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The Psychology of Relapse in Addiction Recovery

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Abstract

Relapse remains one of the most significant challenges in addiction recovery, with rates ranging from 40% to 60% across substance use disorders. The present study investigated the psychological mechanisms underlying relapse vulnerability, with a specific focus on the roles of trigger exposure, perceived stress, craving intensity, environmental risk factors, and coping strategy utilization. A cross-sectional survey design was employed with a purposive sample of 150 adults (M age = 32.7 years, SD = 9.4) currently enrolled in outpatient addiction treatment programs across Karachi, Pakistan. Participants completed the Perceived Stress Scale (PSS), the Craving Intensity Scale (CIS), the Trigger Exposure Index (TEI), the Environmental Risk Score (ERS), and the Brief COPE inventory. Results of a hierarchical multiple regression analysis revealed that craving intensity ($\beta = .39$, $p < .001$), perceived stress ($\beta = .32$, $p < .001$), and trigger exposure ($\beta = .26$, $p < .001$) were the strongest predictors of relapse risk. Adaptive coping strategies were identified as a significant protective factor ($\beta = -.27$, $p < .001$). Environmental risk also independently predicted relapse vulnerability ($\beta = .21$, $p = .002$). The model accounted for 61.4% of variance in relapse risk scores ($R^2 = .614$, $F(6, 143) = 37.82$, $p < .001$). Findings underscore the importance of integrated, multi-component relapse prevention interventions that simultaneously target cognitive, affective, and environmental domains of recovery.

Keywords: Addiction Recovery, Relapse Prevention, Coping Strategies, Substance Use Disorders, Stress, Cravings, Environmental Triggers

Introduction

The path to addiction recovery is not necessarily straight. Although there have been tremendous improvements in the modalities for the pharmacologic and psychosocial treatment of substance abuse, relapse, defined as resumption of substance use after a period of abstinence, can remain a challenge for clinicians, researchers, and individuals in recovery. Epidemiological data show that 40% to 60% of those with a substance use disorder (SUD) will have at least one episode of

relapse in the first year of treatment and that after five years, rates climb to 80% (McLellan et al., 2000; National Institute on Drug Abuse [NIDA], 2018). This statistic highlights the clear need to better understand the psychological processes that underlie relapse, and potentially protective factors that buffer against relapse. Relapse has been explained with several significant theories. Relapse Prevention (RP) is a model developed by Marlatt and Gordon (1985) that views relapse as a psychological event that can be predicted based on high-risk situations, self-efficacy beliefs and outcome expectancies, rather than a moral failure. Later theoretical advances, such as the dynamic model of relapse (Witkiewitz & Marlatt, 2004), have pointed to the transactional, and multidimensional, nature of relapse risk, whereby cognitive, affective, behavioral and environmental factors interact in a complex and non-linear fashion. More recently, dual process models have been focused on automatic, impulsive urge systems and reflective, regulatory systems in regulating substance-seeking behavior under stress (Stacy & Wiers, 2010). Psychological stress, exposure to substance cues and triggers, subjective craving and limited coping resources are among the most common identified risk factors for relapse. It is now well known that the neurobiology of stress-induced craving is well established, with activation of hypothalamic-pituitary-adrenal (HPA) axis and corticotropin-releasing factor (CRF) pathways sensitizing mesolimbic dopaminergic circuits that underlie reward salience and drug-seeking behavior (Koob & Volkow, 2016). However, this neurobiological predisposition is significantly influenced by psychological factors, particularly how stress is perceived by the individual and what coping mechanisms they use (Sinha, 2008). Another critical area of focus is environmental context. Ecological models of addiction suggest that physical, social, and economic contexts in which the person exists create a constant and forceful influence on recovery behavior (Popova et al., 2012). These neighborhood characteristics, when combined, form a landscape of environmental risks, which can be more than an individual can handle even when he or she has a well-developed coping mechanism. Knowing the relative and interactive contributions of the environmental and the psychological factors is crucial for the design of ecologically valid interventions. There is also a consistent theme in the literature that coping strategies are the central point corresponding to the outcomes of relapse. The transactional model of stress and coping as posited by Lazarus and Folkman (1984) has been shown to be related to relapse rates, with problem-focused coping styles and emotion regulation strategies having significantly lower relapse rates than avoidance and substance use as primary coping strategies (Litt et al., 2016). These findings have been turned into empirical, structured interventions (e.g., mindfulness-based relapse prevention, MBRP; Bowen et al., 2014; and cognitive-behavioral therapy, CBT; Carroll, 1996) which have been shown to be effective, but there is still considerable variability in treatment outcomes. However, there are some gaps in this existing research. Second, most of the studies published so far have been in high-income, western country contexts and findings may not be generalizable to the populations of the global south. Secondly, few studies have investigated the unique and combined effects of triggers, stress, cravings, environmental risk and coping in one empirical model. Third, there has been a lack of consideration of culturally specific protective factors and risk amplifiers in South Asian Muslim majority communities, where unique social norms around substance use and recovery may exist.

Objectives

The primary objectives of the present study were as follows: (a) to examine the individual and collective contributions of perceived stress, craving intensity, trigger exposure, environmental risk, and coping strategies to relapse risk among adults in outpatient addiction treatment; (b) to identify which psychological and environmental predictors are most strongly associated with relapse vulnerability; and (c) to determine whether adaptive coping strategies serve as a significant protective factor when controlling for other risk variables.

Hypotheses

Based on the theoretical frameworks and empirical literature reviewed above, the following directional hypotheses were advanced:

H1: Higher levels of perceived stress will be significantly and positively associated with greater relapse risk.

H2: Greater craving intensity will be significantly and positively associated with relapse risk.

H3: Higher exposure to substance-related triggers will be significantly and positively associated with relapse risk.

H4: Greater environmental risk will be significantly and positively associated with relapse risk.

H5: Greater use of adaptive coping strategies will be significantly and negatively associated with relapse risk (i.e., serve as a protective factor).

H6: Greater use of maladaptive coping strategies will be significantly and positively associated with relapse risk.

Literature Review

Stress and Relapse

The connection between psychological stress and relapse to drug and alcohol use is one of the most well replicated in the field of addiction. In a series of controlled laboratory studies, Sinha and colleagues (2011) showed that stress-induced craving (measured in terms of physiological arousal and intensity of self-reported urge) was a better predictor of alcohol and cocaine relapse than baseline craving measures alone. The stress-sensitization hypothesis (Koob & Le Moal, 2008) also posits that chronic drug use disrupts stress-regulated neurocircuitry such that the stress threshold for a relapse also becomes progressively lower throughout an individual's drug experience. This is backed up by clinical evidence: people with a longer history of addiction and more previous relapse episodes have a stronger response of their HPA axis and stronger craving responses to psychosocial stressors (Sinha, 2008). Self-efficacy also has an interaction with stress in regard to relapse outcomes. Bandura's (1997) concept of self-efficacy, which refers to the confidence of being able to make a behavior happen when faced with a difficult situation, has been much researched in the field of addiction. People who have high self-efficacy in refusing substance use in high risk situations have significantly lower rates of relapse, and this is partially mediated by stress appraisal, with high self-efficacy stress appraisers more likely to engage in problem-focused coping and remaining abstinent (Marlatt & Donovan, 2005). However, people who perceive stressors as threatening and uncontrollable are more likely to use substance use to regulate their emotions, which significantly increases the risk of a relapse.

Triggers, Cravings, and Cue Reactivity

Classical conditioning based models of relapse have emphasized substance-related triggers that are internal or external stimuli that evoke conditioned drug-seeking behaviors (O'Brien et al., 1998). Formerly neutral stimuli become potent conditioned cravings through Pavlovian associative learning processes, as a result of repeated drug use in the presence of those stimuli (people, places, drug paraphernalia, emotional states). Neuroimaging studies have shown that drug-related cues are able to induce activity in the anterior cingulate cortex, amygdala and ventral striatum, regions involved in the process of attributing incentive salience and habit formation, even after long periods of abstinence (Volkow et al., 2010). Craving is conceptually separable from cue reactivity, but is closely related in practice, which is often defined as a subjective, conscious urge to engage in a given behavior (in this case, drug use). This was confirmed by a meta-analytic study by Peckham and colleagues (2016) showing that craving scores have prospective predictive power on relapse with a pooled OR of around 2.1 controlling for baseline substance use severity. However, and importantly, coping response is a moderator of the predictive validity of craving: those with coping skills to tolerate or reappraise craving

without engaging in behaviour experienced significantly reduced risk of relapse even when craving intensity was high (Bowen et al., 2014). This discovery has implications for MBIs which focus on urge surfing and cognitive defusion as therapeutic processes.

Environmental Factors and Recovery Ecology

The theory of ecological systems (Bronfenbrenner, 1979) offers a useful theoretical perspective on the influence of macro- and micro-level environmental factors on addiction recovery pathways. Powerful influences are exerted at the micro-system level by the social composition and norms present in the immediate social network of an individual; substance using social network members is shown to increase the likelihood of relapse and recovery-supportive social network contacts buffer against it (Kelly et al., 2011). The macro-system level includes neighborhood disadvantage factors, such as poverty, unemployment, limited access to health services, and concentrated substance availability, which can exacerbate individual level vulnerability, as some theorists have described as an "Addictogenic Environment" (Popova et al., 2012). Recovery capital, which is defined as the social, human, physical and cultural assets that are available to support and sustain recovery (White & Cloud, 2008), is becoming an important moderating variable between environmental context and relapse outcomes. Those communities that provide strong recovery capital – such as recovery housing, peer support group networks, jobs, and healthcare that is not stigmatizing – show significantly higher recovery rates over time. However, people with a background of deprivation in the environment have structural obstacles to recovery, which can outweigh any gains of individual psychological therapies. Such factors are especially relevant to addiction treatment in urban areas of Pakistan, where the formal addiction treatment system is not well developed, and the stigma of seeking treatment is still a strong barrier to seeking help.

Coping Strategies and Relapse Prevention

Coping strategy use is consistently found in the literature to be a key predictor of relapse outcomes. Litt and colleagues (2016) did an important longitudinal study which showed that coping skills learned during cognitive-behavioral therapy were the best prognostic indicator of maintaining abstinence over 12 months of follow-up, compared to baseline craving, addiction severity, or treatment intensity. The difference between adaptive coping (e.g., problem solving, social support, positive reframe, acceptance) and maladaptive coping (e.g., denial, behavioral disengagement, without addressing coping, self-blame) is significant: chronic use of maladaptive coping can not only fail to reduce stress, but can exacerbate emotional dysregulation, which consequently results in greater craving intensity (Witkiewitz & Marlatt, 2004). One such intervention framework that has proven to be especially promising is mindfulness-based relapse prevention (MBRP). Sancho et al. (2018) conducted a meta-analysis that revealed significantly larger reductions in craving and frequency of substance use in the MBRP compared to the treatment as usual conditions, and that the effects were sustained at 6 months' follow-up. These mechanisms are proposed to be: increase in metacognitive awareness, decrease in emotional reactivity and increase in urge surfing (focusing on cravings non-judgementally without acting on them). Acceptance and Commitment Therapy (ACT) shares similar mechanisms and has also been shown to be effective in decreasing the risk of relapse by developing psychological flexibility and values-guided action (Hayes et al., 2012).

Methodology

Participants and Sampling

A total of 150 adults currently enrolled in outpatient addiction treatment programs across different rehabilitation centers in Mardan kpk, Pakistan participated in this study. Purposive sampling was employed to ensure that participants met the following eligibility criteria: (a) a confirmed diagnosis of a substance use disorder (SUD) according to DSM-5 criteria (American Psychiatric Association, 2013); (b) a minimum of 30 days of enrollment in the current treatment

program; (c) at least one prior relapse episode following a documented period of abstinence of no less than 14 days; (d) age 18 years or older; and (e) sufficient literacy in Urdu or English to complete self-report questionnaires. Individuals were excluded if they reported a current psychotic disorder, severe cognitive impairment, or were in acute medical crisis at the time of data collection. Of 174 individuals initially approached, 150 (86.2%) consented to participate and provided complete data. Demographic characteristics of the sample are reported in Table 1. The sample had a mean age of 32.7 years (SD = 9.4, range = 18–58). The majority identified as male (58.0%), with 35.3% identifying as female and 6.7% identifying as non-binary or other gender. The most prevalent primary substances were alcohol (34.7%), opioids (27.3%), and stimulants (18.7%). The mean duration of addiction history was 7.3 years (SD = 4.1), and participants had experienced an average of 2.8 previous relapse episodes (SD = 1.6). Approximately 71% of participants reported having received prior formal treatment, and 44% reported co-occurring anxiety or depressive disorders as identified through clinical intake records. These demographic and clinical characteristics are broadly consistent with the profile of individuals seeking treatment in urban South Asian addiction services.

Research Design and Procedure

A cross-sectional, quantitative survey design was employed. Ethical approval was obtained the organizations, and written informed consent was obtained from all participants prior to data collection. Participation was entirely voluntary, and participants were informed of their right to withdraw at any time without consequence to their treatment. To protect confidentiality, all data were anonymized using numerical identifiers, and no personally identifying information was retained in the dataset. Participants completed a paper-based questionnaire battery administered by trained research assistants in private rooms within the treatment facility. Completion of the full battery required approximately 35 to 45 minutes. Participants received no financial compensation for their participation but were offered a brief oral feedback session upon request, during which a research psychologist summarized findings and recommended resources relevant to their recovery. The research design was selected to capture a representative cross-section of psychological and environmental variables associated with relapse risk at a single time point. While the cross-sectional approach limits causal inference, it is well-suited to the study's primary aim of identifying the relative magnitude of associations between multiple predictors and relapse risk within a naturalistic treatment-seeking sample. Data collection occurred across a 12-week period from January to March 2024. Research assistants received eight hours of training in questionnaire administration, participant confidentiality protocols, and procedures for responding to distress disclosures. A clinical psychologist was available on-site during all data collection sessions to provide immediate support if any participant became distressed.

Measures

Perceived Stress Scale (PSS; Cohen et al., 1983). The PSS is a widely validated 10-item self-report measure assessing the degree to which life situations are appraised as stressful over the past month. Items are rated on a 5-point Likert scale ranging from 0 (never) to 4 (very often). Total scores range from 0 to 40, with higher scores indicating greater perceived stress. The PSS has demonstrated strong psychometric properties across diverse populations, with Cronbach's alpha values typically ranging from .84 to .90 (Lee, 2012). Internal consistency in the present sample was excellent ($\alpha = .87$). Craving Intensity Scale (CIS; Tiffany & Wray, 2012). Craving intensity was assessed using a 7-point single-item visual analog scale (1 = no craving, 7 = the strongest craving I have ever felt) supplemented by four additional items assessing frequency, controllability, and distress associated with cravings over the past two weeks. A composite craving score was computed, with higher scores indicating greater craving severity. The CIS demonstrated excellent internal consistency in the current sample ($\alpha = .91$). Trigger Exposure Index (TEI; adapted from Marlatt & Gordon, 1985). Trigger exposure was measured using an 8-item checklist assessing the frequency of encounter with common relapse precipitants (e.g.,

social situations involving substance use, negative emotional states, conflict with significant others, physical pain) over the past month. Items were rated on a 4-point frequency scale (0 = never, 3 = frequently). Higher total scores indicate greater cumulative trigger exposure. Cronbach's alpha in the present study was .83. Brief COPE (Carver, 1997). Coping strategy utilization was assessed using the 28-item Brief COPE, which measures 14 conceptually distinct coping strategies on 2-item subscales. Consistent with established practice in relapse prevention research (Litt et al., 2016), subscales were aggregated into an Adaptive Coping composite (active coping, planning, positive reframing, acceptance, humor, emotional social support, instrumental social support) and a Maladaptive Coping composite (denial, substance use, behavioral disengagement, venting, self-blame, self-distraction). Internal consistency was acceptable to good for both composites (α = .79 and .76, respectively). Environmental Risk Score (ERS; adapted from Popova et al., 2012). Environmental risk was assessed using a 6-item researcher-developed scale measuring exposure to drug availability in the neighborhood, social network substance use norms, housing stability, employment status, and access to recovery resources. Items were rated on 4-point Likert scales and summed to create a composite score (range: 4–24), with higher scores indicating greater environmental risk. The ERS demonstrated good internal consistency in the present sample (α = .82). elapse Risk Index (RRI). The primary outcome variable was a composite Relapse Risk Index computed from three clinically validated items: (a) self-reported likelihood of relapse in the next 30 days (0–10 scale), (b) clinician-rated relapse risk at the most recent treatment session (low/medium/high, coded 1–3), and (c) total number of relapse episodes in the prior 12 months. These three indicators were standardized and averaged to produce an index score with higher values reflecting greater relapse vulnerability. This composite approach is consistent with recommendations for multifaceted operationalization of relapse risk outcomes (Witkiewitz & Marlatt, 2004).

Results

Descriptive Statistics

Descriptive statistics and internal consistency estimates for all study measures are presented in Table 2. The sample demonstrated moderate-to-high levels of perceived stress (M = 22.4, SD = 5.8), consistent with levels typically observed in treatment-seeking populations (Cohen et al., 1983). Mean craving intensity was 3.6 (SD = 1.2) on a 7-point scale, indicating a moderate average level of cravings, with considerable variability across participants. Trigger exposure scores (M = 18.7, SD = 4.3) indicated frequent encounters with high-risk situations in the past month. Adaptive coping was moderately endorsed (M = 28.1, SD = 6.2), while maladaptive coping was also prevalent (M = 19.4, SD = 5.0). Environmental risk scores (M = 14.2, SD = 3.9) indicated a moderately adverse environmental context for the majority of participants. All measures demonstrated adequate to excellent internal consistency (α range = .76–.91).

Table 1*Demographic and Clinical Characteristics of the Sample (N = 150)*

Variable	N	%
Gender		
Male	87	58.0%
Female	53	35.3%
Non-binary/Other	10	6.7%
Age Group		
18–25 years	34	22.7%
26–35 years	58	38.7%
36–45 years	38	25.3%
46+ years	20	13.3%
Primary Substance		
Alcohol	52	34.7%

Opioids	41	27.3%
Stimulants	28	18.7%
Cannabis	17	11.3%
Other/Poly	12	8.0%

Note. Primary substance reflects the substance primarily addressed in current treatment enrollment. Poly = polysubstance use.

Table 2 *Descriptive Statistics and Internal Consistency Estimates for Study Measures (N = 150)*

Measure	M	SD	Min	Max	α
Perceived Stress Scale (PSS)	22.4	5.8	8	38	.87
Craving Intensity Scale (CIS)	3.6	1.2	1.0	7.0	.91
Trigger Exposure Index (TEI)	18.7	4.3	6	30	.83
Brief COPE – Adaptive Subscale	28.1	6.2	10	40	.79
Brief COPE – Maladaptive Subscale	19.4	5.0	8	32	.76
Environmental Risk Score (ERS)	14.2	3.9	4	24	.82

Note. M = mean; SD = standard deviation; α = Cronbach's alpha. PSS = Perceived Stress Scale; CIS = Craving Intensity Scale; TEI = Trigger Exposure Index; ERS = Environmental Risk Score.

Correlational Analyses

Bivariate Pearson correlations were computed among all predictor variables and the Relapse Risk Index (RRI). All six predictors were significantly correlated with RRI in the expected directions. The strongest bivariate associations with relapse risk were observed for craving intensity ($r = .61$, $p < .001$), perceived stress ($r = .55$, $p < .001$), and trigger exposure ($r = .49$, $p < .001$). Adaptive coping was negatively correlated with relapse risk ($r = -.47$, $p < .001$) and also negatively correlated with perceived stress ($r = -.41$, $p < .001$) and craving intensity ($r = -.38$, $p < .001$), consistent with its proposed protective role. Environmental risk and maladaptive coping were also positively associated with relapse risk ($r = .43$, $p < .001$ and $r = .39$, $p < .001$, respectively). Intercorrelations among predictors were moderate in magnitude, and inspection of variance inflation factors (VIF range = 1.14–2.87) indicated no problematic multicollinearity in the regression model.

Hierarchical Multiple Regression Analysis

A hierarchical multiple regression analysis was conducted to examine the unique contributions of each predictor to relapse risk while controlling for the others. Psychological risk factors (perceived stress, craving intensity, trigger exposure) were entered in Block 1, followed by environmental and coping variables (environmental risk, adaptive coping, maladaptive coping) in Block 2. Age, gender, and addiction history duration were included as covariates in a preliminary Block 0 to control for demographic variance; these covariates collectively accounted for 7.3% of variance in RRI ($R^2 = .073$, $F(3, 146) = 3.84$, $p = .011$). The addition of psychological risk factors in Block 1 accounted for a significant increment in explained variance ($\Delta R^2 = .39$, $\Delta F(3, 143) = 31.67$, $p < .001$), bringing total model R^2 to .463. The addition of environmental and coping variables in Block 2 produced a further significant increment ($\Delta R^2 = .15$, $\Delta F(3, 140) = 14.89$, $p < .001$), yielding a final model R^2 of .614. The overall model was highly significant, $F(6, 143) = 37.82$, $p < .001$, and explained 61.4% of variance in relapse risk. Standardized regression coefficients and associated statistics for the final model (Block 2) are reported in

Table 3. In the final model, craving intensity emerged as the strongest unique predictor of relapse risk (β = .39, t = 4.64, p < .001, 95% CI [0.29, 0.73]), followed by perceived stress (β = .32, t = 4.22, p < .001, 95% CI [0.20, 0.56]) and trigger exposure (β = .26, t = 3.63, p < .001, 95% CI [0.13, 0.45]). Adaptive coping was the strongest protective predictor (β = −.27, t = −3.88, p < .001, 95% CI [−0.47, −0.15]), indicating that higher levels of adaptive coping were associated with significantly lower relapse risk independent of other variables. Environmental risk (β = .21, t = 3.14, p = .002) and maladaptive coping (β = .22, t = 3.43, p = .001) also emerged as significant positive predictors. These findings provide support for all six hypotheses advanced in the present study.

Table 3 *Hierarchical Multiple Regression Analysis Predicting Relapse Risk Index (N = 150)*

Predictor	B	SE B	β	t	p	95% CI
Perceived Stress	0.38	0.09	.32	4.22	<.001	[0.20, 0.56]
Craving Intensity	0.51	0.11	.39	4.64	<.001	[0.29, 0.73]
Trigger Exposure	0.29	0.08	.26	3.63	<.001	[0.13, 0.45]
Environmental Risk	0.22	0.07	.21	3.14	.002	[0.08, 0.36]
Adaptive Coping	−0.31	0.08	−.27	−3.88	<.001	[−0.47, −0.15]
Maladaptive Coping	0.24	0.07	.22	3.43	.001	[0.10, 0.38]

Note. B = unstandardized regression coefficient; SE B = standard error of B; β = standardized regression coefficient; CI = confidence interval. Covariates (age, gender, addiction history duration) included in Block 0 are not shown. R^2 = .614, adjusted R^2 = .600, F(6, 143) = 37.82, p < .001.

Discussion

The present study aimed to describe the psychological and environmental blueprint of relapse risk in outpatient addiction treatment for adults in Karachi, Pakistan. We evaluated the unique contribution of perceived stress, craving intensity, trigger exposure, environmental risk and coping strategy use to a theoretically-based, multi-predictor model of a composite Relapse Risk Index. Results supported all six directional hypotheses and resulted in a model that accounted for more than 61% of the variance in risk for relapse a figure that compares favorably with previous multivariate studies of relapse in Western samples (Witkiewitz & Marlatt, 2004) that accounted for 35% to 55% of the variance. This finding of craving intensity as the most significant predictor of relapse risk (β = .39) was consistent with evidence from a meta-analysis by Peckham et al. (2016) and was in line with theoretical accounts that have posited craving for food, as an automatic process, as the most important determinant of relapse behavior when regulatory resources are exhausted. Most importantly, the current results show that craving is not a stand-alone phenomenon: the beta coefficient of the craving intensity was still significant, but reduced from bivariate estimates when coping was statistically controlled, indicating that coping in some way acts as a mediator or moderator for the relationship between craving and relapse. This is in line with the cognitive-behavioral notion that craving is a necessary but insufficient component of relapse; that is, how the person responds to the craving they either practice urge surfing, distraction, or seek social support, or they passively surrender to the urge decides the behavior that ensues (Marlatt & Donovan, 2005). The high protective effect of adaptive coping (β = −.27) is one of the most clinically actionable results of the current study. The findings of this study support Litt and colleagues (2016) findings in a South Asian treatment-seeking population and

further the empirical evidence for the inclusion of structured coping skills training in addiction treatment in Pakistan. The discovery is important as the existing outpatient services in Karachi are mostly medicine based and very few evidence-based psychosocial interventions are provided. Thus, even from a cross-sectional study perspective, the strength of the association between adaptive coping and lower relapse risk is about the same as that of trigger exposure and points to the treatment promise of targeted skills training. This substantial role of environment risk (β = .21) beyond the psychological factors is of theoretical importance. It suggests that people who are not severely stressed, do not have profound craving patterns, and have good coping skills can still fall back into the pattern if they are in an environmental situation that is hostile. These findings align with the recovery capital theory (White & Cloud, 2008) and indicate that interventions that focus only on individual level cognitive and behavioral-change may not be enough for those with high structural barriers. Policy implications are that recovery housing and peer support networks, as well as strategies to reduce substance availability at the neighborhood level, need to be increased in urban settings in Pakistan. Importantly, perceived stress showed a strong independent association with the risk of relapse (β = .32), thus supporting the stress-sensitization model of addiction (Koob & Le Moal, 2008), and the large body of laboratory literature which indicates that stress promotes craving (Sinha et al., 2011). Stress has a twofold importance in a comprehensive relapse prevention program: (1) as a direct predictor of relapse and (2) as a suppressive factor that inhibits the development of adaptive coping skills. Interventions aimed at multiple domains that help to decrease stress reactivity (e.g., mindfulness, relaxation, exercise) and increase adaptive coping capacity are likely to produce synergistic effects that go beyond what can be obtained through interventions in each domain alone. Mindfulness Based Relapse Prevention (MBRP; Bowen et al., 2014) is a framework which is apt for this dual objective and thus needs to be tested in a clinical setting in Pakistan.

Areas of limitation and future directions.

Some of the limitations of the current study need to be acknowledged. Firstly, cross-sectional design does not allow causal inferences to be drawn and it is not possible to determine the order in which the predictors precede the relapse. Future studies need to include longitudinal or ecological momentary assessment (EMA) designs to more directly describe the within-person, dynamic processes of how stress, craving, and coping interact over time. Second, these three urban treatment centers in the purposive sample may not be representative of all SUD users in Pakistan who don't undergo formal treatment or live in rural areas or use other primary substances. Third, the Relapse Risk Index uses a number of indicators, but it is still a proxy measure; in the future, researchers should observe actual relapse events. Fourth, gender differences in relapse mechanisms, an increasing recognized important clinical aspect (Greenfield et al., 2010), were not the focus of the present analysis and should be examined in future work. Lastly, all the measures were culturally adapted with the Pakistani populations, which were not formally evaluated and psychometric validation studies in this context are warranted.

Conclusions

Results from the present study offer empirical evidence for a multi-dimensional integrated model of relapse risk wherein craving intensity, perceived stress, exposure to triggers, environmental risks, and coping strategies are each unique and significant factors. The results support the notion that relapse is a product of the interaction of multiple psychological and environmental risk factors that operate concurrently in time. The protective role of adaptive coping strategies is a key translational discovery and provides clear, easily quantifiable, and inexpensive targets for clinical intervention. Overall, the findings support the evidence base for multi-component relapse prevention programs and underscore the need to continue to scale up evidence-based psychosocial interventions in the evolving addiction treatment landscape in Pakistan. Effective

relapse response interventions need to be psychological, social and structural and to view recovery as a community-based as well as individual effort.

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