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Role of Childhood Fears and Brain-Behavioral Systems in Adolescent Obsessive-Compulsive Disorder: An Evolutionary Model Based on the Mediation of Uncertainty Intolerance

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ABSTRACT

Objective: The current investigation scrutinizes a proposed theoretical model grounded in the principles of evolution concerning the etiology of obsessive-compulsive disorder (OCD). The primary aim of this research is to explore the intermediary function of intolerance of ambiguity in the association between childhood anxieties and brain-behavioral mechanisms exhibiting indications and manifestations of OCD in male and female high school students from Kouhdasht city, Iran.

Methods: The target population encompassed all male and female students attending secondary schools in Kouhdasht city. Utilizing cluster sampling, data collection involved the employment of the revised fear questionnaire for children and adolescents, Carver and White's (1994) scale measuring behavioral inhibition/activation systems, the uncertainty intolerance questionnaire, and Fawa et al.'s (2002) practical obsession questionnaire. Data analysis was conducted utilizing SPSS and Amos software.

Results: Findings from the data analysis indicated a direct impact of childhood fears and intolerance of ambiguity on obsessive-compulsive disorder. Furthermore, childhood fears and behavioral brain systems were found to indirectly influence this disorder through the activation of intolerance of ambiguity.

Conclusions: Consequently, it is recommended that familiarity with evolution should not be limited to professionals in scientific domains but should also be accessible to the broader public.

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Introduction

The theory of evolution is the most important concept in all human sciences. In the topics related to humans, no question can be answered without considering the perspective of evolution. In other words, the set of human thoughts are strongly influenced by the evolutionary perspective (Buss et al., 2009; Buss, 2000). According to Darwin, natural selection is not only related to the external organs of a person; Rather, it plays a role in the behavior of creatures as much as it affects the appearance characteristics (van Schalkwyk & Leckman, 2017). In this way, because the main concern of psychology is to understand the behavior of humans and other creatures; The theory of natural selection has a direct relationship with psychology (Del Giudice, 2016). Evolutionary psychology is one of the subfields of biological psychology that examines human thinking and action based on the theory of natural selection (Hayes, Hofmann & Wilson, 2020). All biological phenomena, including the human psyche, have evolved by the same simple and inevitable process of natural selection among phenotypes that are partially heritable (Turner, 2014). One of the most important curiosities of evolutionary theory researchers is how the precise operation of natural selection can allow disease and disorder to persist. Therefore, for evolutionary psychologists, the existence of psychopathology is confusing (Crespi, 2020). Considering the importance of evolutionary theory in human sciences, especially psychology, in this research we intend to study obsessive compulsive disorder as a common and debilitating disorder in the field of psychopathology from an evolutionary perspective.

Obsessive Compulsive Disorder (OCD) manifests as a diverse group of symptoms that include intrusive thoughts, obsessive rituals, mental preoccupations, and practical obsessions. These recurring practical or intellectual obsessions cause severe discomfort for the person. These mental or practical obsessions cause a waste of time and create a significant disturbance in the normal and natural process of life, work performance, normal social activities or personal relationships (Sadock, 2007). There is extensive research that describes the similarities between habitual intrusive thoughts and the harm-avoidance behaviors of obsessive-compulsive disorder (OCD) from an evolutionary perspective (Horwath & Weissman 2000; Crino, Slade, & Andrews, 2005; Muris, Merckelbach & Clavan, 1997; Feygin, Swain & Leckman, 2006; Rajkumar, 2020; Bhikram, Abi-Jaoude & Sandor, 2017). Most of the normal ritualistic behaviors are believed to solve problems, avoid bad luck or facilitate environmental changes. Just as normal people perform

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rituals to set things right in the world, whether in the past, present, or future, people with OCD perform compulsions to "put the world back into alignment" (Mavrogiorgou et al., 2015).

Given that most people cope with stress to varying degrees through ritualistic behaviors and reliance on interpersonal relationships, it is likely that the anxiety-relieving function of these behaviors may be the result of a beneficial evolutionary mechanism and ocd is an evolutionarily conserved behavior regulation disorder that is vital for human survival (Noh et al., 2017). In evolutionary research based on mental disorders, there is extensive evidence that obsessive-compulsive disorder is considered as a disorder in normal behaviors and mental states during the period of human development (Feygin, Swain & Leckman, 2006).

The high prevalence and epidemic of the symptoms of this disorder can be a reason for explaining the evolution of this disorder. In 1998, in an extensive study of the global aspects of obsessive-compulsive disorder, Wilson argued that ocd is a dysregulation of an adaptive trait rather than the result of a deleterious genetic mutation. Across cultures, OCD shows a degree of universality (Wilson, 1998). In a study by Fontenelle and colleagues (2004), 101 Brazilian adults with obsessive-compulsive disorder were compared with 15 clinical samples from Europe, Asia, Africa, North America, and Latin America. They often observed a global predominance of females compared to males, an early age at onset, and the association of compulsions with obsessive thoughts, and concluded that cultural variation had little effect on the core features of OCD (Fontenelle et al., 2004). These studies consider OCD to be the result of a disorder in the regulation of neural circuits that play an essential role in detecting threats and avoiding harm. These neural systems are also likely to underlie aspects of experience and ritual behavior as well as fears in early human development (Rajkumar, 2020). From an evolutionary point of view, childhood fears and anxieties can be considered as direct and indirect causes of obsessive-compulsive disorder. Fear and avoidance of environmental dangers and anxiety about the well-being of oneself and loved ones throughout the evolutionary history of man has brought him adaptation to his environment and has resulted in the survival and reproduction of more human beings. As a result, these fears have had an evolutionary advantage and have persisted as a positive trait (Jaeger et al., 2021).

Research has shown that intrusive thoughts and compulsions related to aggression and threats are related to fear about the well-being of oneself and loved ones. These fears translate into disturbing

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thoughts and images about separation or loss (Abed & de Pauw, 1998). Compulsions that are about checking and verification may be related to fears about the security of the subject of interest (Poli & Radomsky, 2019). Obsessions and compulsions in the field of fear of physical security threats cause anxiety about the home environment. Asymmetry or accuracy makes a person sensitive to the placement of objects in the physical environment. These symptoms often appear in early childhood, when an infant or toddler first explores the home environment and forms elaborate daily rituals and routines (Feygin, Swain & Leckman, 2006). Many of these childhood fears are similar to OCD obsessions, such as fears of contamination, death, separation, and strangers. Just like OCD, specific fears may be associated with a specific compulsion in a logical manner. For example, the fear of death may cause a child to develop a close attachment to a comfortable desired object (Audet et al., 2020). Empirical and theoretical data support the idea that childhood ritual behaviors typically emerge early in development (Brune, 2006).

Some of the symptoms of OCD, especially washing rituals and hoarding behavior, have evolutionary similarities as well as practical similarities with behaviors that provide a survival advantage in the face of the spread of infectious diseases and deprivations. The above assumptions are strengthened by two lines of research in the pathogenesis of OCD. First, contemporary research has identified a close cognitive and neurobiological overlap between OCD and the basic human emotion of fear of contamination and disgust (Rajkumar, 2020). From an evolutionary perspective, disgust acts as a stimulus in avoiding infectious diseases and is most closely related to the contamination/cleansing dimension of OCD. Some key brain regions, such as the insula and anterior cingulate cortex, show increased activation both in OCD and in tests designed to induce fear of contamination in normal subjects, underscoring the link between the two. Thus, fear of contamination may be an important link between evolutionary adaptation to infection and OCD (Bhikram, Abi-Jaoude & Sandor, 2017). Second, from an evolutionary perspective, increased pathogenicity burden has historically been associated with natural selection pressure for the short allele(s) of the serotonin transporter gene (5-HTTLPR). On the other hand, OCD is consistently associated with the long (l) 5-HTTLPR allele. Thus, polymorphisms in serotonergic genes may underline similarities and differences between OCD and behaviors that have protected humans from infectious pathogenesis in the past—and continue to do so (Chiao, Blizinsky, 2010; Banerjee, 2020; Bhikram, Abi-Jaoude & Sandor, 2017).

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In Evans et al.'s (1999) study, parents listed their children's fear intensity using a 5-point scale in a 69-item survey. In this study, children under 4 years old showed a significant correlation between bedtime fears and hoarding behavior. A significant correlation was shown between fear of contamination and being too aware or sensitive to certain clothes, between fear of death and close attachment to a favorite object, and between fear of animals and bedtime rituals. Fear of urban environments was associated with ritual behaviors related to collecting and keeping things. Fear of death is associated with repeating certain actions and eating food in a certain way. Fear of separation was associated with repeating certain actions, strong preference for certain foods, liking food in a certain way, and having persistent communication habits. Finally, fear of strangers was related to repetition, meaning that certain actions must happen over and over again (Evans, Gray & Leckman, 1999; Evans & Leckman, 2006). These rituals are pathological when taken to extremes and are very important in teaching children to manage their anxiety about the outside world (Jaeger et al., 2021).

One of the most comprehensive theories that can contribute to obsessive compulsive symptoms along with fear and anxiety is Reinforcement Sensitivity Theory (RST). This theory considers personality traits as a window to individual differences in brain function and causes different emotional reactions to be called in different situations (Elliott et al., 2018). In Gray's initial theory, three emotional systems have been proposed that trigger motivational behaviors. 1- Behavioral Activation System (BAS), 2- Behavioral Inhibition System (BIS), and 3- Fight Flight System (FFS). (BAS) is sensitive to conditioned pleasant stimuli and lack of punishment. The activity and increased sensitivity of this system causes the positive emotions to be called, the behavior of the approach and active avoidance. BIS is triggered by conditioned cues of punishment and lack of reward, as well as by novel, high-intensity stimuli, as well as innate fear stimuli. The activity of this system causes the emotional state of anxiety and behavioral inhibition, passive avoidance, silence, increased attention and erection. The third system is the fight and flight system; The behavioral components of this system, whose high activity is related to psychopathy, are fighting (defensive aggression) and flight (quick escape from the source of punishment). More or less activity, or dysfunction in the functioning of these three brain-behavioral systems, is the basis of psychological pathology (Gray & McNaughton, 2000; Gray, 1970).

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Based on the theory of sensitivity to reinforcement, Gray proposed the assumption that psychiatric disorders are caused by dysfunction of one of the systems or their interactions. Since the presentation of Gerry's model, researchers have hypothesized that the abnormal sensitivity of these systems indicates readiness and aptitude for multiple forms of psychopathology, so that BAS and BIS can explain a wide range of disorders (Urošević et al., 2012).

Another functional disorder that is investigated in this research and suggested as a mediating variable between childhood fears and behavioral brain systems and obsessive-compulsive disorder is uncertainty intolerance. Ambiguity intolerance is a personality trait, a set of negative beliefs about ambiguity (Jong-Meyer, Beck, & Riede, 2009). Intolerance of uncertainty is a type of cognitive bias that affects how a person receives, interprets and reacts to an uncertain situation at the emotional, cognitive and behavioral levels (Rotge et al., 2015). Although some research states that intolerance of uncertainty is specific to worry and pervasive anxiety, Holaway et al. (2006) found that intolerance of uncertainty is likely to be a common ground in a wide range of anxiety disorders (Holaway, Heimberg & Coles, 2006). The theoretical descriptions of this construct about obsessive-compulsive disorder go back to the theory that suggests that patients with obsessive-compulsive disorder have a strong need for certainty and may experience severe anxiety until they obtain certainty (Rotge, 2015). Intolerance of uncertainty in this disorder is related to practical and ritualistic obsessions, which means that people may consider obsessive practices and rituals as the only strategy available to them to reduce confusion. Also, regarding the relationship between tolerance of ambiguity and obsessive-compulsive disorder, researchers believe that the intolerance of ambiguity is high in obsessive-compulsive patients, and the decision-making problems of obsessive-compulsive patients are due to their intolerance of ambiguity (Carleton, 2012; 2016).

It has been suggested that this "generalized cognitive filter" may develop in early childhood. In support of this suggestion, in a study involving 5-year-old children, negative expectancies predicted symptoms of excessive anxiety or generalized anxiety disorder one year later, even after controlling for internalizing problems. Furthermore, when 5- to 9-year-old children were asked to interpret ambiguous scenarios, their cognitions of threat and distress predicted anxiety symptoms over a 3-year time span (Zdebik, Moss & Bureau, 2018). Jacoby and his colleagues (2013) showed that using the average scores of intolerance of uncertainty, people with obsessive-compulsive disorder can be identified (Jacoby et al., 2013). Also, the results of Sarawgi et al.'s research showed

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that the uncertainty intolerance component has a high correlation with the report of obsessive-compulsive disorder by the people themselves (Sarawgi, Oglesby, Cougle, 2013). In the research of Shihata, McEvoy, Mullan, & Carleton (2016), who investigated the intolerance of uncertainty in emotional disorders, their results showed that one of the constructs related to the emotional reaction is intolerance of uncertainty (Shihata et al., 2016).

According to the mentioned researches, it is predicted that in the theory of evolution, childhood fears and behavioral brain systems are related to the impact on ambiguity intolerance and obsessive-compulsive disorder. Considering the importance of the topic, and also considering that until now there has been no research on the mediating role of intolerance of ambiguity in childhood fears and behavioral brain systems in relation to the signs and symptoms of obsessive-compulsive disorder, the purpose of this The research is the answer to the question whether the intolerance of uncertainty can play a mediating role in the relationship between childhood fears and brain-behavioral systems with the signs and symptoms of obsessive-compulsive disorder?

Materials and Methods

In terms of the purpose, this research is fundamental research, in terms of method, it is a non-experimental type of research, and due to the investigation of the relationships between variables and the existence of mediating variables, it is part of the multivariate correlation method based on correlation matrix analysis. The statistical population of this research includes secondary school girls and boys in the schools of Kouhdasht city in the academic year of 1401-1400. A multi-stage cluster sampling method was used to select the statistical sample. According to the number of subscales, the sample size was determined to be 435 people. After preliminary data refinement and removal of random responses, 420 samples were finally included in the analysis. The research tools are as follows.

Revised fear questionnaire for children and adolescents: This test was adapted from Scherer & Nakamura's (1968) Adolescent Fear Inventory And as a tool to identify specific fears in children and adolescents, it is designed to select fearful children and adolescents for treatment and prevention in treatment outcome studies. The test consists of 80 questions, which are answered with three-choice scales of none, somewhat, and a lot. Test items are scored based on five components: failure and criticism, unknowns, harm to animals, risk of death, medical fears, and a

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total fear score. The test-retest correlation was 0.82 during the one-week period, 0.87 during the 2-week period, and 0.62 during the 3-month period for the total score. The retest correlation during the 3-month interval for 5 components was in the range of 0.70 to 0.87. Cronbach's alpha was consistently above 0.90 for the total score and in the range of 0.57 to 0.89 for the components in different samples (Scherer & Nakamura, 1968).

Behavioral activation/inhibition systems scale (Carver & White 1994): This test includes 24 self-report questions and two subscales: BIS subscale and BAS subscale. The BIS subscale in this questionnaire includes seven items that measure the sensitivity of the behavioral inhibition system or response to threat and the feeling of anxiety when faced with threats. The BAS subscale also has thirteen items, which measures the sensitivity of the behavioral activation system, and it includes three other subscales, which are: drive (BAS-DR, four items), response to reward (BAS-RR, five items)) and seeking entertainment (BAS-FS, four items). The items are rated on a four-point scale by the subject. Carver and White (1994) reported the internal consistency of the BIS subscale as 0.74 and the internal consistency of the BAS as 0.71 (Carver & White, 1994).

Uncertainty tolerance test: This test has 27 items that are related to the unacceptability of uncertainty and ambiguity and usually lead to failure, stress and inability to perform the action. This test is answered with a five-point Likert scale (never, rarely, sometimes, often, and always) and each option is scored 1, 2, 3, 4, and 5 respectively. The French version of this test has an internal consistency of 0.91, a very good retest reliability with an interval of four weeks, r=0.74. The validity coefficient of this test is significant and satisfactory. The uncertainty scale was revalidated in 2002 by Buher and Dugas. Cronbach's alpha coefficient and retest reliability coefficient (after 5 weeks) of this scale were reported as 0.94 and 0.74, respectively. The correlation coefficient of this scale with anxiety questionnaire (r=0.60), Beck's depression (r=0.59) and Beck's anxiety (r=0.55) is significant (Buher & Dugas, 2002).

Obsessive Compulsive Inventory – Revised (OCI-R): Foa et al., (2002): which is a shortened version of Foa et al.'s (1998) Practical Obsession Questionnaire, has 18 items and measures obsessive symptoms experienced in the past month and it is a suitable tool for screening obsessions. This version, in addition to having the overall score of the questionnaire, also includes six subscales, which are defined on a 5-point Likert scale from (0) not at all to (4) very or very much: 1- wash, 2- checking, 3- Organizing, 4- Worrying, 5- Hoarding, 6- Neutralizing. Foa

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reported the internal consistency for the total score of 0.81 and for the subscales between 0.34 and 0.93. Retest reliability after two weeks was between 0.74 and 0.91 (Foa et al., 2002).

Results

Prior to the analysis, the assumptions of SEM including distribution normality, error independence, and multiple alignment were examined. To examine the normality of the research variable distribution the skewness and kurtosis of the distribution of scores were used, the results of which showed that the distribution of scores of all variables is normal (range of distribution between +1 and -1). The Dorbin-Watson test was used to check the independence of the errors, which showed no correlation between the errors (D.W = 1.773, range between 1.5 to 2.5 is acceptable). Inflation variance (VIF) and tolerance factors were used to evaluate the multiple alignment between the predictor variables. The results showed that there is no alignment between the variables (VIF amplitude was less than five and tolerance was higher than 0.1). Results presented in Table 1.

Table 1. The mean, standard deviation, and information regarding assumptions of SEM

variable		min	max	M	SD	skewness	kurtosis	tolerance	VIF
1.	**CHF**	53	136	93.34	18.32	.087	-1.232	.512	**1.955**
2.	**BIS**	7	28	19.57	6.10	-.617	-.276	.321	**3.111**
3.	**BAS**	29	52	38.49	4.19	.379	-.323	.895	**1.117**
4.	**IUS**	34	135	.84.85	28.24	-.406	-1.037	.257	**3.891**
5.	**OCD**	**8**	**63**	**33.97**	**15.48**	**.102**	**-1.378**	**-**	**-**

Note. n= 441, BAS=Behavioral Activation System; BIS=Brain Inhibition System; CHF= Childhood Fears; IUS= Intolerance of Uncertainty; OCD= Obsessive Compulsive Disorder

Another assumption is the establishment of a linear relationship between independent and dependent variables, which was examined by Pearson correlation, the results of which are reported Table 2.

Table 2. The correlation between the variables

Variable		1	2	3	4	5
1.	CHF	1				
2.	BIS	.582**	1			
3.	BAS	-.136**	.149**	1		
4.	IUS	.662**	.821**	.124**	1	
5.	OCD	.699**	.713**	.109*	.823**	1

Note. *P<.05, **P<.01, BAS=Behavioral Activation System; BIS=Brain Inhibition System; CHF= Childhood Fears; IUS= Intolerance of Uncertainty; OCD= Obsessive Compulsive Disorder

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Results presented in Table 2 indicate that childhood fears, behavioral activation system and brain inhibition system have a significant relationship with obsessive compulsive disorder through intolerance of uncertainty. SEM was used to test the relationships between research variables. First, the fit of the model in the whole sample was examined and then the effect of gender was examined.

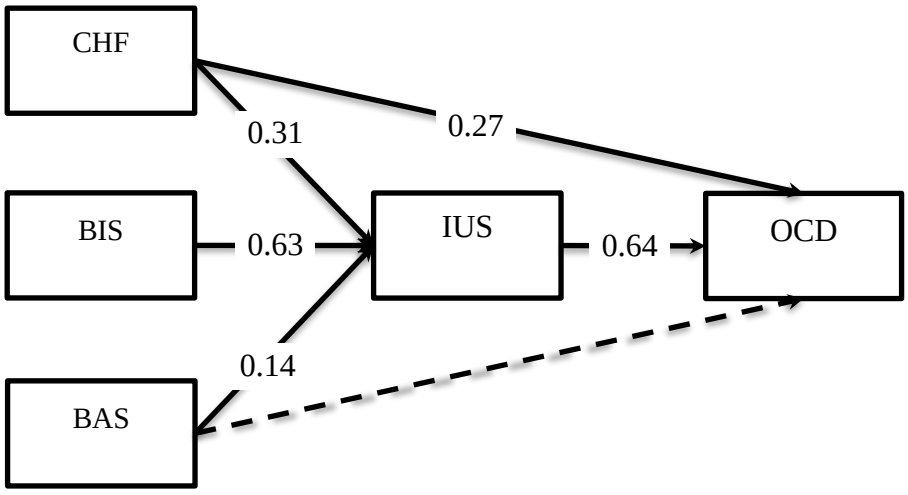

Figure 2. The causal model of the relationship of CHF, BIS and BAS with OCD through IUS (standard mode)

BAS=Behavioral Activation System; BIS=Brain Inhibition System; CHF= Childhood Fears; IUS= Intolerance of Uncertainty; OCD= Obsessive Compulsive Disorder

First, to determine the overall fit of the model, the fit index was considered. The model fit indices are presented in Table 3. For the X^2/df fit index, values smaller than 3 are appropriate, and the closer it is to zero, the better the model will fit. For GFI and IFI, CFI index, a value close to 0.90 and above is considered as an acceptable goodness of fit, which indicates that the model is good. In relation to the RMSEA index, values close to 0.05 or less indicate a good fit of the model and a value of 0.08 or less indicates a reasonable error of approximation; A value higher than 0.10

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indicates the need to reject the model (Hooman, 2012b). The fit indices presented in Table 3 indicate the good fit of the model.

Table 3. Fit indices for the developed model

Model fit indices	X^2	df	X^2/ df	GFI	IFI	CFI	RMSEA
Obtained values	5.61	2	2.80	0.99	0.99	0.99	0.064

Then, all the effects related to all different paths in the SEM were investigated, the results of which are presented in Table 4.

Table 4. Coefficients of the model of the relationships between CHF, BIS, BAS, OCD and IUS

Direct path	Regression coefficient	statistic -t
CHF→ IUS	0.31	10.24**
BIS → IUS	0.63	20.96**
BAS → IUS	0.14	5.47**
CHF → OCD	0.27	8.14**
IUS→ OCD	0.64	18.97**

Note. **P<.01, BAS=Behavioral Activation System; BIS=Brain Inhibition System; CHF= Childhood Fears; IUS= Intolerance of Uncertainty; OCD= Obsessive Compulsive Disorder

Analysis of data from the relationships of variables through the path of regression coefficients in Table 4 shows that the direct effects of CHF (β=0.31, P<0.01), BIS (β=0.63, p<0.01), and BAS (β=0.14, P<0.01) on IUS are positive and significant. The results also showed that the effect of CHF (β=0.27, P<0.01) and IUS (β=0.64, P<0.01) on OCD are positive and significant. Meanwhile, as the direct effects of BIS and BAS on OCD were not significant in the primary model, these pathways were omitted from the model in order to gain the best fitness of the model in the sample of the study. Finally, the Sobel's test was also applied to investigate the mediating role of IUS in the relationship of CHF, BIS and BAS with OCD, the results of which are reported in Table 5.

Table 5. The mediating role of IUS in the relationship between CHF, BIS and BAS with OCD

Variables	P	Sobel's test (z)
CHF → IUS → OCD	P<0.001	15.78
BIS → IUS → OCD	P<0.001	21.39
BAS → IUS → OCD	P=0.009	2.60

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The results of Sobel's test in table 5 show that the variable of IUS plays a significant mediating role in the relationship of CHF (Z = 15.78, P<0.001), BIS (Z =21.39, P<0.001) and BAS (Z = 2.60, P=0.009) with OCD, respectively.

Discussion

The purpose of this study was to investigate the mediating role of intolerance of uncertainty in the relationship between childhood fears and brain-behavioral systems with signs and symptoms of obsessive-compulsive disorder. The results of structural equation modeling indicated a good fit of the proposed model with the data. Finally, the general research hypothesis was confirmed. Regarding research hypotheses, it can be said that people with high activity of behavioral brain systems get a higher score in intolerance of uncertainty, which in turn is related to a higher level of intellectual-practical obsession. People with high childhood fears also get a higher score on intolerance of uncertainty, which in turn is related to a higher level of obsessive-compulsive disorder.

Obsessive-compulsive disorder has attracted a lot of attention and has been the subject of numerous studies. The main reason for this attention can be attributed to the increase in the prevalence of this disorder in recent decades (Agarwal et al., 2016). In Polimeni, Reiss, & Sareen study (2005), the question was raised that "could obsessive-compulsive disorder have originated as an adaptive trait selected by the group in traditional societies?" The researchers in this article state that obsessive compulsive disorder (OCD) has distinctive features that require evolutionary and anthropological explanations. Using a group selection paradigm, the authors suggest that OCD reflects an ancient form of behavioral specialization. Most compulsions, such as checking, washing, counting, the need to confess, hoarding, and the need for accuracy, all have the potential to benefit society. Focusing primarily on hunting and gathering cultures, the potential evolutionary benefits of OCD are explored (Polimeni, Reiss & Sareen, 2005). In the research of Rajkumar (2020), convincing evidence of the relationship between some dimensions of OCD and behaviors that minimize the risk of infection in the covid-19 pandemic can be obtained from the theory of evolution. In particular, it has been suggested that fear of pollution and washing behaviors may have played a role in the improvement of hygiene standards and general health of ancient tribes and could provide evidence for the natural selection of pollution aversion and the roots of OCD

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(Rajkumar, 2020). In the research of Georgiadis et al. (2020) who investigated the tendency and sensitivity to disgust in childhood anxiety and obsessive-compulsive disorder, their findings showed that there is a significant relationship between the change of disgust and the severity of symptoms in obsessive-compulsive disorder. Disgust tendency was found to uniquely predict pollution obsessions, and disgust sensitivity predicted moral obsessions (Georgiadis et al., 2020). In Berger and Anaki's (2014) research, the mediating role of behavioral inhibition systems in the relationship between the emotion of disgust and the symptoms of obsessive-compulsive disorder was investigated. Disgust is strongly associated with obsessive-compulsive disorder (OCD) symptoms in this study, but its contribution to specific OCD symptoms remains unclear. Findings showed that disgust and BIS are both related to common and different elements of OCD. Disgust was exclusively related to flushing symptoms, whereas BIS was exclusively related to hoarding symptoms. Both disgust and BIS influenced symmetry obsessions. In addition, BIS partially mediated the relationship between disgust and OCD symptoms, i.e. investigation and obsession, and partially neutralization. They presented a model supported by a confirmatory factor and mediation analyses, suggesting that disgust and BIS are related to different aspects of OCD, whereas disgust is mainly related to the contamination aspect of OCD, BIS is related to difficulties in inhibiting behavior (Berger & Anaki, 2014).

Intolerance of uncertainty in this disorder is related to practical and ritualistic obsessions, which means that people may consider obsessive practices and rituals as the only strategy available to them to reduce confusion. Also, regarding the relationship between tolerance of ambiguity and obsessive-compulsive disorder, researchers believe that the intolerance of ambiguity is high in obsessive people and the decision-making problems in obsessive patients are due to their intolerance of ambiguity. Doubts and checking behaviors in people with obsessive compulsive disorder are most related to the scale of not tolerating uncertainty; Reed (1985) showed that doubt in one's experiences and actions is directly related to the uncertainty of an ambiguous situation (Carleton, 2012; 2016).People who cannot tolerate uncertainty describe situations of uncertainty as stressful, negative and stressful and try to avoid these situations, and if they are in these situations, their performance will suffer (Gentes, Meron & Ruscio, 2011). Ambiguity is a pluralistic state in which there is not enough information to find a solution. The experience of uncertainty can be bad and threatening (Erin et al., 2013).

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Intolerance of uncertainty supports a chain of negative emotions and a negative attitude towards the problem and directly affects the increase of negative emotions and cognitive and behavioral avoidance. People with this cognitive filter find uncertain events highly distressing, regardless of whether or not these events are likely to occur, and prefer to face a problem with a certain negative outcome rather than an uncertain one (Zdebik, Moss, E & Bureau, 2018).

People with high sensitivity of the behavioral activation system are more likely to experience difficulty in expressing emotions in situations. Failure in this process can lead to lack of behavioral control and involuntary behaviors. Responding without proper evaluation of the situation, responding without considering and paying attention to its consequences, having the inability to delay the reward, is one of the important dimensions of obsessive-compulsive disorder. Its cognitive dimension, i.e. the inability to perform inhibitory control and the desire to respond quickly without thinking or, more broadly, the intolerance of uncertainty and ambiguity by activating the anxiety cycle in people is the cause of OCD (Silveira et al., 2020; Sarawgi, Oglesby & Cougle, 2013). A physiological vulnerability from birth to react more quickly or more intensely means that children with damage to brain-behavioral systems are at greater risk of overreacting to new or unfamiliar situations or stimuli before they can self-regulate and become aware of their emotions (Kagan, Snidman, Kahn & Towsley, 2007). Therefore, they tend to avoid new situations early in life, inhibit habituation to such situations, and maintain these behaviors, thus putting them at risk of developing internalizing problems and anxiety disorders.

Considering the lack of complete response of existing descriptive and therapeutic approaches to explain and improve the symptoms of obsessive-compulsive disorder, it seems necessary to study new approaches, including evolutionary psychology, to find a special look at this disorder. Recent years have seen notable efforts to apply evolutionary theories to psychopathology. Therefore, it is suggested that not only experts in scientific fields should know about evolution, but also the general public should understand it. At least, without a brief knowledge of it, we have neither a chance to understand the nature around us, nor a chance to understand the incomparability of man, his diseases and their treatment.

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Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by ethics committee of Razi University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

All authors contributed to the study conception and design, material preparation, data collection and analysis and contributed to the article and approved the submitted version.

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