally significant, uncertainty about potential harm or personal culpability becomes intolerable, prompting repetitive checking, reassurance seeking, and other compulsive behaviors aimed at achieving certainty. Prior qualitative and review-based research has highlighted IU as a cognitive vulnerability factor for OCD that interacts with maladaptive belief systems (Knowles & Olatunji, 2023). The present mediational findings are consistent with studies showing that IU mediates relationships between cognitive appraisals and obsessive–compulsive symptoms, including research demonstrating mediating roles for IU between self-compassion and OCD symptoms, as well as between emotional schemas and symptom severity (Abdollahpour et al., 2025; Kaçar-Başaran & Gökdağ, 2025). Together, these

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results reinforce the conceptualization of IU as a central mechanism translating maladaptive cognitive interpretations into obsessive–compulsive symptom expression.

With regard to emotion regulation, the present study found that cognitive reappraisal was negatively associated with obsessive–compulsive symptoms, whereas expressive suppression did not show a significant direct association but exerted an indirect effect through IU. The protective role of reappraisal is consistent with the broader emotion regulation literature, which has repeatedly shown that reappraisal is associated with lower negative affect, greater psychological well-being, and reduced psychopathology (Gross & John, 2003; Karreman & Vingerhoest, 2012). In OCD-specific contexts, recent research suggests that adaptive regulation strategies such as reappraisal may buffer against distress elicited by intrusive thoughts, reducing the need for compulsive behaviors (Bischof et al., 2024; Cha & Hyun, 2024). Neurobehavioral evidence further indicates that reappraisal ability is linked to distinct neural and behavioral markers, supporting its role as a mechanism that can modulate emotional responses to threat and uncertainty (Kosonogov et al., 2023; Vitolo et al., 2022). The present findings extend this literature by demonstrating that reappraisal is inversely related to obsessive–compulsive symptoms in a student sample, highlighting its relevance beyond clinical populations.

The indirect effect of expressive suppression on obsessive–compulsive symptoms through IU suggests a more nuanced role for maladaptive regulation strategies. Suppression has been widely associated with increased physiological arousal, reduced emotional clarity, and poorer mental health outcomes (Gross & John, 2003). In the context of OCD, suppression may exacerbate uncertainty by preventing effective processing and integration of emotional experiences, thereby intensifying doubt and distress. Longitudinal evidence indicates that emotion regulation mediates the relationship between IU and emotional difficulties over time, supporting the plausibility of the pathway identified in the present model (Sahib et al., 2024). Furthermore, studies conducted during high-stress contexts, such as the COVID-19 pandemic, have shown that maladaptive emotion regulation strategies interact with IU and perceived stress to predict OCD symptom severity (Shafaei & Jafari, 2021; Sharmi Alamdari et al., 2023). The current results are therefore consistent with a growing consensus that emotion regulation difficulties do not merely co-occur with OCD symptoms but actively contribute to their maintenance via uncertainty-related processes.

The strong direct association between IU and obsessive–compulsive symptoms observed in this study is also in line with extensive prior evidence. IU has been shown to distinguish individuals with OCD from healthy controls and from those with other disorders, such as major depression, and to be associated with greater symptom severity (Arfaie et al., 2011; Fathi Avali Gheshlaqi & Najafi, 2023). Experimental and decision-making studies further demonstrate that individuals high in IU show altered responses to probabilistic and delayed outcomes, reinforcing the notion that uncertainty is experienced as aversive and threatening (Ciria et al., 2021). Neurocognitive findings linking IU to frontal brain structures involved in inhibitory control and threat evaluation lend additional support to its role as a trait-like vulnerability factor (Carlson et al., 2025). In light of these findings, the present study adds to the literature by situating IU as both a direct predictor and a mediator within a broader cognitive–emotional model of obsessive–compulsive symptoms.

From a methodological perspective, the adequacy of the measurement and structural models supports the appropriateness of using partial least squares structural equation modeling to examine complex mediational relationships among latent constructs. The use of well-validated instruments, such as the Padua Inventory, the Thought–Action Fusion Questionnaire, the Emotion Regulation Questionnaire, and the Intolerance of Uncertainty Scale, enhances confidence in the interpretability of the findings (Freeston et al., 1994; Sanavio, 1988; Shafran et al., 1996; Shams et al., 2010). The observed pattern of relationships is also consistent with previous SEM-based studies that modeled IU as a mediator between cognitive or emotional variables and obsessive–compulsive symptoms (Mousavi & Najafi, 2023; Partovi Piroz et al., 2022). The acceptable overall model fit, as evaluated using established criteria, further supports the plausibility of the proposed integrative framework (Fornell & Larcker, 1981; Henseler et al., 2009).

5. Conclusion

Taken together, the findings suggest that obsessive–compulsive symptoms in students are best understood as emerging from the interaction of maladaptive cognitive appraisals (TAF), emotion regulation patterns, and intolerance of uncertainty. Rather than operating in isolation, these processes appear to form a reinforcing network in which intrusive thoughts become fused with perceived

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action and moral significance, emotional responses are poorly regulated or suppressed, uncertainty becomes intolerable, and compulsive behaviors are enacted to restore a sense of control. This integrative perspective aligns with contemporary transdiagnostic and process-based approaches to psychopathology, which emphasize shared mechanisms across disorders and highlight modifiable targets for intervention (Knowles & Olatunji, 2023; Lee et al., 2025; Nielsen et al., 2025).

6. Limitations & Suggestions

Several limitations should be considered when interpreting the findings of this study. First, the cross-sectional design precludes causal inferences regarding the directionality of the observed relationships. Second, the reliance on self-report measures may introduce response biases, such as social desirability or shared method variance. Third, the sample consisted of university students, which may limit the generalizability of the findings to clinical populations or to individuals from different age groups or cultural contexts. Fourth, although the model included key cognitive–emotional variables, other relevant factors such as perfectionism, experiential avoidance, or attachment-related processes were not directly examined.

Future research would benefit from employing longitudinal or experimental designs to clarify the temporal ordering and causal pathways among thought–action fusion, emotion regulation, intolerance of uncertainty, and obsessive–compulsive symptoms. Studies involving clinical samples could examine whether the proposed model operates similarly in diagnosed OCD populations or whether certain pathways are more pronounced in clinical versus nonclinical groups. Additionally, incorporating multimethod assessments, such as behavioral tasks or ecological momentary assessment, could provide a more nuanced understanding of how these processes unfold in daily life. Expanding the model to include additional transdiagnostic constructs may further enhance its explanatory power.

From an applied perspective, the findings highlight the importance of targeting intolerance of uncertainty, maladaptive thought–action fusion beliefs, and emotion regulation strategies in preventive and therapeutic interventions for obsessive–compulsive symptoms. Interventions that enhance cognitive reappraisal skills, reduce reliance on expressive suppression, and promote greater tolerance of uncertainty may be particularly beneficial for students experiencing elevated obsessive–compulsive tendencies. Integrating these components into existing cognitive–behavioral or transdiagnostic treatment frameworks may help reduce symptom severity and improve psychological well-being in academic settings.

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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Authors' Contributions

All authors equally contributed to this article.

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