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Explaining the Causal Relationships Between Attachment Styles and Pain in Women with Rheumatoid Arthritis: The Mediating Role of Mood Disorders

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A B S T R A C T

Objective: The present study aimed to explain the causal relationships between attachment styles and pain, with the mediating role of mood disorders in women with rheumatoid arthritis.

Methods and Materials: In a cross-sectional study using structural equation modeling, 286 participants diagnosed with rheumatoid arthritis were selected through purposive sampling during the period from November 2022 to June 2023. The participants were recruited from three hospitals in Tehran: Loghman, Taleghani, and Shahid Tajrish. After obtaining informed consent and confirming the eligibility criteria, the participants entered the study process. Three indices—attachment styles, pain, and mood disorders—were completed by the participants at a single time point. Data were analyzed using SPSS and AMOS version 25 software.

Findings: The data analysis showed that the path coefficient between mood disorders and pain was positive and significant ($\beta = 0.291$, $p = 0.001$). The indirect path coefficient between anxious attachment style ($\beta = 0.045$, $p = 0.023$) and avoidant attachment style ($\beta = 0.111$, $p = 0.001$) with pain was positive, while the indirect path coefficient between secure attachment style ($\beta = -0.066$, $p = 0.001$) and pain was negative and significant.

Conclusion: The findings of this study, consistent with prior research, indicate a relationship between attachment styles and pain, mediated by mood disorders. Overall, mood disorders and attachment styles are crucial variables in understanding the pain experience in patients with rheumatoid arthritis, and they may serve as unique therapeutic targets in the multifaceted management of such conditions.

Keywords: *Attachment style, pain, mood disorders, rheumatoid arthritis.*

1. Introduction

Rheumatoid arthritis is a well-known systemic autoimmune disease (Ding et al., 2023). The cause of rheumatoid arthritis is unknown but is generally attributed to environmental and genetic factors (Cush, 2021). Rheumatoid arthritis initially affects small joints and then spreads to larger ones. It also impacts other organs, such as the lungs, eyes, kidneys, heart, and skin. In rheumatoid arthritis, cartilage and joints are destroyed, and ligaments and tendons become fragile. Joint damage leads to abnormalities and bone destruction, which may cause significant pain for patients (Prabha et al., 2024). The mechanism(s) of action involve joints being mistakenly attacked by the immune system, causing inflammation and thickening of the joint capsule, resulting in bone and cartilage damage in these areas. The clinical diagnosis of rheumatoid arthritis is based on the patient's physical manifestations and symptoms (Li & Su, 2020). The global prevalence of this disease is approximately one percent, making it the forty-second most common disabling condition worldwide (Cross et al., 2014). With the aging global population, its prevalence is increasing. Due to the high mortality and complications of rheumatoid arthritis, patients experience a severely reduced quality of life, imposing a significant economic burden on society (Fazal et al., 2018).

Pain has been reported as one of the most significant issues impacting the quality of life for patients with rheumatoid arthritis and serves as a primary barrier to their mental health (Sarzi-Puttini et al., 2023). Today, residual chronic pain remains a major unmet medical need in rheumatoid arthritis, characterized by poor prognosis despite optimal control of inflammatory disease (Minhas et al., 2023). Pain in rheumatoid arthritis patients is caused by multiple mechanisms (Vergne-Salle et al., 2020). In addition to inflammatory pain from localized and systemic cytokine effects, arthritis pain results from simple mechanical stimuli, such as bearing weight and moving joints. Changes in the joint environment due to structural joint damage and chronic inflammation can increase neural sensitivity or sensitize peripheral pain receptors at the joint site (peripheral pain sensitization) (Lim, 2023). Recent studies using functional magnetic resonance imaging have shown increased and modulated cortical responses to pain stimuli in the central nervous system, indicating the role of central processing in arthritis-related pain (central pain sensitization) (Basu et al., 2018).

Another variable associated with pain in rheumatic diseases is attachment style. The attachment system is activated in stressful situations, such as life-threatening medical conditions. Attachment is a construct related to developmental psychology that provides a strong conceptual and methodological framework for studying interpersonal relationships throughout life (Bowlby, 2008; Lo Cricchio et al., 2022). Attachment is a well-documented indicator of interpersonal patterns that emerge from early childhood interactions with a primary caregiver. Attachment style likely influences the development of close relationships, stress resilience, and physiological health (Mikulincer & Shaver, 2012). Studies indicate that adult attachment styles are associated with pain-related disabilities (Romeo et al., 2017). Approximately 65% of individuals in normative samples exhibit a secure attachment style, while 35% have insecure attachment styles (Mickelson et al., 1997). However, in patients with chronic pain, these percentages appear to reverse (Hunter & Maunder, 2015; Kowal et al., 2015).

Current psychiatric insights suggest that inflammation plays a critical role in the pathogenesis of psychiatric disorders such as depression and anxiety (Jones Amaowei et al., 2022). Recent advances also show that inflammatory and infectious conditions can lead to psychiatric complications in patients (Beurel et al., 2020). Patients with chronic diseases are more susceptible to psychosocial stressors, both physically and mentally. Symptoms of psychosocial effects, such as severe stress, nervousness, anxiety, fear, complaints of depression, reduced tolerance, anger, post-traumatic stress disorder, and psychosomatic complaints, are often observed (Brooks et al., 2020). The prevalence of depression in patients with rheumatoid arthritis is higher than in the general population, although this is also true for other chronic and disabling conditions. Possible causes of depression in these patients include advanced age, disease severity, pain, and functional disability (Joaquim & Appenzeller, 2015). One study showed that patients with rheumatoid arthritis had a higher prevalence of mood disorders, including depression and anxiety, compared to healthy individuals, and psychological distress was associated with increased pain levels (Edwards et al., 2011). In another study conducted in 2017, Machin et al. explored the perceptions of anxiety and depression through qualitative interviews with rheumatoid arthritis patients recruited from a social clinic in the United Kingdom. Participants confirmed the negative impact of rheumatoid arthritis on their mental health, with many reporting experiences of

JARAC Assessment and Research in Applied Counseling
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depression and anxiety (Machin et al., 2017). Functional limitations and the unpredictable nature of arthritis symptoms could also exacerbate stress by complicating daily planning and increasing dependence on others for routine activities (Sirois & Gick, 2014). Given that stress is involved in the etiology, maintenance, and exacerbation of rheumatic diseases (Cohen et al., 2012), understanding the factors and processes that affect how individuals with arthritis perceive and respond to disease-related stress can have important implications for managing and regulating the disease.

It is hypothesized that attachment style is associated with pain and that this relationship may be moderated by mood disorders. Despite the research background on the mentioned indices, examining the multiple relationships between these variables through structural equation modeling (SEM) has not been the focus of attention to date. The present study aims to explain the causal relationships between attachment styles and pain, with the mediating role of mood disorders in women with rheumatoid arthritis.

2. Methods and Materials

2.1. Study Design and Participants

This was a cross-sectional study using structural equation modeling (SEM) conducted with ethical approval code IR.BPUMS.REC.1401.069. In this context, between November 2022 and June 2023, 286 participants diagnosed with rheumatoid arthritis, who were referred to three hospitals in Tehran (Loghman, Taleghani, and Shahid Tajrish), were selected through purposive sampling. After obtaining informed consent and confirming eligibility criteria, participants were included in the study process. Inclusion criteria: 1) age range of 18-45 years (chosen based on the allostatic load theory regarding the effect of time on the embodiment of traumatic events, the sample was selected within a limited age range); 2) diagnosis of rheumatoid arthritis by a specialist; 3) score above 41 on the Childhood Trauma Questionnaire; 4) no receipt of palliative care with opioid medications (the use of physician-prescribed analgesics was allowed, but the use of any narcotic drugs was not permitted); 5) no psychological interventions in the past six months; 6) ability to read and write; exclusion criteria: incomplete questionnaires. Three indices—pain, attachment styles, and mood disorders—were completed by participants at one point in time.

2.2. Measures

2.2.1. Pain

The revised McGill Pain Questionnaire (2SF-MPQ) was developed by Dworkin et al. in 2009 to expand and complete the original McGill Pain Questionnaire by adding both neuropathic and non-neuropathic pain indicators in 22 items, modifying the response framework with a range of 0 to 10 for pain intensity. The questionnaire was tested on 882 individuals with various pain symptoms and 226 diabetic patients with neuropathic pain who participated in a randomized clinical trial. The findings indicated acceptable validity and reliability for this questionnaire. The exploratory and confirmatory factor analysis results revealed four subscales: continuous pain, varying pain, neuropathic pain, and affective pain. Cronbach's alpha coefficients were reported as 0.87, 0.87, 0.83, and 0.86, respectively. Tanhai et al. (2012) validated this tool for patients with irritable bowel syndrome, reporting three factors: sensory pain, affective pain, and neuropathic pain. Cronbach's alpha validity in the Iranian version was 0.87 for sensory pain, 0.87 for affective pain, 0.78 for neuropathic pain, and 0.92 for the entire tool (Ensandoost et al., 2021; Roshandel et al., 2022). In the present study, Cronbach's alpha coefficients for sensory pain were 0.82, affective pain 0.87, and neuropathic pain 0.74.

2.2.2. Attachment Styles

This questionnaire was developed by Hazan and Shaver in 1987 and consists of 15 items, with five items related to secure attachment style, five items to insecure/avoidant attachment style, and five items to insecure/anxious-ambivalent attachment style. Cronbach's alpha coefficients for the secure, avoidant, and anxious-ambivalent subscales were reported as 0.83 and 0.86, respectively. Rahmian (2004) reported concurrent validity for this questionnaire with Main's Structured Interview for Adult Attachment as 0.79 for secure attachment, 0.84 for insecure/avoidant attachment, and 0.87 for insecure/anxious-ambivalent attachment (Alnuaimi et al., 2024; Deini & Sasani, 2024). In the present study, Cronbach's alpha coefficients for secure attachment style were 0.69, for insecure/avoidant attachment style 0.78, and for insecure/anxious-ambivalent attachment style 0.71.

JARAC Assessment and Research in Applied Counseling
E-ISSN: 3041-8518

2.2.3. *Depression, Anxiety, and Stress*

This scale consists of 21 items related to symptoms of negative emotions (depression, anxiety, and stress). The depression subscale includes items assessing low mood, lack of self-confidence, hopelessness, worthlessness of life, lack of interest in engaging in activities, lack of enjoyment in life, and lack of energy and strength. The anxiety subscale includes items assessing physiological over-arousal, fears, and situational anxiety, while the stress subscale includes items measuring difficulty relaxing, nervous tension, irritability, and restlessness. In Asghari's study, internal consistency for the depression, anxiety, and stress subscales was 0.81, 0.73, and 0.81, respectively (Abbasian Hadadan, 2024; Abdelaziz et al., 2024). In the present study, Cronbach's alpha coefficients were 0.79 for the depression scale, 0.76 for the anxiety scale, and 0.83 for the stress scale.

2.3. *Data analysis*

Data were analyzed using SPSS and AMOS version 25 software and SEM method.

3. Findings and Results

In the present study, 286 participants with a mean age of 38.67 years and a standard deviation of 5.86 years took part. Among the participants, 59 (20.6%) were single, 178 (62.2%) were married, and 49 (17.1%) were divorced. Regarding education levels, 86 participants (30.1%) had less than a high school diploma, 83 (29%) had a high school diploma, 25 (8.7%) had an associate degree, 70 (24.5%) had a bachelor's degree, and 22 (7.7%) had a master's degree or higher. Additionally, 131 participants (45.8%) were housewives, 50 (17.5%) were employees, 81 (28.3%) were self-employed, and 24 (8.4%) were unemployed. Finally, the time since diagnosis was less than two years for 145 participants (50.7%), between two and five years for 84 participants (29.4%), and more than five years for 57 participants (19.9%). Table 1 shows the means, standard deviations, and correlation coefficients between the predictor variables.

Table 1

Means, Standard Deviations, and Correlation Coefficients

Variables	1	2	3	4	5	6	7	8	9
1. Secure Attachment Style	-								
2. Avoidant Attachment Style	-.19**	-							
3. Anxious Attachment Style	-.32**	.27**	-						
4. Mood Problems - Depression	-.37**	.34**	.41**	-					
5. Mood Problems - Anxiety	-.21**	.25**	.21**	.53**	-				
6. Mood Problems - Stress	-.43**	.30**	.32**	.60**	.52**	-			
7. Sensory Pain	-.33**	.41**	.29**	.24**	.28**	.36**	-		
8. Affective Pain	-.26**	.35**	.31**	.45**	.21**	.42**	.56**	-	
9. Neuropathic Pain	-.32**	.41**	.38**	.32**	.24**	.31**	.49**	.53**	-
Mean	13.65	14.49	15.02	8.62	9.15	9.66	28.02	22.19	17.81
Standard Deviation	4.20	4.54	4.98	2.34	2.90	3.57	6.60	5.17	4.86

**P < .01

Table 1 shows the correlation coefficients between the research variables, indicating that the correlations were in the expected direction and aligned with theories in the field. In this study, to evaluate the assumption of univariate normality, the skewness and kurtosis of the variables were examined, and to evaluate multicollinearity, the Variance Inflation Factor (VIF) and tolerance values of the predictor variables were reviewed. The results indicated that the skewness and kurtosis values of the variables were within the ±2 range, suggesting that the assumption of normal distribution was met. Additionally, the assumption of multicollinearity was also met, as the tolerance values for the predictor variables were greater than 0.1 and the VIF values were less than 10. According to Meyers et al. (2006), a tolerance value less than 0.1 and a VIF value greater than 10 indicate the violation of the multicollinearity assumption. In

JARAC Assessment and Research in Applied Counseling
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this study, to assess the assumption of multivariate normality, the analysis of Mahalanobis distance was used. The skewness and kurtosis values for Mahalanobis distance were 2.21 and 6.84, respectively. Since these values were outside the ±2 range, the assumption of multivariate normal distribution was not met. Consequently, a boxplot was drawn, and it was observed that five participants formed multivariate outliers. The data from these five participants were removed, resulting in reduced skewness and kurtosis values of 0.91 and 1.16, respectively. Thus, by removing the multivariate outliers, the assumption of multivariate normality was met. Finally, the evaluation of the scatter plot of standardized residuals showed that the assumption of homogeneity of variances was also met.

Additionally, the results indicate that all goodness-of-fit indices derived from confirmatory factor analysis supported the acceptable fit of the measurement model with the collected data ($\chi^2/df = 2.51$, CFI = .966, GFI = .962, AGFI = .914, RMSEA = .073). In the measurement model, the largest factor loading was for the affective pain indicator (β = .922), and the smallest factor loading was for the stress indicator (β = .687). Therefore, since all factor loadings were above .32, it can be concluded that all indicators were adequately capable of measuring the two latent variables in the study.

Table 2

Path Coefficients Between Variables in the Structural Model

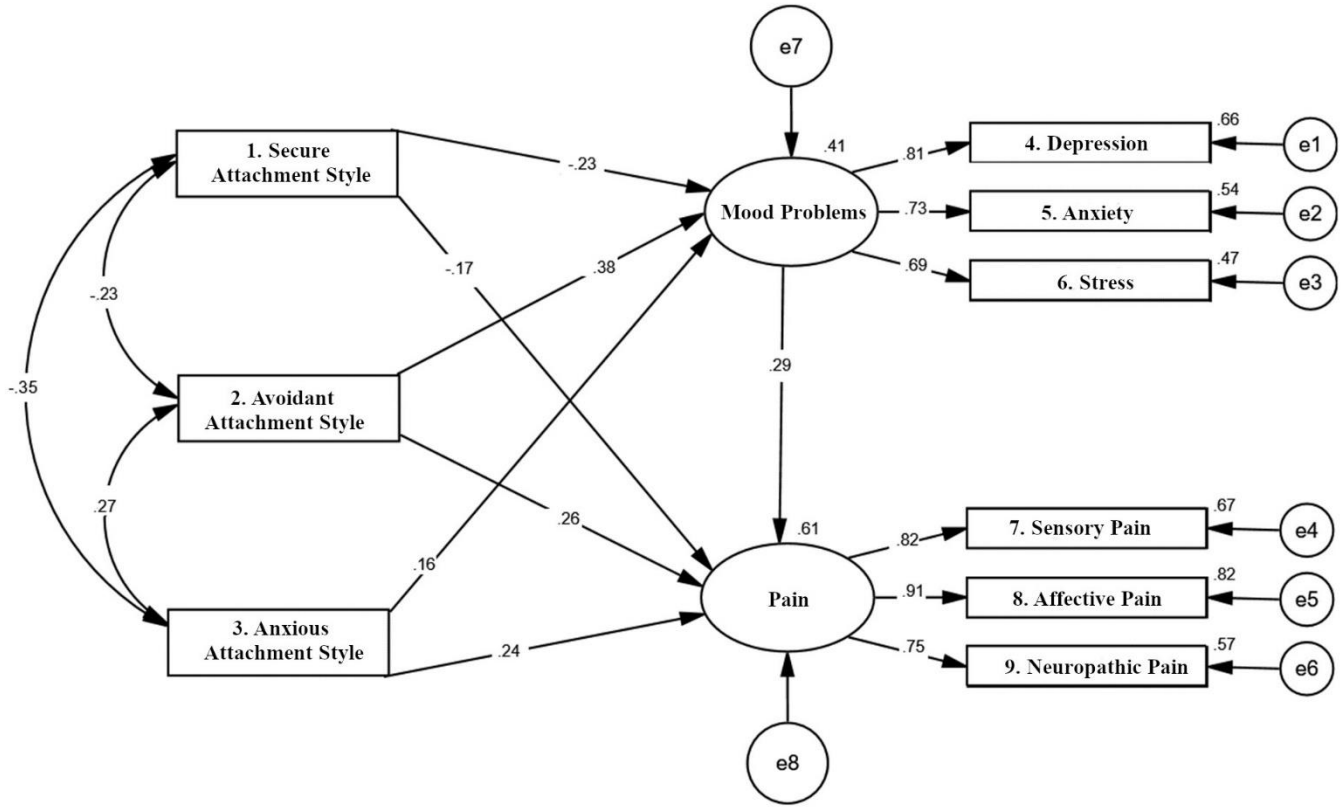
Path	Latent Variables	b	S.E.	β	p
Direct	Anxious Attachment → Mood Issues	.113	.047	.156	.018
Direct	Avoidant Attachment → Mood Issues	.248	.046	.383	.001
Direct	Secure Attachment → Mood Issues	-.199	.044	-.228	.001
Direct	Anxious Attachment → Pain	.580	.141	.241	.001
Direct	Avoidant Attachment → Pain	.566	.139	.264	.001
Direct	Secure Attachment → Pain	-.508	.153	-.175	.001
Direct	Mood Issues → Pain	.962	.247	.291	.001
Indirect	Anxious Attachment → Pain	.109	.055	.045	.023
Indirect	Avoidant Attachment → Pain	.238	.062	.111	.001
Indirect	Secure Attachment → Pain	-.192	.065	-.066	.001
Total	Anxious Attachment → Pain	.689	.147	.286	.001
Total	Avoidant Attachment → Pain	.805	.132	.377	.001
Total	Secure Attachment → Pain	-.697	.154	-.241	.001

Table 2 shows that the total path coefficient between secure attachment style and pain (β = -.241, p = .001) was negative, while the total path coefficients between anxious attachment style (β = .286, p = .001) and avoidant attachment style (β = .377, p = .001) and pain were positive and significant. Table 4 also indicates that the path coefficient between mood problems and pain was positive and significant (β = .291, p = .001). The indirect path coefficients between anxious attachment style (β = .045, p = .023) and avoidant attachment style (β = .111, p = .001) and pain were positive, while the indirect path coefficient between secure attachment style (β = -.066, p = .001) and pain was negative and significant. Therefore, it can be concluded that in women with rheumatoid arthritis, mood problems positively mediate the relationship between avoidant and anxious attachment styles and pain, while negatively mediating the relationship between secure attachment style and pain.

JARAC Assessment and Research in Applied Counseling
E-ISSN: 3041-8518

Figure 1

Structural Model of the Study Using Standardized Data



As shown, the total squared multiple correlations (R^2) for the pain variable was .61, indicating that attachment styles and mood problems together explain 61% of the variance in pain among women with rheumatoid arthritis.

4. Discussion and Conclusion

The present study aimed to explain the causal relationships between attachment styles and pain, with the mediating role of mood problems in women with rheumatoid arthritis. The findings showed that secure attachment style had a negative relationship with pain, while the total path coefficients between anxious and avoidant attachment styles and pain were positive and significant. Additionally, the path coefficient between mood problems and pain was positive and significant. On the other hand, the indirect path coefficients between anxious and avoidant attachment styles and pain were positive, while the indirect path coefficient between secure attachment style and pain was negative and significant. Therefore, it can be concluded that, among women with rheumatoid arthritis, mood problems positively mediate the relationship between avoidant and anxious attachment styles and pain, and negatively mediate the relationship between secure attachment style and pain.

Studies explaining these findings indicate that pain is a significant source of distress for patients and their spouses or other significant individuals. In this regard, Forsythe et al. (2012) found that insecure attachment styles are associated with widespread chronic pain, and individuals with insecure attachment styles experience more pain compared to those with secure attachment styles (Forsythe et al., 2012). Attachment and interpersonal processes can contribute to health-related outcomes. In a prototypical couple relationship, attachment style can influence the partners' processes. Each partner's interpersonal processes can affect, and be affected by, physiological responses, emotional states, health behaviors, and disease outcomes. Specifically, when insecurely attached patients react to pain using interpersonal strategies, it leads to greater relationship conflict, which in turn may influence pain adaptation outcomes (Pietromonaco et al., 2013). Furthermore, Wilson and Ruben (2011) found that women with anxious attachment responded negatively to experimentally induced acute pain when their attachment partner also had an anxious

JARAC Assessment and Research in Applied Counseling
E-ISSN: 3041-8518

attachment style (Wilson & Ruben, 2011). Additionally, partners with high anxious attachment reported more anxious mood compared to those with low anxious attachment (Porter et al., 2012). In fact, the patient's pain is a stressor not only for the patient but also for the spouse. Spouses play a role in regulating negative emotions in response to their partner's pain, making the attachment style of spouses significant as well.

5. Limitations & Suggestions

One limitation of the present study is its cross-sectional design, which restricts the ability to establish causal relationships between attachment styles, mood problems, and pain in women with rheumatoid arthritis. Additionally, the reliance on self-reported measures may introduce biases such as social desirability or recall bias, potentially affecting the accuracy of the data. The sample was also limited to women with rheumatoid arthritis from a specific geographical region, which may limit the generalizability of the findings to other populations or men with the same condition. Finally, the exclusion of other psychological or social variables that could influence pain perception, such as social support or coping strategies, is another limitation that future studies may address.

Future research could employ longitudinal designs to better capture the dynamic and causal relationships between attachment styles, mood problems, and pain over time in individuals with rheumatoid arthritis. Including a more diverse sample in terms of gender, geographical location, and cultural background would enhance the generalizability of the findings. Additionally, investigating the role of other psychosocial factors, such as social support networks, interpersonal dynamics, and coping mechanisms, may provide a more comprehensive understanding of how attachment styles and mood disorders interact with pain in chronic conditions. Experimental interventions focusing on attachment-based therapy or mood regulation techniques could also be explored to assess their effectiveness in pain management for these patients.

The findings of this study suggest that healthcare providers working with rheumatoid arthritis patients should consider integrating psychological assessments, particularly for attachment styles and mood disorders, into their routine care plans. Interventions aimed at improving emotional regulation, reducing anxiety, and enhancing secure attachment patterns may play a key role in managing chronic pain. Multidisciplinary care teams, including psychologists, could offer attachment-based counseling or cognitive-behavioral therapy (CBT) to address the emotional and relational aspects of pain, thereby improving overall treatment outcomes and enhancing the quality of life for these patients.

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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 (Ethics Code: IR.BPUMS.REC.1401.069).

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 in this article.

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