Journal Website

Article history:
Received 07 December 2024
Revised 04 February 2025
Accepted 18 February 2025
Published online 30 March 2025

Iranian Journal of Neurodevelopmental Disorders

Volume 4, Issue 1, pp 11-20

E-ISSN: 2980-9681

The Relationship Between Brain/Behavioral Systems and Pain Anxiety Mediated by Distress Tolerance in Psychiatric Patients in Babol County

Maedeh Asgharpour Miri[1], Majid Pourfaraj Omran[2*]

1 MA, Department of Psychology, Am.C. Islamic Azad University, Amol, Iran.
[1] Department of Psychology,Beh.C, Islamic Azad University, Behshahr, Iran (Corresponding Author).

*** Corresponding author email address**: m.pourfaraj@gmail.com

Article Info

Article type:
Original Research

How to cite this article:
Asgharpour Miri, M., Pourfaraj Omran, M. (2024). The Relationship Between Brain/Behavioral Systems and Pain Anxiety Mediated by Distress Tolerance in Psychiatric Patients in Babol County. *Iranian Journal of Neurodevelopmental Disorders, 4*(1), 11-20.
https://doi.org/10.61838/kman.jndd.4.1.2

ABSTRACT

Purpose: This study aimed to examine the relationship between brain/behavioral systems and pain anxiety with the mediating role of distress tolerance in psychiatric patients in Babol County.

Methods and Materials: The study employed a descriptive-correlational design using structural equation modeling (SEM). The statistical population included all psychiatric patients who referred to treatment centers in Babol County during 2024. A sample of 250 participants was selected using convenience sampling. Data collection was conducted using standardized instruments: Carver and White's BIS/BAS Scales to measure brain/behavioral systems, the Pain Anxiety Symptoms Scale (PASS) by McCracken and Dhingra (2002), and the Distress Tolerance Scale by Simons and Gaher (2005). Data analysis was performed using SmartPLS software. The normality of data distribution was evaluated through the Kolmogorov–Smirnov test, and due to non-normal distributions, variance-based SEM techniques were applied. Reliability and validity of the measurement models were assessed using composite reliability, Cronbach's alpha, Average Variance Extracted (AVE), and discriminant validity via the Fornell-Larcker criterion.

Findings: The results indicated a significant positive relationship between brain/behavioral systems and pain anxiety ($\beta = 0.635$, $p < 0.001$), and a significant negative relationship between brain/behavioral systems and distress tolerance ($\beta = 0.973$, $p < 0.001$). Additionally, distress tolerance was found to significantly predict lower levels of pain anxiety ($\beta = 0.148$, $p < 0.001$). The Sobel test confirmed the mediating role of distress tolerance in the relationship between brain/behavioral systems and pain anxiety ($Z = 6.998$, $p < 0.001$), thus supporting the fourth hypothesis of the study.

Conclusion: The findings suggest that distress tolerance plays a critical mediating role in the link between neural reactivity (BIS/BAS activity) and pain-related anxiety among psychiatric patients. Enhancing distress tolerance may therefore be a valuable therapeutic target for reducing pain anxiety in clinical populations.

Keywords: *Brain/Behavioral Systems, Pain Anxiety, Distress Tolerance, Psychiatric Patients*

1. Introduction

Anxiety and pain are two deeply interconnected phenomena that play a significant role in individuals' daily lives, particularly among patients suffering from neurological and psychiatric disorders. Pain, as a multidimensional experience, encompasses not only sensory-emotional components but also cognitive, affective, and behavioral aspects that may lead to the emergence of anxiety, depression, and other psychological problems (Abow et al., 2023; Ali Akbari & Hossein Sabat, 2021). Conversely, anxiety can intensify the perception and experience of pain, forming a self-reinforcing cycle in which pain and anxiety mutually exacerbate one another. This complex cycle can become a serious challenge to mental health, especially among psychiatric patients in Babol County, who are subject to specific geographical and cultural conditions (Mohammadi et al., 2021).

Moreover, research has shown that distress tolerance can serve as a mediating variable in the relationship between chronic pain and anxiety. In other words, individuals with higher distress tolerance may be less affected by anxiety and pain and generally function more effectively in everyday life (Fatahi, 2024; Tavanaye Nanekaran & Eyni, 2024). This issue is particularly important in populations exposed to greater environmental and social stressors, such as psychiatric patients in Babol. From a neuropsychological perspective, understanding how brain and behavioral systems interact—and how this interaction influences the experience of pain and anxiety—is of paramount importance. For example, the limbic system, which includes the amygdala and hippocampus, plays a crucial role in processing emotions and affective responses to pain. Additionally, the central nervous system—especially the prefrontal cortex and neurofeedback systems—regulates cognitive and behavioral responses to pain (Afshari & Safarzadeh, 2024; Dadashzadeh Sangary et al., 2024). These systems interact with anxiety both directly and indirectly and can influence the subjective experience of pain (Vachon-Presseau et al., 2019). Thus, investigating the relationship between brain/behavioral systems, anxiety, and pain through the mediating role of distress tolerance may enhance our understanding of these mechanisms and inform the development of more effective therapeutic interventions. This issue is particularly significant in high-stress populations such as psychiatric patients in Babol County.

Several studies have examined the pairwise relationships among pain anxiety, distress tolerance, and brain/behavioral systems (Balazadeh et al., 2021; Dehghanpour et al., 2021; Karami et al., 2021; Khaki et al., 2020; Taheri et al., 2022; Williams et al., 2020). Research conducted on individuals with low distress tolerance shows that those with higher levels of distress tolerance exhibit better cognitive-behavioral functioning and, consequently, experience fewer stressors. These individuals are more effective in confronting interpersonal conflicts (Larrazabal et al., 2022). Overall, it can be stated that cognition is a source of some of our deepest emotions and feelings, such as love, hatred, anger, fear, sadness, and pleasure, and the extent to which individuals can understand, talk about, and manage these strong emotions plays a decisive role in their interpersonal functioning and satisfaction. People who have the ability to control their emotions (self-regulation) and who are adept at managing how they express emotions toward others are often able to prevent many interpersonal conflicts and misunderstandings (Marck et al., 2017). In fact, distress management, when tailored to an individual's psychological condition, appears to play a major role in their psychological state. High distress tolerance leads to personality traits such as increased acceptance and a stronger sense of efficacy, indicating the presence of effective cognitive and interpersonal skills. When emotional information fails to be processed, perceived, and evaluated cognitively, the individual may experience emotional and cognitive distress and helplessness. This inability disrupts emotional and cognitive organization, leading to difficulties in interpersonal relationships at various levels. The need for interpersonal connection is intrinsic, and individuals who are unable to receive the physical and psychological care they need are likely to suffer. When facing stress and crisis, if a person lacks adequate interpersonal support, they will have limited capacity to cope with psychological crises (Morales-Raveendran et al., 2018).

Pain, as an emotional experience and unpleasant feeling, is associated with actual or potential tissue damage or is described in terms of such damage. This definition emphasizes both the sensory and emotional aspects of pain and suggests that the relationship between tissue injury and pain is not necessarily consistent or predictable. In addition to the sensory dimensions that result from neural transmission to the brain, pain perception also depends on cognitive elements. Clearly, in such cases, multiple cultural-social, cognitive, and emotional factors can influence the perception of pain and the resulting disabilities. According to developmental theories of pain, neurobiological structures and genetic predispositions that affect attachment also

E-ISSN: 2980-9681

impact the regulation and processing of pain. These factors, when disrupted, can impair emotional and interpersonal self-regulation and reduce one's tolerance for physical and psychological distress (Zargham Hajebi et al., 2019). Deficits in these regulatory capacities may lead to persistent low distress tolerance in adulthood. Mechanisms shaping physical pain may manifest as hypersensitivity to pain, difficulties in interpersonal interactions, problems in pain regulation, or a combination of these elements (Kilpatrick, 2018). Furthermore, because distressing physical and psychosocial experiences rely on shared brain circuits, unsupported interpersonal experiences—particularly during childhood—can activate pathways associated with physical pain. This interaction between biological factors and childhood trauma can lead to hyperactivation of neural circuits that affect individuals' perceptions of psychological, emotional, and physical pain (Merchán-Clavellino et al., 2019). Among the factors influencing pain modulation and its associated anxiety are the relative activations of two neurobiological systems. Gray (1990) proposed two core systems under the umbrella of brain/behavioral systems: the Behavioral Activation System (BAS), which activates responses to rewards such as incentive stimuli, and the Behavioral Inhibition System (BIS), which activates responses to punishment or inhibitory stimuli (Taheri et al., 2022).

Given the points raised above, the present study seeks to answer the following research question: Does distress tolerance mediate the relationship between brain/behavioral systems and pain anxiety in psychiatric patients in Babol County?

2. Methods and Materials

2.1. Study Design and Participants

This study is a descriptive-correlational research using structural equation modeling (SEM), as its objective is to determine the mediating role of distress tolerance in the relationship between brain/behavioral systems and pain anxiety in psychiatric patients in Babol County. The statistical population consisted of all psychiatric patients in Babol County during a three-month period from December 2024 to February 2025. The research sample included 300 patients selected through convenience sampling from the psychiatric ward of Shahid Yahya Nejad Hospital. According to Kline (2005), structural equation models are categorized into three types—simple, moderately complex, and complex—based on their structure. He suggests that sample sizes for simple models should be below 100, for moderately complex models between 100 and 200, and for complex models above 200. Given the number of variables examined in the present study, it qualifies as a moderately complex model. Therefore, considering the potential for participant dropout, a sample size of 250 was determined for statistical analysis. The research instruments included the Behavioral Inhibition System/Behavioral Activation System (BIS/BAS) scale, the Pain Anxiety Symptoms Scale, and the Distress Tolerance Scale.

2.2. Measure

Behavioral Inhibition System/Behavioral Activation System (BIS/BAS) Scale: This self-report scale consists of 24 items and was developed by Carver and White in 1994. The BIS subscale includes 7 items that measure behavioral inhibition system sensitivity or responses to threat and feelings of anxiety in threatening situations. The BAS subscale includes 13 items and assesses behavioral activation system sensitivity. It comprises three sub-dimensions: Drive (4 items), Reward Responsiveness (5 items), and Fun Seeking (4 items). Reward Responsiveness measures the extent to which rewards produce positive emotions. Drive assesses an individual's motivation to pursue desired goals, while Fun Seeking evaluates one's desire to pursue new and potentially rewarding experiences on impulse. Four filler items are also included in the scale but are not used in scoring the BIS or BAS. According to Carver and White (1994), the internal consistency of the BIS subscale is reported as 0.74, and for the BAS subscales—Reward Responsiveness, Drive, and Fun Seeking—the values are 0.73, 0.76, and 0.66, respectively (Taheri et al., 2022).

Pain Anxiety Symptoms Scale (PASS): The PASS was developed by McCracken and Dhingra (2002) to assess symptoms of pain-related anxiety. In Iran, it has been validated by Ghazayi et al. (2018). This questionnaire consists of 20 items and measures four components: cognitive symptoms, escape-avoidance, fear, and physiological anxiety. Responses are given on a five-point Likert scale with items such as "When I am in pain, I cannot think." Validity refers to the degree to which an instrument measures what it is intended to measure. Ghazayi et al. (2018) evaluated the content, face, and criterion validity of the questionnaire as satisfactory. Reliability, defined as the degree of consistency and stability of a measurement tool under consistent conditions, was also assessed. The

E-ISSN: 2980-9681

Cronbach's alpha coefficient reported in the study by Ghazayi et al. (2018) for this instrument was above 0.70 (Khaki et al., 2020).

Distress Tolerance Scale (DTS): The Distress Tolerance Scale was developed by Simons and Gaher (2005) to measure an individual's capacity to tolerate emotional distress. It includes 15 items divided into four subscales: Tolerance (tolerance of emotional distress), Absorption (being overwhelmed by negative emotions), Appraisal (subjective evaluation of distress), and Regulation (efforts to reduce distress). Items are rated on a five-point Likert scale (1 = strongly agree to 5 = strongly disagree). Simons and Gaher (2005) reported Cronbach's alpha coefficients of 0.72, 0.82, and 0.70 for the subscales, and 0.82 for the total scale. They also reported that the scale has good initial criterion and convergent validity. Findings from the study by Mohammadpour et al. (2022), titled "Psychometric Properties of the Distress Tolerance Scale in the Elderly," indicated acceptable internal consistency, with subscale reliability coefficients ranging from 0.64 to 0.82 and an overall reliability coefficient of 0.89. Confirmatory factor analysis (CFA) confirmed that the scale structure fit the data well and all model fit indices supported the model. Simons and Gaher (2005) also confirmed the same alpha values for the subscales and the total scale. Alavi (2009), in his thesis, used this instrument on a sample of 48 students (31 females and 17 males) from Ferdowsi University and Mashhad University of Medical Sciences. He reported high internal consistency for the total scale ($\alpha = 0.71$) and moderate reliability for the subscales (Tolerance = 0.54, Absorption = 0.42, Appraisal = 0.56, Regulation = 0.58) (Anwar et al., 2024).

2.3. Data Analysis

Descriptive statistics such as mean and standard deviation were used to summarize the data, and SEM was applied to test the research hypotheses using PLS software.

3. Findings and Results

In the descriptive demographic analysis section, results showed that out of 250 respondents, 212 participants (84.8%) were female and 38 participants (15.2%) were male. In terms of age, the highest percentage was in the 20–25 age group at 36%, while the lowest percentage was in the 36–40 age group at 4.8%. Regarding education level, most respondents held a bachelor's degree (58.4%), and the fewest had a doctoral degree (1.2%). These results indicate a sample predominantly composed of women, young adults, and individuals with undergraduate education.

Table 1

Descriptive Statistics of Variables

Variables	Mean	Standard Deviation	Variance
Brain/Behavioral Systems	45.38	7.03	49.47
Pain Anxiety	37.97	13.52	182.96
Distress Tolerance	42.60	10.37	107.56

Table 1 presents the means, standard deviations, and variances for each component.

Before testing the research hypotheses, a brief discussion is provided regarding the selected test, its rationale, and interpretation. As the study investigates the mediating role of distress tolerance in the relationship between brain/behavioral systems and pain anxiety, after collecting the relevant variable data, the Kolmogorov–Smirnov test was conducted to assess the normality of the distributions derived from the questionnaires. If data distributions are normal, parametric tests are applied; otherwise, non-parametric methods are used. According to its logic, if the significance level (Sig.) is less than 0.05, the distribution is considered non-normal; if it is greater than 0.05, the distribution is deemed normal.

The results of the Kolmogorov–Smirnov test for normality assessment of the research variables are presented. In this test, the null hypothesis (H_0) indicates a normal distribution, while the alternative hypothesis (H_1) indicates non-normality. For the brain/behavioral systems variable, the test statistic was 0.98 and the significance level was 0.000. Since the p-value is less than 0.05, the null hypothesis is rejected, indicating that this variable does not follow a normal distribution. For pain anxiety, the test statistic was 0.72 and the significance level was 0.003, also less than 0.05, thus indicating non-normality. For distress tolerance, the test statistic was 0.68 and the significance level was 0.008, again less than 0.05, confirming non-normality. Overall, the normality test results show that none of the research variables follow a normal distribution. Therefore, using non-

E-ISSN: 2980-9681

parametric statistical methods or variance-based structural equation modeling approaches such as PLS is recommended for data analysis.

A measurement model refers to the portion of the overall model that includes a latent variable along with its observed indicators. To assess model fit, three criteria are commonly used: reliability, convergent validity, and discriminant validity. In addition to evaluating content validity of the questionnaire, convergent and discriminant validity were also assessed using PLS-based structural equation modeling. Convergent validity refers to the extent to which indicators of a construct correlate moderately or strongly. According to Fornell and Larcker, an average variance extracted (AVE) greater than 0.50 is considered evidence of convergent validity.

For convergent validity and composite reliability assessment of the measurement models, the results related to the study variables were as follows: for the brain/behavioral systems variable, the AVE was reported as 0.492. The composite reliability (CR) was 0.867, and Cronbach's alpha was 0.786, indicating acceptable internal consistency. For the pain anxiety variable, the AVE was 0.510, CR was 0.910, and Cronbach's alpha was 0.842, all suggesting satisfactory convergent validity and strong reliability. Finally, for the distress tolerance variable, the AVE was 0.422, CR was 0.839, and Cronbach's alpha was 0.915, indicating excellent internal consistency, although the AVE was slightly below the ideal threshold of 0.50.

As shown, the model meets all three previously mentioned criteria effectively. Specifically, the Average Variance Extracted (AVE) values exceed 0.40, composite reliability values exceed 0.70, and Cronbach's alpha values exceed 0.60—indicating that the model has a high level of adequacy. Discriminant validity, the third criterion for evaluating the fit of measurement models, addresses two aspects: (a) comparing the correlation between a construct and its indicators versus the correlation between those indicators and other constructs; and (b) comparing a construct's correlation with its indicators against its correlation with other constructs. According to Davari and Rezazadeh (2013), discriminant validity can be assessed by comparing the square root of AVE with the correlation between latent variables, and for each reflective construct, the square root of AVE must be greater than the construct's correlations with others in the model. Discriminant validity was assessed using the Fornell and Larcker method, and the results are reported in Table 2. The diagonal of this matrix contains the square root of the AVE values for the study constructs. According to Fornell and Larcker's (1981) criterion, if the square root of AVE for each construct exceeds its correlation with other constructs, then discriminant validity is established.

Table 2

Correlation Matrix and Discriminant Validity (Fornell and Larcker Method, 1981)

Variable	*Brain/Behavioral Systems*	*Pain Anxiety*	*Distress Tolerance*
Brain/Behavioral Systems	*0.779*		
Pain Anxiety	*0.249*	*0.753*	
Distress Tolerance	*0.589*	*0.567*	*0.746*

As shown in Table 2, the diagonal values (square roots of AVE) are greater than the corresponding inter-construct correlations in all cases, confirming discriminant validity. Based on these findings and outputs from the SmartPLS software, the measurement models demonstrate acceptable levels of both convergent and discriminant validity, as well as internal consistency (factor loadings, composite reliability, and Cronbach's alpha).

In the structural model—unlike the measurement model—observable variable items are not directly examined; rather, the relationships between latent variables are assessed. The arrows in the model indicate factor loadings, which numerically represent the strength of association between a latent construct and its respective indicators in the path analysis. These paths also indicate how much one variable contributes to explaining another. The same logic applies to other latent and observed variables in Figure 1, which presents the model in terms of T-values.

E-ISSN: 2980-9681

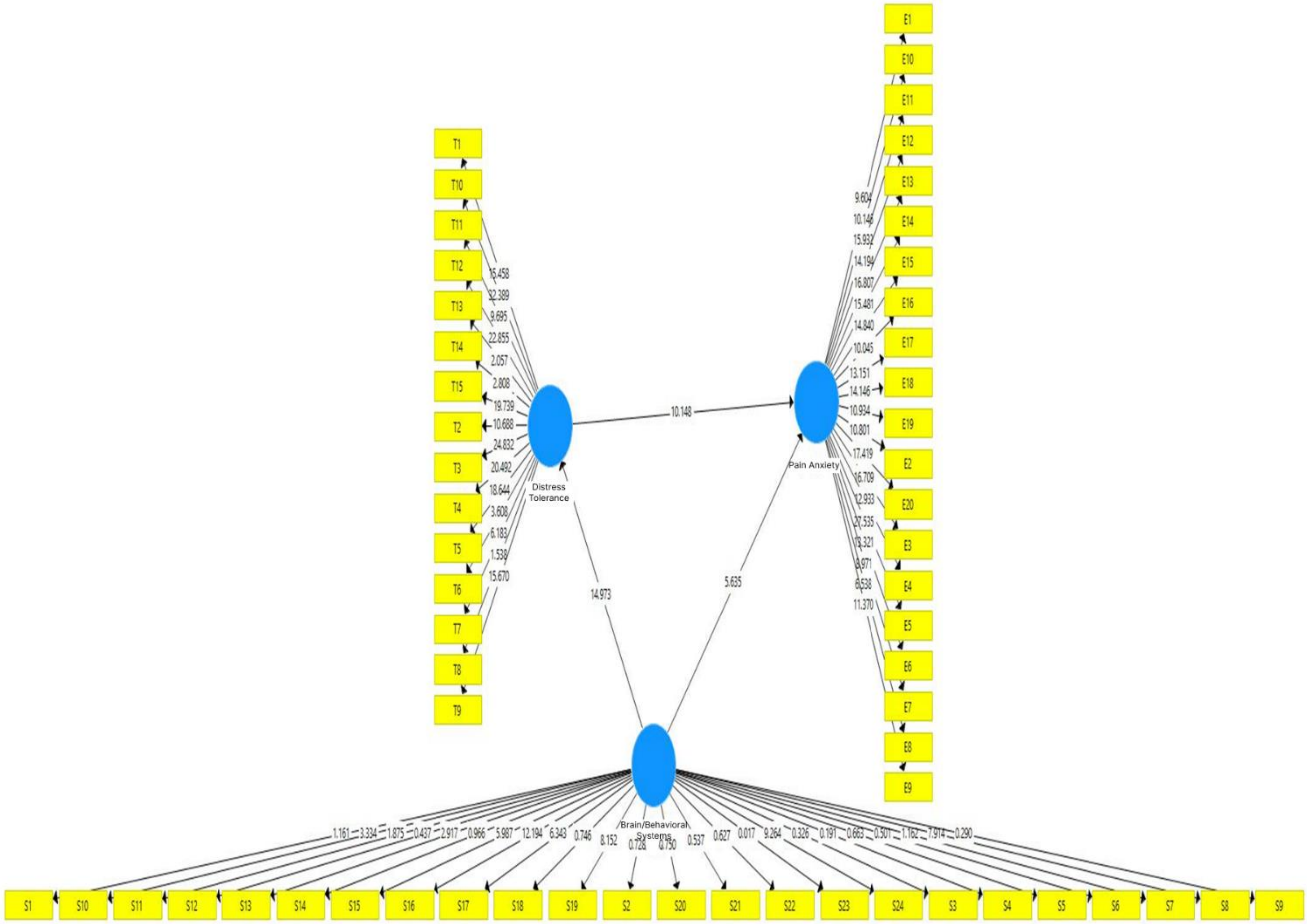
Table 3

Summary of T-Test Results

Significance Level	T-Value	Standard Error	Analyzed Paths
0.000	10.148	0.049	Distress Tolerance → Pain Anxiety
0.000	5.635	0.056	Brain/Behavioral Systems → Pain Anxiety
0.000	14.973	0.038	Brain/Behavioral Systems → Distress Tolerance

Figure 1

Model in T-value State



The values on the arrows represent factor loadings, which quantify the strength of the relationship between a latent variable and its corresponding indicator in the path analysis. These paths indicate the extent to which one variable explains another. This logic also applies to the latent and observed variables in Figure 2, which displays standardized coefficients. In other words, if path coefficients exceed 0.60, the relationship is considered strong; coefficients between 0.30 and 0.60 represent moderate relationships, and those below 0.30 indicate weak relationships.

Table 4

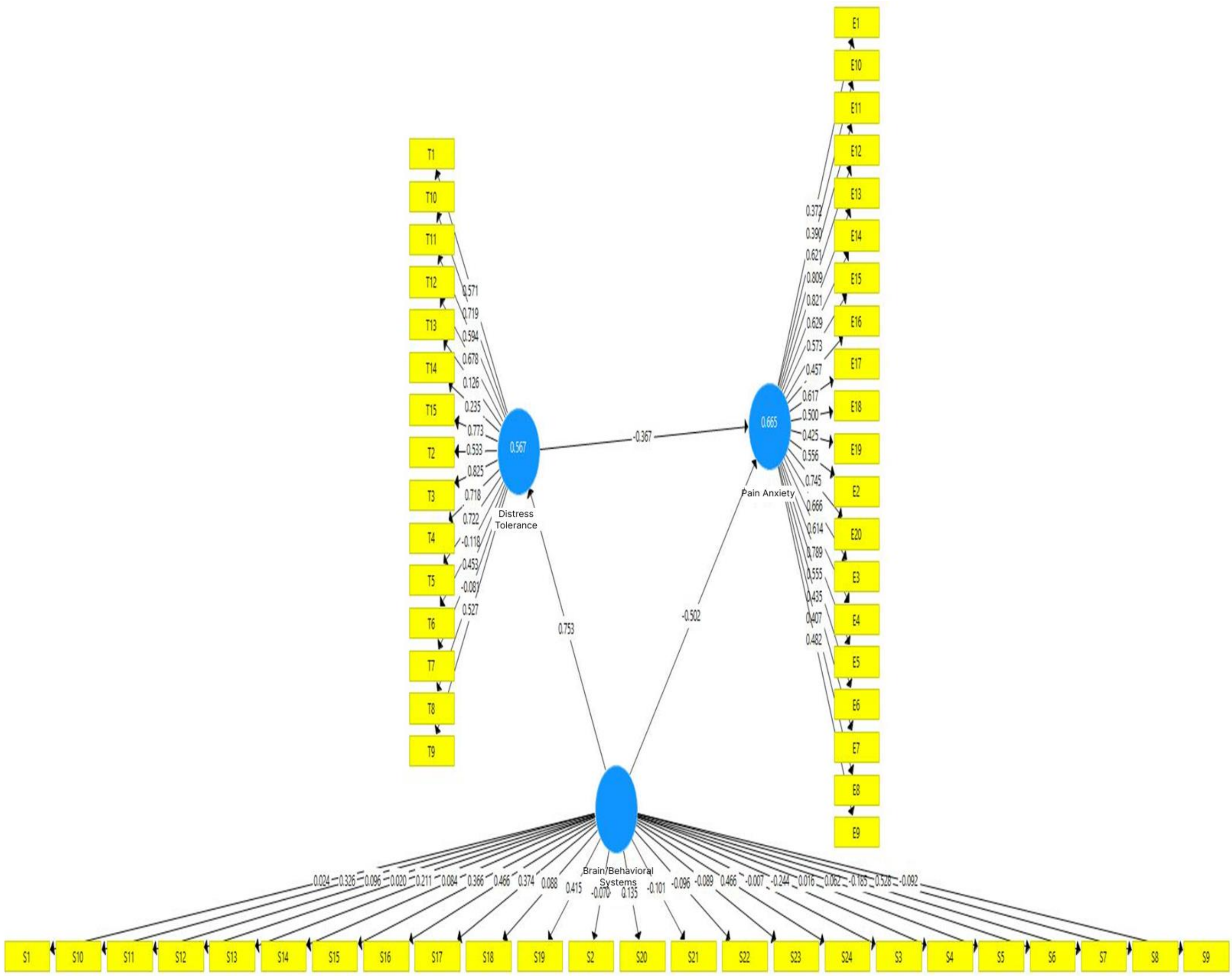
Sobel Test Results

Mediating Variable	Z-Value (Sobel Test)	Standard Error	Significance Level
Distress Tolerance	6.998	0.087	0.000

E-ISSN: 2980-9681

Figure 2

Structural Model with Standardized Coefficients



According to the Sobel test results presented in Table 4, since the significance level is less than 0.05, the mediating effect of distress tolerance on the relationship between brain/behavioral systems and pain anxiety is statistically significant. Therefore, Hypothesis 4 is confirmed.

4. Discussion and Conclusion

This study was conducted to determine the relationship between brain/behavioral systems and pain anxiety, with the mediating role of distress tolerance, in psychiatric patients in Babol County. The statistical population consisted of all psychiatric patients in this county who sought treatment during 2024. A sample of 250 individuals was selected through convenience sampling. Standardized questionnaires were used to assess brain/behavioral systems, distress tolerance, and pain anxiety, and data were analyzed using PLS software. The findings revealed significant relationships between brain/behavioral systems and pain anxiety, brain/behavioral systems and distress tolerance, and distress tolerance and pain anxiety. Moreover, structural equation modeling results indicated that distress tolerance significantly mediates the relationship between brain/behavioral systems and pain anxiety. These results may inform the development of therapeutic interventions aimed at reducing pain anxiety in psychiatric patients.

The results of the first hypothesis test demonstrated a significant relationship between brain/behavioral systems and pain anxiety among psychiatric patients in Babol County. Specifically, heightened activity in brain/behavioral systems (e.g., increased sensitivity to punishment or reward) was predictive of higher levels of pain anxiety in these patients. This finding aligns with domestic research (Ali Akbari & Hossein Sabat, 2021; Balazadeh et al., 2021;

E-ISSN: 2980-9681

Dehghanpour et al., 2021; Karami et al., 2021), all of which confirmed the link between hyperactivity of the behavioral inhibition system and increased anxiety and pain perception. It is also consistent with international findings (Cryan & Dinan, 2022; Larrazabal et al., 2022; Rickerby et al., 2024), who emphasized the role of BIS and BAS sensitivity in the experience of anxiety and pain. From a neuropsychological perspective, the Behavioral Inhibition System (BIS) becomes activated in response to threat or punishment cues, leading to anxiety and heightened sensitivity to pain. In other words, individuals with more active BIS tend to perceive pain as more threatening and exhibit stronger anxiety responses to pain cues.

The results of the second hypothesis test indicated a significant relationship between brain/behavioral systems and distress tolerance in psychiatric patients in Babol County. This finding suggests that the function of the BIS and BAS systems can influence individuals' ability to tolerate unpleasant psychological and emotional states. Specifically, individuals with a more active and sensitive BIS tend to exhibit lower distress tolerance when faced with emotional and psychological discomfort, quickly becoming anxious or emotionally avoidant. These findings are supported by domestic studies (Karami et al., 2021; Khaki et al., 2020; Mahmoudalilou et al., 2019), which pointed to the connection between BIS activity, poor regulation of negative emotions, and lower distress tolerance. Similar evidence has been reported in international studies (Anwar et al., 2024; Yanjuan et al., 2023), which demonstrated that BIS is associated with intense responses to threat cues and difficulty managing psychological distress. From an explanatory standpoint, high BIS sensitivity to negative and threatening stimuli renders individuals more vulnerable in stressful situations and impairs their capacity to endure unpleasant states.

The results of the third hypothesis test indicated a significant relationship between distress tolerance and pain anxiety in psychiatric patients in Babol County. This means that lower levels of distress tolerance are associated with higher pain-related anxiety. This finding is consistent with domestic studies (Ali Akbari & Hossein Sabat, 2021; Dehghanpour et al., 2021; Khaki et al., 2020), which showed that individuals with low distress tolerance exhibit stronger anxiety responses to physical pain. This relationship may be explained using cognitive-emotional models: individuals with low distress tolerance tend to make exaggerated and negative appraisals when experiencing pain. Due to a lack of effective coping strategies, they perceive the pain as a major threat, which results in intensified anxiety responses. Conversely, individuals with higher distress tolerance are able to accept the unpleasant emotions caused by pain and adopt more adaptive, rather than avoidant or catastrophic, coping strategies.

The fourth hypothesis, which proposed that distress tolerance significantly mediates the relationship between brain/behavioral systems and pain anxiety, was confirmed based on the results of the Sobel test.

This study has several limitations, including limited generalizability to other populations and the use of self-report instruments, which are susceptible to bias and response errors. Additionally, potential confounding variables such as illness severity, medication use, or social support were not controlled. Future studies are recommended to include more diverse samples from various geographical regions. It is also essential to investigate the cultural and social factors influencing pain anxiety and distress tolerance. Future research should focus on evaluating effective therapeutic interventions. Clinicians are also encouraged to incorporate distress tolerance skills training as a means to reduce anxiety in psychiatric populations.

Authors' Contributions

All authors significantly contributed to this study.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

Acknowledgments

We hereby thank all individuals for participating and cooperating us in this study.

Declaration of Interest

The authors report no conflict of interest.

Funding

According to the authors, this article has no financial support.

E-ISSN: 2980-9681

Ethical Considerations

In this study, to observe ethical considerations, participants were informed about the goals and importance of the research before the start of the interview and participated in the research with informed consent.

References

Abow, F. H., Razak, T. A., Abulkassim, R., Adnan, M., Rahi, A., & Fadhil, A. M. (2023). Comparing the Effectiveness of Acceptance and Commitment Therapy and Hope Therapy on Pain Anxiety and Self-Acceptance in Patients with Leukemia. *International Journal of Body, Mind & Culture*, *10*(1). https://doaj.org/article/b2a380ef404e4cee98481266d98c1567

Afshari, A., & Safarzadeh, S. (2024). Testing the Causal Model of Sports Success Based on Brain-Behavioral Systems with the Mediation of Nature and Character Dimensions in Athletes: A Descriptive Study. *Journal of Rafsanjan University of Medical Sciences*, *23*(5), 377-391. https://doi.org/10.61186/jrums.23.5.277

Ali Akbari, M., & Hossein Sabat, F. (2021). Distress tolerance and pain anxiety with borderline personality traits: The mediating role of childhood trauma. 8th Congress of the Iranian Psychological Association, Tehran,

Anwar, N., Shahzadi, M., Shahzadi, M., Khanum, S., & Imtiaz, M. (2024). Distress Tolerance and Mental Health Problems among University Students: Distress Tolerance and Mental Health. *Pakistan Journal of Health Sciences*, *5*(03), 73-78. https://doi.org/10.54393/pjhs.v5i03.1336

Balazadeh, L., Mirzaian, B., & Hassanzadeh, R. (2021). Structural equation modeling of the brain-behavioral system on psychological vulnerability with the mediation of distress tolerance in patients with asthma. *Pajouhan Scientific Journal*, *20*(1), 41-50. https://doi.org/10.61186/psj.20.1.41

Cryan, J. F., & Dinan, T. G. (2022). The impact of gut microbiota on brain function and behavior. *Trends in Neurosciences*, *45*(3), 189-201. https://pubmed.ncbi.nlm.nih.gov/22968153/

Dadashzadeh Sangary, Y., Pournaghash Tehrani, S. S., & Farahani, H. (2024). Investigating the relative contribution of brain-behavioral systems in the marital satisfaction of married women in Urmia, Iran. *Health Science Monitor*, *3*(2), 90-104. https://doi.org/10.61186/hsm.3.2.90

Dehghanpour, V., Rafieipour, A., Abolmaali Alhosseini, K., Sabat, M., & Vahid Dastjerdi, M. (2021). Structural equation modeling of the relationship between pain coping strategies and brain/behavioral systems and distress tolerance in migraine sufferers. *Journal of Disability Studies*, *11*, 86-86. https://jdisabilstud.org/article-1-2491-en.html

Fatahi, N. (2024). Structural Equation Model of the Relationship between Brain-Behavioral Systems and Attachment Styles with Emotion Dysregulation in Couples with Conflict. *International Journal of Behavioral Sciences*, *18*(2), 68-75. https://civilica.com/doc/2046856/

Karami, N., Amini, N., Behrouzi, M., & Jafarinia, G. (2021). The mediating role of social isolation in the relationship between brain-behavioral systems and HEXACO personality traits with distress tolerance in drug-dependent individuals. *Quarterly Journal of Counseling Culture and Psychotherapy*, *12*(47), 221-258. https://qccpc.atu.ac.ir/article_12655.html

Khaki, S., Torkan, H., & Sobatollahi, V. (2020). Comparison of pain anxiety, distress tolerance, and mindfulness in individuals with irritable bowel syndrome and normal individuals. *Analytical-Cognitive Psychology*, *42*(11), 71-81. https://journals.iau.ir/article_678320.html?lang=en

Kilpatrick, Q. K. (2018). The role of the behavioral inhibition and activation systems in the stress process. https://www.proquest.com/openview/db4586ff0a883f8ef0b1bcf3941e8a28/1?cbl=18750&diss=y&pq-origsite=gscholar

Larrazabal, M., Naragon-Gainey, K., & Conway, C. (2022). Distress tolerance and stress-induced emotion regulation behavior. *Journal of research in personality*, *99*, 104243. https://doi.org/10.1016/j.jrp.2022.104243

Mahmoudalilou, M., Pak, R., & Mahmoudalilou, A. (2019). The predictive role of brain/behavioral systems in the occurrence of pain anxiety. *Modern psychological research*, *54*, 138-147. https://psychologyj.tabrizu.ac.ir/article_9688.html?lang=en

Marck, C., De Livera, A. M., Weiland, T. J., Jelinek, P., Neate, S. L., Brown, C. R., & Jelinek, G. A. (2017). Pain in people with multiple sclerosis: Associations with modifiable lifestyle factors, fatigue, depression, anxiety, and mental health quality of life. *Front Neurol*, *8*, 461. https://doi.org/10.3389/fneur.2017.00461

Merchán-Clavellino, A., Alameda-Bailén, J. R., Zayas García, A., & Guil, R. (2019). Mediating Effect of Trait Emotional Intelligence Between the Behavioral Activation Systems (BAS)/Behavioral Inhibition System (BIS) and Positive and Negative Affect. *Frontiers in psychology*, *10*, 424. https://doi.org/10.3389/fpsyg.2019.00424

Mohammadi, M., Ahmadi, A., & Rezaei, S. (2021). Investigating the relationship between distress tolerance and anxiety in patients with chronic pain. *Journal of Clinical Psychology*, *12*(3), 234-250.

Morales-Raveendran, E., Goodman, E., West, E., Cone, J. E., Katz, C., Weiss, J., & Wisnivesky, J. P. (2018). Associations between asthma trigger reports, mental health conditions, and asthma morbidity among world trade center rescue and recovery workers. *J Asthma*, *1*(7), 1-8. https://doi.org/10.1080/02770903.2018.1502300

Rickerby, N. C., Hodges, P. W., Jensen, M. P., Besomi, M., & Melissa, A. (2024). An evaluation of the behavioural inhibition system and behavioural activation system (BIS-BAS) model of pain in athletes. *Journal of Sports Sciences*, 1-10. https://doi.org/10.1080/02640414.2024.2370154

Taheri, Z., Tanha, Z., Amraei, K., & Hassanvandi, S. (2022). Determining the effect of the brain-behavioral system on psychological vulnerability with the mediation of anxiety sensitivity, emotions, and distress tolerance in patients with diabetes. *Journal of Medical Science Studies*, *33*(10), 708-719. https://doi.org/10.52547/umj.33.10.708

Tavanaye Nanekaran, S., & Eyni, S. (2024). Comparison of psychological well-being, cognitive-emotional regulation and brain-behavioral system of middle school male and female students. *Journal of Psychological Science*, *23*(135), 557-572. https://psychologicalscience.ir/browse.php?a_id=2132&sid=1&slc_lang=en

Vachon-Presseau, E., Centeno, M. V., & Apkarian, A. V. (2019). Brain mechanisms underlying the impact of stress on chronic pain. *Nature Neuroscience*, *22*(11), 1749-1759.

Williams, M., Rapport, L., Sander, A., & Parker, H. (2020). Pain anxiety and rehabilitation outcomes after acquired brain injury. *Brain Injury*, *35*(3), 1-9. https://doi.org/10.1080/02699052.2020.1859614

Yanjuan, L., Ruilin, J., Stefan, G. H., Wingsze, C., Ye, G., Yu, L., & Xinghua, L. (2023). Distress tolerance as a mechanism of mindfulness for depression and anxiety: Cross-sectional and diary evidence. *International Journal of Clinical and Health Psychology*, *23*(4), 100392. https://doi.org/10.1016/j.ijchp.2023.100392

E-ISSN: 2980-9681

Zargham Hajebi, M., Pourabdol, S., Beyki, M., & Sajjadpour, S. M. (2019). The Role of Brain/Behavioral Systems and Emotional Processing in Predicting Social Anxiety of Students. *International Journal of School Health*, *6*(3), [Add page numbers]. https://doi.org/10.5812/intjsh.85784

E-ISSN: 2980-9681