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Schema Modes and Addiction Relapse in Methadone-Treated Individuals: The Mediating Roles of Quality of Life and Rumination

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ABSTRACT

Objective: This study aimed to develop a structural model of addiction relapse based on schema modes, with quality of life and rumination as mediating variables among individuals receiving methadone treatment.

Methods and Materials: This descriptive-correlational study was conducted using structural equation modeling. The study population included clients undergoing methadone treatment in addiction treatment centers in Qazvin, Iran, in 2025. A total of 310 participants were selected through convenience sampling. Data were collected using the Addiction Relapse Questionnaire, Schema Mode Questionnaire, World Health Organization Quality of Life Questionnaire, and Rumination Questionnaire. Data were analyzed using SPSS version 26 and AMOS. The proposed model was evaluated using structural equation modeling and model fit indices.

Findings: The structural model showed acceptable fit indices, including $\chi^2/df = 2.10$, RMSEA = .05, CFI = .94, NFI = .91, GFI = .96, and AGFI = .94. Schema modes had a significant positive direct effect on addiction relapse ($\beta = .40$, $p < .001$) and rumination ($\beta = .41$, $p < .001$), while quality of life had a significant negative direct effect on relapse ($\beta = -.34$, $p < .001$). Schema modes also significantly predicted quality of life negatively ($\beta = -.53$, $p < .001$). Indirect effects of schema modes on relapse through rumination ($\beta = .20$, $p < .001$) and quality of life ($\beta = .18$, $p < .001$) were significant.

Conclusion: Schema modes, rumination, and quality of life are important psychological factors associated with addiction relapse among individuals receiving methadone treatment. Interventions targeting maladaptive schemas, rumination reduction, and quality-of-life improvement may support relapse prevention.

Keywords: Addiction Relapse, Schema Modes, Quality of Life, Rumination, Methadone Treatment.

Introduction

Drug addiction is one of the significant social and health problems that has profound and negative impacts on the personal and social lives of individuals (Lin et al., 2025). Methadone treatment is recognized as one of the effective methods in reducing the adverse effects of addiction and helping individuals return to normal life (Bachhuber et al., 2025). This treatment, in addition to alleviating withdrawal symptoms, can also help improve the quality of life for individuals undergoing treatment. However, many of these individuals face numerous psychological and emotional challenges that may affect their treatment process and quality of life (Ben-Shlomo et al., 2025). In addicted individuals, schema modes can specifically exacerbate addictive behaviors and lead to an inability to cope with life's stresses and pressures. Research has shown that addicted individuals often face negative emotions such as anxiety, depression, and anger, which can reinforce the cycle of addiction (Hand et al., 2024).

Another variable that seems to be related to addiction relapse is schema modes. According to schema theory, schema modes are activated patterns of cognitive and emotional responses, including both adaptive and maladaptive coping responses, currently active in an individual's information processing system. Schema modes are classified into four categories: child modes (vulnerable child, angry child, and impulsive child); dysfunctional parent modes (punitive parent and demanding parent); maladaptive coping modes (submissive surrender, detached protector, and excessive compensator); and healthy modes (Jamshidi et al., 2020).

The damage caused by maladaptive schemas does not end in one situation; their traces can be found in all important decisions and choices in an individual's life, such as choosing a spouse, selecting a career, parenting styles, boundary-setting in interpersonal relationships, and other significant areas of life (Van Vreeswijk et al., 2012). Liao & Zhang (2023) in their study showed that schemas such as mistrust/abuse, emotional deprivation, entitlement and grandiosity, and insufficient self-discipline have significant relationships with drug addiction. It seems that schemas lead to biases in individuals' interpretations of events, and these biases manifest as misunderstandings, distorted attitudes, misconceptions, unrealistic expectations, and goals in their psychological pathology (McNeil & Alibali, 2019).

Substance abuse imposes significant individual and social burdens on the affected individual. One of these changes is the significant alteration in the quality of life of these individuals. Quality of life refers to individuals' perception of their health status and how satisfied they are with it. This concept is defined in contrast to quantity, and considering the broad dimensions of health, it refers to the years of life lived with satisfaction, happiness, and pleasure (Köhlerová et al., 2024). In fact, quality of life consists of objective factors (such as physical, psychological, and social functioning) and subjective factors (such as internal well-being) that interact with each other. Subjective factors focus more on life satisfaction, while objective factors focus on material needs and participation in activities and interpersonal relationships. Furthermore, each dimension of quality of life can significantly impact other aspects of life (Yeh et al., 2024). In recent years, identifying factors that enhance quality of life has been one of the most important topics of research, and psychologists have realized that individuals should focus their mental energy on positive experiences (Martinotti et al., 2020).

Another influencing factor that seems to increase the risk of relapse in individuals undergoing treatment for substance abuse is rumination (Cao et al., 2021; Memedovic et al., 2019). According to the Nolen-Hoeksema response style theory, rumination can be defined as repetitive thoughts and behaviors that focus the attention of the depressed individual on the symptoms of depression, the causes, and its consequences. In fact, it directs their attention to emotions like apathy, worry about emotional and behavioral symptoms. This theory suggests that a person who is suffering from rumination will remain exposed to perceived stress, worry, and craving for consumption if they do not have a constructive response style to divert negative thoughts and emotions (Ferguson et al., 2024). Previous research indicates that controlling rumination, worry, and

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perceived stress with strategies such as adopting a rumination response style or self-control can prevent relapse and reduce craving for stimulant substances (Sinha, 2024).

Drug addiction is one of the most significant individual and social problems that not only causes the collapse of an individual's psychological and personality structure, leading to severe motivational disorders and loss of behavioral control, but also imposes substantial costs in various dimensions of physical, psychological, and social health on society. It contributes to increased crime rates, social abnormalities, and mortality, posing a serious threat to the security and health of countries worldwide. Despite numerous policies and interventions, a significant portion of individuals suffering from substance abuse relapse after completing their treatment courses, and this remains a persistent challenge for healthcare and treatment services worldwide. In this context, identifying the psychological mechanisms affecting addiction relapse, such as schema modes, and examining their consequences, considering mediating variables such as quality of life and rumination, has gained significant importance. This is because various research findings suggest that psychological and cognitive factors play a prominent role in the likelihood of relapse. However, a review of the literature and previous research indicates that in Iran, no precise structural model or causal framework has been proposed that can comprehensively assess the direct and indirect relationships between schema modes, relapse, and the mediating role of quality of life and rumination. This clearly indicates a significant research gap, especially considering that many previous studies have only focused on identifying bivariate relationships or descriptive studies, neglecting structural analysis and modeling. Therefore, there is a clear need for the present study to define a causal and structural model of addiction relapse and to examine the goodness of fit of the proposed model, considering the mediating role of quality of life and rumination. This study aims to provide a scientific and evidence-based response to this ambiguity and significant issue. The researchers aim to answer the following research question: Does the proposed causal model of schema modes, with the mediating role of quality of life and rumination, fit the data regarding addiction relapse in methadone-treated clients?

Methods and Materials

The present study is descriptive-correlational with structural equation modeling. The statistical population for this study consisted of all clients undergoing methadone treatment at addiction treatment centers in the cities of Qazvin in 2025. The sample size was calculated using the convenience sampling method based on Klein's (2015) to be 230 individuals, but to increase reliability, 310 participants were selected. Inclusion criteria for the study included: voluntary consent to participate; an age range of 20 to 60 years; basic literacy; no severe psychiatric disorders (such as psychosis) as confirmed by a psychiatrist and medical records; at least three months of methadone treatment with stable consumption conditions. Exclusion criteria included: the participant having completed the treatment or missing sessions; lack of willingness to continue participation; and participation in other psychotherapy programs during the study.

Instruments

Addiction Relapse Questionnaire: This self-report scale was developed by Wright et al. (1993). It includes 45 items, with each question presenting a situation that the participants need to imagine themselves in. It includes two components: the strength of the urge in a specific situation and the likelihood of consumption in that situation. Scoring is based on a five-point Likert scale: 0 = none, 1 = weak, 2 = moderate, 3 = strong, and 4 = very strong. Scores ranging from 0 to 60 indicate weak relapse potential, from 60 to 90 indicate moderate relapse potential, and scores above 90 indicate strong relapse potential. Wright et al. (1993) reported internal consistency for the urge subscale as 0.90 and for the likelihood of consumption subscale as 0.87 using Cronbach's alpha. In the study by Mehrabi et al. (2004), the reliability calculated using Cronbach's alpha for the consumption subscale was 0.94 and for the urge subscale, it was 0.97.

Schema Mode Questionnaire: This questionnaire consists of 124 items aimed at measuring 14 schema modes, including vulnerable child mode, angry child mode, impulsive child

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mode, undisciplined child mode, and others. The response scale is based on a six-point Likert scale, from 1 (never) to 6 (always). High scores indicate the dominance of that schema mode in the participant's information processing system. The schema modes are divided into four broader categories: impaired child modes, ineffective parent modes, maladaptive coping modes, and healthy modes. The reliability of this tool, using Cronbach's alpha, was 0.87, and the tool was reported to have good discriminative power for Axis I and II disorders (Roediger et al., 2018).

World Health Organization Quality of Life Questionnaire: This 26-item questionnaire evaluates four domains: physical health (7 items), psychological health (6 items), social relationships (2 items), and environmental factors (8 items). Each item is scored on a five-point Likert scale, from 1 (very low) to 5 (very high). The reliability of this scale has been reported by Nasiri et al., (2020) using Cronbach's alpha as ranging from 0.73 to 0.89 across the four subscales, with a test-retest reliability of 0.7 over two weeks.

Rumination Questionnaire: This scale was designed by Trapnell & Campbell (1999). It consists of 11 items, with a five-point Likert scale ranging from "strongly disagree" (0) to "strongly agree" (4). The subscales are related to contemplation, introspection, and brooding. In Iran, the reliability of the scale was confirmed with a Cronbach's alpha of 0.73 (Manavi Pour & Shah-Hosseini, 2015).

Procedure

After obtaining necessary permissions from the Ethics Committee with code (IR.IAU.TON.REC.1404.135) and coordinating with the addiction treatment centers in Qazvin, the primary researcher, along with a clinical psychologist and an experienced psychology graduate, began the data collection process. A list of all government and private addiction treatment centers in Qazvin was prepared. After visiting each center and presenting an official introduction letter, the researcher explained the study's objectives and importance to the center's administrators and arranged an appropriate time for participant access. The researcher, in consultation with the psychiatrist or psychologist of each center, identified eligible participants based on the inclusion criteria. Then, in a private and calm environment, the researcher introduced the study, explained the importance of participation, confidentiality, the right to withdraw at any stage of the study, and the non-effect of participation on treatment. After obtaining written consent from the participants, they were provided with the questionnaires. The researcher explained how to respond to the questions and remained available to provide any necessary clarifications during the completion of the questionnaires, which took approximately 45 to 60 minutes. For participants with lower literacy levels, the researcher read the questions aloud and recorded their responses while maintaining complete independence in their answers. After the questionnaires were completed, the researcher thanked the participants for their cooperation and promised to provide a summary of the study results upon completion, if desired. The data collection process took three months, adhering to ethical guidelines and maintaining the participants' privacy and safety.

Data Analysis

Statistical analysis was performed using both descriptive and inferential statistics. Descriptive analysis involved calculating mean, standard deviation, skewness, and kurtosis to describe the variables. Frequency and percentage were also reported for demographic characteristics. Inferential statistics aimed to generalize results from a small sample (the study sample) to a larger population. Structural equation modeling was used to test the hypotheses and confirm or reject them. The data were analyzed using SPSS version 26 and Amos software.

Findings and Results

The results show that the mean age of participants in this study was 35.3 years with a standard deviation of 4.78; the lowest age among the participants was 22 years, and the highest was 45 years. The results indicate that 174 participants (56.1%) were women, and 136 participants (43.9%) were men. Furthermore, 153 participants (49.4%) had education below high school or a high school diploma, 94 participants (30.3%) had an associate degree, 49 participants (15.8%) had a bachelor's degree, and 14

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participants (4.5%) had a master's degree. The descriptive findings of the research subscales are presented in Table 1.

Table 1

Descriptive findings of the research subscales

Statistic	Scale	Mean	Standard Deviation	Skewness	Kurtosis
Childhood Vulnerability Mindset	4.114	1.34	-0.676	-0.222	
Inner Critic Mindset	2.56	2.14	0.265	0.132	
Dysfunctional Coping Mindset	4.111	4.24	-0.668	0.033	
Healthy Mindset	3.9	2.24	-0.178	0.265	
Physical Health	9.15	2.68	0.438	0.379	
Mental Health	9.16	2.28	0.138	-0.082	
Social Relationships	9.15	2.02	-0.341	0.445	
Living Environment	9.15	3.01	-0.236	0.562	
Rumination	9.40	1.31	-0.335	0.85	
Introspection	9.79	1.83	-0.444	0.118	
Overthinking	9.7	0.946	-0.837	-1.89	
Intensity of Urge	10.50	1.14	-1.11	0.307	
Likelihood of Consumption	9.42	1.12	-1.23	0.02	

As seen in Table 1, the descriptive findings of the research subscales are shown. The results presented in skewness and kurtosis fall within the range of (3, -3), indicating that the data is normally distributed or approximately normal. According to the general criterion for assessing univariate normality, if skewness and kurtosis fall within the range of (3, -3), the data are considered normally distributed. Based on the data in Table 1, it is evident that none of the indicators have skewness or kurtosis values outside the range of (3, -3), thus we can consider them as normal or approximately normal.

One of the assumptions of structural equation modeling is the multivariate normal distribution of the data. For this purpose, the multivariate skewness coefficient of Mardia is used in AMOS software. Bentler (2010) suggests that values greater than 5 for the Mardia coefficient indicate non-normal distribution of the data. The Mardia coefficient for the data in this study is 2.80, which suggests that the assumption of multivariate normality is met. When continuous data do not significantly deviate from normality, the Maximum Likelihood (ML) estimation method can be used.

Another assumption of structural equation modeling is the absence of multicollinearity between predictor variables. Tolerance and Variance Inflation Factor (VIF) indices are used to check this assumption. The tolerance index ranges between 0 and 1. For each independent variable, a value for this index exists; if the value is higher than 0.1, it indicates no severe multicollinearity with other independent variables. The VIF index also indicates the absence of multicollinearity when the value is less than 10. As seen, all values indicate no severe multicollinearity among the predictor variables. The results of the model when standardized and some of the important goodness-of-fit indices are presented in Table 2.

Table 2

Model Fit Indices

Index Name	Value	Acceptable Range
$(\chi^2)/df$	2.10	Less than 3
RMSEA (Root Mean Square Error of Approximation)	0.05	Less than 0.10
CFI (Comparative Fit Index)	0.94	Greater than 0.90

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NFI (Normed Fit Index)	0.91	Greater than 0.90
GFI (Goodness-of-Fit Index)	0.96	Greater than 0.90
AGFI (Adjusted Goodness-of-Fit Index)	0.94	Greater than 0.90

In general, when working with the AMOS software, none of the indices individually confirm or reject the model's goodness of fit, and they should be interpreted together. The obtained values for these indices indicate that the model is in a good direction regarding fit and explanation.

Table 3

Factor Loadings and Significance for Measurement Models

Scale	Component	Standardized Weight	Sig
Schema Mindsets	Child Vulnerability Mindset	0.55	0.001
Inner Critic Mindset	0.65	0.001	
Dysfunctional Coping Mindset	0.56	0.001	
Healthy Mindset	0.67	0.001	
Quality of Life	Physical Health	0.53	0.001
Mental Health	0.60	0.001	
Social Relationships	0.46	0.001	
Living Environment	0.61	0.001	
Rumination	Reflection	0.68	0.001
Introspection	0.54	0.001	
Overthinking	0.70	0.001	
Relapse of Addiction	Intensity of Urge	0.66	0.001
Likelihood of Consumption	0.80	0.001	

As seen from Table 3, all factors for the five scales have significant factor loadings at a 99% confidence level ($p < 0.01$). Given that the paths between the variables in the models tested above represent the hypotheses of the research, further analysis on the direct and indirect effects has been performed. The direct effects are examined next.

Table 4

Direct Effects of Schema Mindset on Addiction Relapse

Criterion Variable	Predictor Variable	Effect Type	Standardized β	t-Statistic	P
Addiction Relapse	Schema Mindset	Direct	0.40	3.72	0.001
Addiction Relapse	Rumination	Direct	0.48	4.05	0.001
Addiction Relapse	Quality of Life	Direct	-0.34	-3.46	0.001
Rumination	Schema Mindset	Direct	0.41	3.78	0.001
Quality of Life	Schema Mindset	Direct	-0.53	-4.56	0.001

As seen in Table 4, Schema Mindset has a direct effect on addiction relapse, with a significant emotional dysregulation relationship with relapse being direct ($t = 3.72$, $\beta = 0.40$). Therefore, the hypothesis regarding the direct effect of schema mindset on relapse in methadone-treated patients is confirmed with 99% confidence. Rumination has a direct effect on addiction relapse, with a direct relationship ($t = 4.05$, $\beta = 0.48$), confirming the hypothesis regarding the effect of rumination on relapse with 99% confidence. Quality of life has a direct effect on addiction relapse, with a direct relationship ($t = -3.46$, $\beta = -0.34$), confirming the hypothesis regarding the effect of quality of life on relapse with 99% confidence. Schema Mindset has a direct effect on rumination, with a direct relationship ($t = 3.78$, $\beta = 0.41$), confirming the hypothesis regarding the effect of schema mindset on rumination with 99% confidence. Schema

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Mindset has a direct effect on quality of life, with a direct relationship (t = -4.56, β = -0.53), confirming the hypothesis regarding the effect of schema mindset on quality of life with 99% confidence.

To examine the mediating effect of rumination between schema mindset and addiction relapse, Sobel's test was used. Sobel (1982) test is a method used to check the significance of the mediating variable effect. The test measures the significance of the indirect effect by dividing the product of two unstandardized coefficients that form the mediation path by the standard error of this product. If the ratio is greater than 1.96, it is concluded that the mediation effect is significant.

Table 5

Indirect Effects of Schema Mindset on Addiction Relapse through Rumination and Quality of Life

Criterion Variable	Predictor Variable	Effect Type	Standardized β	t-Statistic	Sig
Addiction Relapse	Schema Mindset	Indirect (Rumination)	0.20	3.42	0.001
Addiction Relapse	Schema Mindset	Indirect (Quality of Life)	0.18	3.38	0.001

The results from Table 5 indicate that the hypothesis regarding the indirect effect of schema mindset on addiction relapse via rumination is confirmed with 99% confidence ($p < 0.01$). Similarly, the hypothesis regarding the indirect effect of schema mindset on addiction relapse via quality of life is confirmed with 95% confidence ($p < 0.05$).

Discussion and Conclusion

The results of the structural equation modeling analysis showed that the proposed model of the study, based on the relationship between schema mindset with the mediating role of quality of life and rumination in relapse of addiction in individuals under methadone treatment, has a good fit. The results indicated that the proposed model of the study, based on the relationship between schema mindset with the mediating role of quality of life and rumination in relapse of addiction in individuals under methadone treatment, fits well. The findings of this study align with previous research, indicating that emotional dysregulation plays a crucial role in the addiction process and relapse.

Schema mindset, as part of an individual's cognitive-emotional structure, plays a role in the experience and processing of everyday events. According to Young's perspective, early maladaptive schemas are stable patterns formed during childhood as a result of interactions with negative emotional events and frustrating experiences. In adulthood, they manifest as thoughts, perceptions, and emotions that negatively influence behavior. The results of the studies by Khosravani et al. (2016), and Bojed & Nikmanesh (2013) also show that there is a direct and significant relationship between early maladaptive schemas and the tendency to substance use. This finding, in line with the present research results, indicates that individuals with schemas such as abandonment, distrust, emotional deprivation, and failure, when faced with everyday life stressors, are likely to resort to ineffective emotional strategies such as avoidance or substance use to temporarily reduce tension, instead of using effective and reality-based coping strategies.

The findings also emphasize that rumination is one of the mediating pathways between cognitive variables and relapse of addiction. Esmaeeilzadeh et al. (2025) in their research demonstrated that rumination is not only related to addiction attitudes but can also sustain the way thoughts related to consumption are processed, weakening the will to quit. In other words, an individual who is constantly preoccupied with repetitive negative thoughts about failures or unpleasant emotions is faced with increased psychological pressure and may opt for relapse as a way to escape this mental cycle. The findings of external research also align with this. Mao et al. (2024) and Ferguson et al. (2024) both confirmed that rumination is a strong predictor of the urge to consume and actual substance use in individuals with substance use disorder. From this perspective, rumination

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creates a mental loop that not only exacerbates anxiety and depression but also increases the motivation to relapse into substance use.

Another important point in the model of this research is the mediating role of quality of life. Quality of life is a multidimensional concept that includes an individual's physical, psychological, social, and environmental well-being. Research evidence has shown that low quality of life is one of the most significant factors contributing to sustained substance use and failure in the recovery process. Afkari et al. (2013), Karimi et al. (2019) have explicitly reported that addiction severely weakens the quality of life of individuals and their families, and even those in recovery tend to have a lower quality of life compared to the general population. In this research, it was also observed that decreased quality of life could exacerbate the negative effects of emotional dysregulation and maladaptive schemas, thus facilitating the relapse process. The findings of Armoon et al., (2022) also confirm this role through meta-analysis, indicating that low quality of life is both a consequence and a predictor of substance use disorders.

On the other hand, it can be argued that the interaction between emotion, cognition, and quality of life explains a significant portion of the reason for recurrent relapse in patients under methadone treatment. Although methadone provides a way to treat opioid misuse by preventing withdrawal symptoms and controlling cravings, it alone is not enough to change the persistent cognitive and emotional mechanisms in an individual. Without simultaneous psychological interventions (such as mindfulness-based treatments or schema-focused cognitive therapy), underlying factors such as emotional dysregulation and rumination remain active, causing individuals to relapse with even the slightest emotional trigger or environmental stress.

Furthermore, low quality of life can play a reinforcing role in this cycle. An individual who still faces economic problems, disrupted family relationships, loneliness, or unemployment after quitting substances may not have enough motivation to maintain abstinence, and any negative emotion may lead to relapse. The findings of Pasareanu et al. (2015) also indicate that after treatment, the improvement of quality of life is a key indicator of treatment success, and without enhancing it, the likelihood of relapse is very high.

The findings of Mohammadi Benmar et al. (2023) and Pourafshari et al. (2022) in the context of behavioral addictions (such as mobile addiction) have also confirmed that rumination and emotional dysregulation are common patterns across various types of addictions, reflecting a unified psychological mechanism. Therefore, it can be concluded that, on a cognitive level, rumination, rather than processing emotions constructively, repeats and solidifies negative thoughts, and on an emotional level, the inability to regulate emotions reduces psychological flexibility. In such a state, the individual resorts to immediate behaviors, such as substance use, to escape mental pressure, and these patterns increase the likelihood of relapse even after quitting.

On the other hand, the effect of maladaptive schemas leads to the formation of negative mindsets toward oneself and the future. Individuals with schemas such as failure or emotional deprivation feel more helpless when faced with failures Zibaei et al., (2020), and this feeling of helplessness, in the absence of emotion regulation skills, leads to extensive psychological distress. Ultimately, this creates a context for increased rumination, trapping the individual in an irreversible cycle of thought, emotion, and behavior. This cycle is the main mechanism of relapse in patients under methadone treatment, which is confirmed by the findings of the present study.

In conclusion, the results of the present study indicate that the process of addiction relapse is not merely a physiological phenomenon or drug-dependent but has deeper psychological roots. Therefore, treatments based on cognitive-behavioral models that focus simultaneously on changing the content of schemas and teaching emotion regulation strategies will show the greatest effectiveness in this population. When interpreting the pathways of the model, it can be said that schema mindset, through increasing rumination and decreasing quality of life, has a strong indirect effect on addiction relapse. These results align with the findings of Ferguson et al. (2024) and Cao et al. (2021), who emphasize that rumination and poor sleep

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quality (as an indicator of quality of life) are exacerbating factors in substance use. Moreover, Rahbarian et al. (2017) study, highlighting the relationship between intensity of use and emotional dysregulation, confirms the role of emotion regulation in sustaining the addiction loop.

Limitations

This study employed convenience sampling, which, while effective for accessing the target population in addiction treatment centers, may not represent the exact characteristics of the entire population of methadone-treated patients across the country. Thus, caution should be exercised when generalizing the results to other cities or treatment groups. Most of the tools used were self-report questionnaires, which, due to their reliance on the honesty, accuracy, and self-awareness of respondents, may be subject to response biases, memory issues, or the desire to provide socially acceptable answers. This increases the likelihood of error or misalignment between the individual's actual situation and the recorded data. Despite efforts to design a comprehensive model and control for certain demographic variables, other influential factors (such as genetic factors, addiction history, family conditions, economic status, or concurrent treatment interventions) may have influenced the observed relationships but were not measured or controlled in this study. Data were collected over a specified period, so the psychological and behavioral state of participants was assessed only at that time. Due to the dynamic nature of factors like quality of life or rumination, this study lacks longitudinal follow-up and cannot provide definitive conclusions about changes or the persistence of effects. Although structural equation modeling allows for the simultaneous examination of relationships between variables, the non-experimental nature of the data means causal relationships cannot be definitively established. The results only reflect statistical relationships and structural correlations, and experimental or longitudinal studies would be required to establish causality.

Recommendations for future research:

It is suggested that future studies use random or stratified sampling methods in various treatment centers (across the country or different cities) to achieve better representation of the overall target population and improve the generalizability of the results. In future studies, it is recommended to use objective tools such as clinical observation, specialized interviews, or medical records to minimize potential response biases and self-report errors. It is essential to carefully control or assess the role of background variables such as genetic factors, disease history, family and economic conditions, and concurrent treatment to obtain a more accurate analysis of each factor's influence on addiction relapse. Longitudinal studies with follow-up of participants over various time periods should be designed to examine the sustainability of psychological changes, related relapse behaviors, and changes in quality of life dimensions. For causal relationships, future research should design controlled experiments or implement psychological interventions (e.g., emotion regulation training) to practically assess the effectiveness of interventions and the precise role of each variable in preventing addiction relapse.

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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 Declaration of Helsinki, which provides guidelines for ethical research involving human participants. Ethical considerations in this study were that participation was entirely optional.

Transparency of Data

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

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Authors' Contributions

All authors equally contributed to this study.

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