

Research Paper

Exploring the Role of Mindfulness and Metacognition in Opioid Recovery among Indian adult Men: Implications for Global Addiction Rehabilitation

Hemant Kashyap^{1*}, Dr. Lalhmingmawii Khiangte²

ABSTRACT

Purpose: Mindfulness and metacognition, two higher-order cognitive capacities central to emotion regulation and relapse prevention, are often impaired in individuals with opioid use disorder (OUD). Despite their conceptual overlap, few studies have examined their combined relationship, particularly in non-Western contexts. This study assessed mindfulness and metacognitive functioning among Indian men with OUD, compared these abilities with healthy controls, and explored their interrelationship within a culturally grounded framework. **Methods:** A total of 200 adult men aged 25–45 years participated. The clinical group (n = 100) met ICD-11 diagnostic criteria for OUD, while the control group (n = 100) comprised age-matched psychologically healthy men. Participants completed standardized measures of mindfulness, metacognitive awareness, and general health. Independent-sample t-tests examined group differences, and Pearson's correlations assessed associations between mindfulness and metacognitive regulation, with statistical adjustments for multiple comparisons. **Results:** Men with OUD demonstrated significantly lower levels of mindfulness and metacognitive awareness than controls ($p < .05$). A strong positive correlation ($r = .92$) was observed between mindfulness and metacognitive regulation, suggesting a reciprocal relationship in which enhancement of one process may facilitate the other. **Conclusions:** This study provides the first integrated empirical analysis of mindfulness and metacognition among opioid-dependent men in India. Findings reveal a shared cognitive vulnerability underlying OUD and underscore the need for culturally adapted mindfulness-based interventions that target metacognitive regulation. Such approaches may enhance relapse prevention, promote sustained recovery, and strengthen the cross-cultural validity of global addiction treatment models.

Keywords: *Mindfulness, Metacognition, Opioid Use Disorder, Cognitive Regulation, Relapse Prevention, Cultural Adaptation, Global Mental Health*

¹Department of Clinical Psychology, Mizoram University, Aizawl, Mizoram, India.
ORCID: 0009-0007-0448-45821

²Department of Clinical Psychology, Mizoram University, Aizawl, Mizoram, India.
ORCID: 0009-0005-5072-15802

*Corresponding Author

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Exploring the Role of Mindfulness and Metacognition in Opioid Recovery among Indian adult Men: Implications for Global Addiction Rehabilitation

Key Message: Adult men with opioid use disorder often demonstrate marked deficits in mindfulness and metacognitive awareness, potentially impairing their capacity for emotional regulation and sustained recovery. Enhancing mindfulness skills may, in turn, strengthen metacognitive functioning, presenting a promising target for intervention. Integrating mindfulness-based strategies into addiction treatment could improve self-regulation, lower relapse risk, and promote long-term recovery outcomes.

Metacognition

Metacognition, often described as “thinking about thinking,” refers to the awareness, monitoring, and regulation of one’s cognitive processes (Flavell, 1979). It comprises two interrelated components: *metacognitive knowledge*: understanding one’s cognitive abilities and strategies; and *metacognitive regulation*: the capacity to plan, monitor, and evaluate one’s thinking and behaviour (Schraw & Dennison, 1994; Veenman et al., 2006).

In the context of substance use disorders (SUDs), metacognitive impairments are consistently linked to diminished self-awareness, heightened impulsivity, and poor decision-making (Fernandez-Montalvo & López-Goñi, 2011; Spada et al., 2008). Such deficits can perpetuate substance use by reducing the ability to anticipate negative consequences, apply adaptive coping strategies, and replace maladaptive thought patterns (Balconi et al., 2014). Interventions such as Metacognitive Therapy (MCT) aim to address these deficits by modifying dysfunctional beliefs about thinking and strengthening self-regulatory abilities (Wells, 2000; Spada et al., 2015). However, most research on metacognition and addiction has been conducted in Western settings, leaving questions about how cultural contexts influence both cognitive functioning and treatment outcomes.

Mindfulness

Mindfulness, rooted in Eastern contemplative traditions, is the sustained, non-judgmental awareness of present-moment experience (Brown & Ryan, 2003; Kabat-Zinn, 2003). Practising mindfulness involves intentionally focusing on current thoughts, feelings, and sensations without avoidance, suppression, or over-engagement, thereby enhancing emotional regulation and cognitive flexibility (Baer, 2003; Bishop et al., 2004; Hayes et al., 2006; Chambers et al., 2009).

From a cognitive science perspective, mindfulness fosters a metacognitive mode of awareness in which individuals observe mental events as transient rather than absolute (Teasdale et al., 2002; Wells, 2005). This shift can reduce rumination, promote emotional balance, and interrupt the automatic behavioural patterns common in addiction. Mindfulness-based interventions (MBIs)—including Mindfulness-Based Stress Reduction (MBSR), Mindfulness-Based Cognitive Therapy (MBCT), and Mindfulness-Based Relapse Prevention (MBRP): demonstrate efficacy in reducing relapse risk, lowering craving reactivity, and improving overall well-being in SUD populations (Bowen et al., 2009; Garland et al., 2014; Witkiewitz et al., 2014).

Despite mindfulness’s South Asian origins, empirical research on its therapeutic application in local clinical settings remains sparse. This raises important questions about how cultural familiarity with mindfulness might affect intervention uptake and outcomes.

Substance Use Disorders, Cognitive Deficits, and Interaction of Mindfulness & Metacognition

Opioid use disorder (OUD) is associated with deficits in attention, working memory, inhibitory control, and planning (Verdejo-García et al., 2004; Stavro et al., 2013). These cognitive impairments are compounded by metacognitive difficulties, including challenges in monitoring and adjusting one's thought processes, which can reduce insight, hinder adaptive coping, and increase relapse risk (Spada et al., 2008; Garcia-Rodriguez & Secades-Villa, 2012).

Evidence suggests that mindfulness and metacognition are interdependent. Mindfulness may strengthen metacognitive skills by increasing awareness of mental states, while metacognition may sustain mindfulness practice through self-monitoring (Shapiro et al., 2006; Jankowski & Holas, 2014). Conversely, deficits in either domain can reinforce maladaptive cognitive-emotional cycles, perpetuating substance use (Teasdale et al., 2002; Wells, 2005). Integrated approaches: such as combining MBRP with MCT; target both domains and have shown promise in improving emotional regulation, cognitive control, and relapse prevention (Bowen et al., 2014; Sedghi et al., 2019). However, little is known about how these processes interact in non-Western, culturally specific populations.

Cultural Context and Research Gap

Most studies on mindfulness and metacognition in addiction feature Western, mixed-gender, and predominantly unadult samples. This limits generalisability because cognitive functioning and recovery trajectories are shaped by cultural norms, gender roles, and marital structures.

In South Asian cultures, marriage carries distinct psychological and social implications. Adult men, often the primary earners, are expected to maintain financial stability, uphold family honour, and provide care. These responsibilities can heighten stress and emotional dysregulation, which are already prevalent in SUDs, potentially worsening mindfulness and metacognitive deficits (Kermode et al., 2009; Nadkarni et al., 2015). Moreover, family involvement in treatment can be either a protective factor or a source of additional pressure, depending on stigma, role expectations, and interdependence.

Unique Contribution of the Present Study

Although mindfulness and metacognition are conceptually related, both involving the ability to monitor, evaluate, and regulate one's mental states, very few empirical investigations have explored their combined role within the context of opioid use disorder (Schoenberg & Speckens, 2020). The majority of studies have been conducted in Western clinical settings, often with heterogeneous samples in terms of gender, marital status, and cultural background. This limits the generalisability of findings because cognitive processes, recovery trajectories, and treatment engagement are influenced by socio-cultural factors that differ significantly across regions and populations (Heim et al., 2021).

In South Asian societies, including India, cultural expectations and marital structures play a pivotal role in shaping psychological well-being and behaviour. Adult men, often the primary economic providers, are expected to fulfil financial responsibilities, maintain family stability, and uphold social reputation. These pressures may amplify stress and emotional dysregulation, which are already common in substance use disorders, potentially exacerbating deficits in mindfulness and metacognitive regulation. Moreover, in collectivist

Exploring the Role of Mindfulness and Metacognition in Opioid Recovery among Indian adult Men: Implications for Global Addiction Rehabilitation

societies, family involvement in treatment can be both a protective factor and a source of additional pressure, influencing recovery in ways that Western models may not account for (Kermode et al., 2009; Nadkarni et al., 2015).

The current study makes three specific contributions to address these knowledge gaps:

- 1. Integrated Analysis of Mindfulness and Metacognition in Opioid Dependence:** Previous studies often examine mindfulness or metacognition in isolation, which limits understanding of their interplay. By jointly assessing these constructs using validated tools, this study provides empirical evidence of how deficits in one may relate to deficits in the other, offering a more complete cognitive profile of individuals with opioid use disorder.
- 2. Focus on a Culturally Specific and Underrepresented Demographic:** Adult men in India represent a group that has been largely neglected in addiction research, despite their high treatment needs and distinct socio-cultural pressures. Studying this demographic yields data that can inform interventions tailored to marital and cultural contexts, something that is particularly important given that much of the existing intervention literature is based on Western, often unadult or mixed-gender, samples.
- 3. Cross-Cultural Relevance and Comparability:** The use of internationally validated psychometric instruments (e.g., CAMS-R, MAI) enables findings from this study to be directly compared with those from other cultural settings. This not only strengthens the internal validity of the study but also enhances its relevance to the global evidence base. Importantly, situating these findings in a culture where mindfulness practices have indigenous historical roots allows for a richer interpretation of results and may facilitate the development of culturally adapted mindfulness-based interventions that are both acceptable and effective in local contexts.

By addressing these areas, the present research contributes novel, culturally grounded insights into the cognitive vulnerabilities associated with opioid dependence. It also has practical implications: the strong observed association between mindfulness and metacognition suggests that enhancing mindfulness skills could simultaneously improve metacognitive regulation, potentially strengthening relapse prevention strategies. These findings can guide both local policymakers and international treatment developers in creating more context-sensitive, cross-culturally valid recovery frameworks for opioid use disorder.

Rationale of the Study

Opioid use disorder is associated with cognitive impairments, particularly reduced metacognitive awareness and mindfulness, both of which are critical for emotional regulation and effective decision-making (Zeidan et al., 2010; Baumeister & Vohs, 2016). Metacognition involves the ability to monitor and regulate one's own thought processes, while mindfulness refers to present-moment awareness characterized by openness and non-judgment. This study compares individuals with opioid use disorder to psychologically healthy controls in order to examine the relationship between mindfulness and metacognitive functioning. The aim is to better understand how mindfulness may contribute to enhanced metacognitive awareness and thereby support recovery in individuals undergoing treatment for substance use disorders.

Exploring the Role of Mindfulness and Metacognition in Opioid Recovery among Indian adult Men: Implications for Global Addiction Rehabilitation

Objectives of the Study:

1. To evaluate and compare the metacognitive abilities of individuals suffering from opioid dependence alongside healthy control participants.
2. To measure and compare the levels of mindfulness between individuals suffering from opioid dependence alongside healthy control participants.
3. To investigate how mindfulness relates to metacognitive functioning among those with opioid dependence.

Hypotheses of the Study:

1. **H1:** Individuals with opioid dependence will demonstrate significantly lower metacognitive abilities than healthy control participants.
2. **H2:** Individuals with opioid dependence will report lower levels of mindfulness compared to healthy control participants.
3. **H3:** There will be a positive correlation between higher levels of mindfulness and enhanced metacognitive awareness in individuals with opioid dependence.

METHODOLOGY

Design of Research

This study will employ a cross-sectional comparative research design involving two groups: opioid -dependent patients, and healthy controls.

Sampling technique: Purposive

Sample Size:

Data from a total number of 200 participants will be collected, Group A: comprising of adult male diagnosed with opioid dependence Disorder as per ICD-11 criteria (n=100) and Group C: (N=100) adult male without substance use disorder Participants will be recruited as per inclusion and exclusion criteria.

Selection Criteria for male person with substance dependent disorder

Inclusion Criteria

1. Person has been diagnosed with opioid dependent disorder (ICD-11)
2. Age between 21- 45 years.
3. Can comprehend well and speak fluently: Hindi/English.
4. Those who agree to take part in the study by providing informed consent.

Criteria of Exclusion

1. Individuals with other mental disorders
2. Individuals with major medical condition

Selection Criteria for Normal Healthy Control Group (Male)

Inclusion Criteria

1. Individuals who have never met criteria for dependence syndrome for any substance
2. Age between 21- 45 years.
3. Can comprehend well and speak fluently: Hindi/English.
4. Stable medical and mental health

Exploring the Role of Mindfulness and Metacognition in Opioid Recovery among Indian adult Men: Implications for Global Addiction Rehabilitation

Exclusion Criteria

1. Individuals with any mental disorders
2. Individuals with major medical condition

Tools to be used:

1. **Socio-Demographic Data Sheet** – Gathered data on participants' age, religious affiliation, marital status, educational background, family structure, and employment status.
2. **Consent Form**: Ensured ethical participation and informed consent.
3. **General Health Questionnaire (GHQ-28)**: A 28-item screening tool (Goldberg & Hillier, 1979) used to assess emotional distress and risk for psychiatric disorders.
4. **Cognitive and Affective Mindfulness Scale-Revised (CAMS-R)**: Assesses the ability to regulate attention, maintain awareness of the present moment, and accept experiences without judgment (Feldman et al., 2007).
5. **Metacognitive Awareness Inventory (MAI)**: A 52-item instrument developed by Schraw and Dennison (1994) that evaluates metacognitive awareness, encompassing both knowledge of cognition (declarative, procedural, and conditional knowledge) and regulation of cognition (including planning, monitoring, evaluating, debugging, and managing information).

Procedure

The study received ethical approval from the Research and Ethics Committee of the University. A total of 200 adult male participants were included, comprising 100 individuals diagnosed with opioid use disorder based on ICD-11 criteria and 100 psychologically healthy controls. Participants were selected according to clearly defined inclusion and exclusion criteria. Informed consent was obtained from all individuals prior to data collection. Socio-demographic information was gathered using a semi-structured proforma. The General Health Questionnaire (GHQ-28) was administered to screen for psychiatric morbidity, with a cut-off score of 23 used to determine eligibility. Participants who met the criteria proceeded to complete the Metacognitive Awareness Inventory (MAI), which assessed their metacognitive skills, and the Cognitive and Affective Mindfulness Scale Revised (CAMS-R), which evaluated levels of mindfulness.

Data analysis was conducted using SPSS version 23.0. Descriptive statistics were used to summarize the data, and independent t-tests were applied to compare metacognitive awareness and mindfulness between the group with opioid use disorder and the healthy control group.

Missing Data Handling:

Cases with incomplete responses on any of the primary scales were excluded from final analysis. Less than 5% of total cases were removed for this reason.

RESULTS

Table No: I Comparison of Socio-Demographic Characteristics Between Individuals with Opioid Dependence and Healthy Controls (N=200).

Source	Opioid Dependen t Mean S.D.	±	Control Group Mean S.D.	±	df	t	Sig.	F	Low er	Uppe r
Age	30.343±5.336		33.34±7.714		198	-3.184	0	26.36	-4.8528	-1.1403
Gender	1±1		1±1		198			7.786	-1.305	-0.375
Marital Status	1±1		1±1		198			0		
Education	3.5±1.541		4.34±1.782		198			0		
Occupation	2.25±1.158		4.86±2.065		198	-3.566	0.006	141.166	2.143	3.077
Family Income	1.98±0.619		1.4±0.492		198	11.025	0	3.255	0.424	0.736
Religion	1.95±0.796		1.7±0.948		198	7.331	0.073	3.883	0.006	0.494
Family	1.79±0.935		2.71±0.671		198	2.019	0.05	54.21	-1.147	-0.693
Locality	1.17±0.378		1.17±0.378		198	-7.992	0	0	-0.105	0.105

Note: *df* – Degrees of Freedom, *F* – F-Statistic (F-Ratio), *Sig.* – Significance Level (p-value).

The group of individuals with opioid use disorder was significantly younger than the control group ($t(198) = -3.18, p < .01$), with a mean age of 30.34 years compared to 33.34 years. As all participants were male, no gender differences were present. There were no significant differences between groups in terms of marital status or locality. However, significant group differences were found in education and occupation, with the control group being more educated and more likely to be employed ($p < .01$). Interestingly, the group with opioid use disorder reported significantly higher family income ($t(198) = 11.03, p < .001$). Differences in religion were also observed ($p = .05$). Additionally, family type differed significantly between groups ($t(198) = 2.02, p = .05$), with participants in the control group more likely to come from nuclear families.

**Exploring the Role of Mindfulness and Metacognition in Opioid Recovery among Indian adult Men:
Implications for Global Addiction Rehabilitation**

Table No: II Metacognitive Awareness in Opioid-Dependent vs. Healthy Control Group (N=200)

Source	Opioid dependent Mean ±S.D.	Healthy Control Group Mean ± S.D.	df	t	Sig.	F	Lower	Upper
Declarative Knowledge	4.2±1.4284	6.26±1.567	198	-9.714	0.528	0.399	-2.478	-1.641
Procedural Knowledge	1.86± 0.725	3.53±0.501	198	-18.942	0.043	4.141	-1.843	-1.496
Conditional K.	2.74± 0.938	4.54±0.500	198	-16.917	0	39.742	-2.009	-1.590
Plannning	3.41± 1.083	6.05±0.821	198	-19.421	0	16.099	-2.908	-2.371
Info. Management Strategies	3.46± 1.086	8.91±0.888	198	-38.83	0.002	10.148	-5.726	-5.173
Comprehension	3.44± 1.085	5.51±1.132	198	-13.195	0.461	0.545	-2.379	-1.760
Monitoring	3.02± 0.816	4.44±0.574	198	-14.229	0.012	6.494	-1.616	-1.223
Debugging Strategies	3.45 ±1.095	5.16± 0.787	198	-12.675	0	24.575	-1.976	-1.444
Evaluation								
Mai Total	25.58±2.421	36.77 ± 5.831	198	-55.336	0.99	3062.1	-19.594	-18.245

Note: *df* – Degrees of Freedom, *F* – F-Statistic (F-Ratio), *Sig.* – Significance Level (p-value).

Table 2 presents a comparison of cognitive and metacognitive skills between individuals with opioid use disorder and psychologically healthy controls across multiple domains. Participants in the control group consistently scored significantly higher than those with opioid use disorder in all assessed domains, including declarative, procedural, and conditional knowledge; planning; information management; comprehension monitoring; debugging strategies; evaluation; and the overall score on the Metacognitive Awareness Inventory (MAI). These differences were statistically significant ($p < .05$) and were accompanied by large effect sizes, indicating substantial impairments in both cognitive and metacognitive functioning among individuals with opioid use disorder.

Table No: III Cognitive and Mindfulness Differences Between Opioid-Dependent and Healthy Control Group (N=200)

Source	Opioid dependent Mean ± S.D.	Healthy Control Group Mean ± S.D.	df	t	Sig.	F	Lower	Upper
Attention	5.81±1.169	9.88±1.892	198	-18.295	0.002	10.33	-4.5087	-3.631
Present status	5.99±1.141	9.63±1.606	198	-18.475	0.007	7.41	-4.0285	-3.251
AWARENESS	6.22 ±1.106	10.01±1.16	198	-23.654	0.387	0.751	-4.106	-3.474
ACCEPTANCE	6 ±1.2391	10.31±1.698	198	-20.505	0.006	7.787	-4.7245	-3.895
CAMSR	24.02±2.256	39.83±4.602	198	-32.204	0	39.71	-16.778	-14.8419

Note: *df* – Degrees of Freedom, *F* – F-Statistic (F-Ratio), *Sig.* – Significance Level (p-value).

Exploring the Role of Mindfulness and Metacognition in Opioid Recovery among Indian adult Men: Implications for Global Addiction Rehabilitation

Individuals with opioid use disorder demonstrated significantly lower scores than healthy controls across all measured components of mindfulness, including attention, present-moment awareness, acceptance, and overall mindfulness as assessed by the Cognitive and Affective Mindfulness Scale–Revised (CAMS-R). These findings indicate that opioid use disorder is associated with reduced mindfulness and a diminished ability to remain focused, aware, and accepting of one's experiences.

Table No: IV Correlation Between Metacognitive Awareness, Cognitive, and Mindfulness Variables in Opioid-Dependent Individuals (N=100).

	MAI	CAMS	DK	PK	CK	PLANNING	IMS	CM	DS	EVALUATION	ATTENTION	PS	AWARENESS	ACCEPTANCE
MAI	1	.923**	.396**	.255*	.266**	.511**	.236*	.218*	.108	.547**	.206*	.301**	.513**	.207*
CAMS		1	.320**	.197	.270**	.488**	.370**	.215*	.152	.524**	.643**	.572**	.110	.567**
DK			1	.021	.099	.371**	.236*	.167	.127	.126	.138	.301**	.390**	.206*
PK				1	.120	.123	.135	.255*	.052	.147	.87	.298**	.123	.286**
CK					1	.321**	.081	.277**	.514**	.258**	.266**	.311**	.325**	.124
PLANNING						1	.421**	.117	.365**	.950**	.171	.106	.357**	.322**
IMS							1	.142	.123	.054	.345**	.231**	.133	.274**
CM								1	.076	.149	.132	.224*	.235*	.228*
DS									1	.305**	.094	.201*	.227*	.236*
EVALUATION										1	.156	.151	.114	.723**
ATTENTION											1	.428**	.396**	.441**
PS												1	.358**	.407**
AWARENESS													1	.733**
ACCEPTANCE														1

Note: * = Significant at $p < .05$, ** = Significant at $p < .01$, *** = (if used) would indicate $p < .001$

The correlation table shows significant positive relationships between metacognitive awareness (MAI), mindfulness (CAMS), and their subcomponents. MAI strongly correlates with CAMS (.923**), planning (.511**), and evaluation (.547**). Mindfulness (CAMS) also relates positively with attention (.643**) and acceptance (.567**). Subcomponents like declarative knowledge (DK), procedural knowledge (PK), conditional knowledge (CK), planning, and acceptance show moderate correlations with both MAI and CAMS, indicating interconnectedness between cognitive and mindfulness abilities. Overall, higher metacognitive awareness is associated with better mindfulness and cognitive functioning.

RESULTS AND DISCUSSION

The present study is among the first to examine mindfulness and metacognition concurrently in individuals with opioid dependence and, to our knowledge, the first to do so among adult men in India. This demographic has been largely absent from the global addiction literature despite being overrepresented in the clinical reality of South Asia's treatment settings (Kermode et al., 2009; Nadkarni et al., 2015). Our findings revealed substantial deficits in both metacognitive awareness and mindfulness among opioid-dependent participants compared to healthy controls, with large effect sizes across all measured domains. Moreover, the very strong positive correlation between mindfulness and metacognitive functioning ($r = .923$) provides compelling empirical support for the conceptual view that these constructs are interlinked facets of cognitive-emotional self-regulation (Jankowski & Holas, 2014; Shapiro et al., 2006).

Integration with Existing Literature

The observed impairments in declarative, procedural, and conditional knowledge, as well as self-regulatory components such as planning, evaluation, and comprehension monitoring, align with earlier findings that opioid use is associated with pervasive executive dysfunction (Mintzer & Stitzer, 2002; Ersche et al., 2006; Verdejo-García et al., 2004). Chronic opioid exposure has been linked to structural and functional alterations in the prefrontal cortex, anterior cingulate cortex, and insula—brain regions critical for metacognitive monitoring, attentional control, and error detection (Goldstein & Volkow, 2011; Lu et al., 2014; Balconi et al., 2014). The mindfulness deficits we identified are consistent with prior studies showing that long-term substance use disrupts present-moment awareness and nonjudgmental acceptance, likely via dysregulation of these same neural networks (Hölzel et al., 2011; Garland et al., 2014; Brewer et al., 2013).

What is notable here is the magnitude of the correlation between mindfulness and metacognition, greater than most prior reports in mixed-gender, Western samples (Schoenberg & Speckens, 2020; Teasdale et al., 2002). This may indicate that in certain sociocultural contexts, these two processes are even more tightly coupled, perhaps because of the ways in which cultural norms and social roles shape cognitive-emotional regulation. Adult men in collectivist societies such as India often carry the dual burden of economic provision and social responsibility, making effective self-regulation both a personal and a relational necessity (Tripathi, 2016; Bhugra & Gupta, 2011).

Novel Contributions and Cultural Context

While numerous studies have separately assessed mindfulness and metacognition in substance use disorders (Bowen et al., 2014; Spada & Wells, 2005), our work is distinct in its joint analytical approach and its focus on an underrepresented cultural-demographic group. This dual emphasis yields three specific contributions:

- **Joint Construct Analysis:** By evaluating mindfulness and metacognitive functioning within the same analytical framework, we provide empirical evidence for their interaction in opioid dependence, supporting theoretical models that conceptualize mindfulness as an applied form of metacognition (Jankowski & Holas, 2014; Shapiro et al., 2006).
- **Cultural Familiarity with Mindfulness:** India's long-standing contemplative traditions, from Vipassana meditation to yogic attention practices, mean that mindfulness is not a foreign concept in the way it might be in Western contexts (Kabat-Zinn, 2003; Sharma, 2014). This cultural familiarity could enhance

Exploring the Role of Mindfulness and Metacognition in Opioid Recovery among Indian adult Men: Implications for Global Addiction Rehabilitation

engagement and adherence in mindfulness-based interventions (MBIs), a critical factor in low-resource settings where dropout rates are high (Chadha et al., 2019).

- **Familial and Marital Structures:** In South Asia, extended and joint family systems can play a facilitative or inhibitory role in recovery, influencing relapse risk and treatment adherence (Nadkarni et al., 2015; Velleman & Templeton, 2007). Our findings that family structure and socio-economic variables differ between opioid-dependent and control groups underscore the need to integrate family-based approaches into cognitive-emotional training.

International Relevance

From a global mental health perspective, these results have three broad implications:

- **Universality with Cultural Modulation:** The strong association between mindfulness and metacognition underscores a potentially universal cognitive-emotional link, but its magnitude and expression may vary with cultural norms, marital roles, and socio-economic pressures (Patel & Saxena, 2014; Kohrt et al., 2018).
- **Culturally Adaptive Intervention Design:** Evidence-based MBIs such as Mindfulness-Based Relapse Prevention (MBRP) and Metacognitive Therapy (MCT) may require adaptation for cultural resonance, such as incorporating family engagement, local metaphors, and familiar spiritual practices (Chiesa & Serretti, 2014; van der Heiden & Watters, 2020).
- **Global Scalability and Policy Impact:** Because we used internationally validated instruments (MAI, CAMS-R), our results are directly comparable with studies in other settings, facilitating cross-cultural meta-analyses and informing World Health Organization (WHO) recommendations for integrating psychosocial interventions into addiction treatment frameworks in LMICs (WHO, 2020).

Theoretical Implications

The findings provide empirical support for cognitive models positioning mindfulness as a metacognitive process that enhances attentional control, cognitive flexibility, and emotional regulation (Shapiro et al., 2006; Jankowski & Holas, 2014). They also suggest that interventions targeting mindfulness may produce parallel gains in metacognitive monitoring, thereby amplifying their impact on relapse prevention (Garland et al., 2015; Zeidan et al., 2014). Furthermore, the near-perfect correlation between planning and evaluation ($r = .950$) reinforces the metacognitive theory that self-regulation is an iterative, interdependent process (Schraw & Moshman, 1995).

Clinical Implications

- **Dual-Target Interventions:** Combining MBIs with MCT could enhance both present-moment awareness and strategic self-monitoring, offering a synergistic approach to relapse prevention (Spada & Wells, 2005; Sedghi et al., 2019).
- **Cultural Tailoring:** For adult men in India, protocols should incorporate socio-cultural stressors, role expectations, and family involvement, leveraging cultural familiarity with contemplative practices to maximize engagement.
- **Resource-Efficient Models:** Group-based MBIs adapted for community delivery could extend reach in resource-limited settings without compromising efficacy, particularly when integrated into primary care or community mental health platforms (Patel et al., 2018).

Limitations and Future Directions

The cross-sectional design precludes causal inference, and all participants were male and adult, limiting generalizability to other demographic groups. Longitudinal and intervention-based research could clarify causal pathways between mindfulness and metacognition in opioid dependence. Additionally, comparative cross-cultural studies could help disentangle universal from culture-specific mechanisms, strengthening theoretical frameworks and informing global intervention strategies.

CONCLUSION

This study advances the international literature by demonstrating a near-perfect correlation between mindfulness and metacognition in a culturally distinct and underrepresented population. By integrating cultural context into cognitive-behavioral models of addiction, it paves the way for more effective, culturally sensitive, and globally scalable interventions for opioid use disorder. The results underscore that while cognitive-emotional processes may be universally relevant, their optimal therapeutic engagement requires a deep appreciation of local socio-cultural dynamics.

Limitations

Several limitations must be acknowledged. First, the cross-sectional design limits causal inference. Second, the study sample included only adult males, limiting the generalizability to females and unadult individuals. Third, reliance on self-report measures introduces potential bias. Finally, while statistical results were robust, the absence of neuropsychological or neuroimaging data restricts insight into the biological underpinnings of the observed impairments.

Future Directions

Future studies should adopt longitudinal or intervention-based designs to examine whether improvements in mindfulness and metacognitive awareness lead to sustained reductions in relapse risk. Incorporating neurocognitive assessments and neuroimaging could further elucidate the mechanisms linking opioid use to cognitive and emotional regulation deficits. Expanding the sample to include females, unadult individuals, and diverse socio-economic backgrounds will enhance the applicability and generalizability of findings.

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Implications for Global Addiction Rehabilitation**

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Exploring the Role of Mindfulness and Metacognition in Opioid Recovery among Indian adult Men: Implications for Global Addiction Rehabilitation

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