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A Model of Substance Use Tendency Based on Mindfulness with the Mediating Role of Psychological Capital

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A B S T R A C T

Purpose: This study aimed to examine the relationship between mindfulness and substance use tendency, with the mediating role of psychological capital among senior high school students in Tehran.

Methods and Materials: The study employed a descriptive-correlational design using structural equation modeling. The statistical population included all second-cycle high school students in Tehran during spring 2024. A sample of 400 students was selected through multistage cluster sampling. Data were collected using the Substance Use Tendency Questionnaire (Mousavi et al., 1999), the Adolescent and Adult Mindfulness Scale (Dratman et al., 2018), and the Psychological Capital Questionnaire (Luthans et al., 2007). Analysis was conducted using SEM in AMOS-22.

Findings: Results showed a significant negative direct effect of mindfulness on substance use tendency ($\beta = -0.28$, $p < 0.01$). Additionally, the indirect effect of mindfulness through psychological capital was also significant and negative ($\beta = -0.12$, $p < 0.01$), resulting in a total effect of $\beta = -0.40$. The Sobel test confirmed the mediation effect ($Z = 3.21$, $p < 0.01$). Model fit indices indicated an acceptable model fit (CFI = 0.92, RMSEA = 0.059, TLI = 0.90).

Conclusion: The findings suggest that mindfulness reduces substance use tendency in adolescents both directly and indirectly by enhancing psychological capital. Enhancing mindfulness and developing psychological capital may serve as effective preventative strategies within educational settings.

Keywords: *Mindfulness, substance use tendency, psychological capital.*

1. Introduction

Adolescence is a developmental period marked by heightened impulsivity, identity exploration, and sensitivity to peer influence—factors that elevate susceptibility to initiating substance use. Although prevention programs have historically focused on external controls and educational strategies, there is growing recognition that internal regulatory mechanisms, such as dispositional mindfulness, may offer more sustainable and generalizable protection against substance-related risk behaviors (Barros et al., 2021; Riggs et al., 2019). Mindfulness is generally defined as the ability to attend to present-moment experiences in a nonjudgmental and accepting manner, and research has indicated that it is inversely related to impulsivity, emotional reactivity, and maladaptive coping mechanisms, all of which are predictors of substance use tendencies (El-Ashry & Abdelaal, 2025; Shorey et al., 2017).

The growing interest in mindfulness-based approaches to substance use prevention and treatment has been fueled by empirical evidence from both clinical and non-clinical populations. Numerous studies have found that higher levels of trait mindfulness are associated with lower cravings, reduced frequency of substance use, and improved emotion regulation capacities (Single & Keough, 2020; Smith-Russell & Bowen, 2023). For instance, Shorey and colleagues found that mindfulness-based group therapies significantly reduced substance use behaviors in residential treatment settings, with sustained effects at follow-up assessments (Shorey et al., 2017). Similarly, Barros et al. emphasized the role of mindfulness training as an adjunct treatment for substance use disorders, enhancing cognitive flexibility and reducing the risk of relapse (Barros et al., 2021). These findings are supported by systematic reviews and meta-analyses that consistently identify mindfulness-based interventions as effective in reducing both the frequency and severity of substance use across various populations (Roos et al., 2018; Rösner et al., 2015).

Mindfulness also appears to exert its protective effects indirectly by strengthening positive psychological assets, such as psychological capital. Psychological capital, a multidimensional construct comprising self-efficacy, hope, resilience, and optimism, has been identified as a key determinant of behavioral adaptation and stress management in adolescents. It reflects an individual's belief in their capacity to mobilize internal resources toward achieving goals, recovering from setbacks, and maintaining a positive outlook under stress (Baldus et al., 2018; Lu et al., 2019). Research suggests that higher psychological capital is associated with reduced substance use tendencies, particularly in adolescents facing psychosocial adversities (Ghazanfari & Lavasani, 2021; Ramírez-Garduño et al., 2020). Notably, mindfulness has been shown to bolster components of psychological capital by improving attentional control, emotion regulation, and metacognitive awareness, which can enhance an individual's resilience and optimism in the face of stressors (Moesgen et al., 2019; Ramli et al., 2018).

The theoretical rationale for exploring psychological capital as a mediator in the relationship between mindfulness and substance use tendency is grounded in the broaden-and-build theory of positive emotions and the metacognitive model of substance use. According to the broaden-and-build theory, mindfulness may expand cognitive and emotional capacities, thereby facilitating the development of adaptive psychological resources such as hope and resilience (Baptista et al., 2022; Daniel, 2021). The metacognitive model, on the other hand, posits that substance use often emerges as a maladaptive strategy to manage distress and intrusive thoughts; thus, strengthening psychological capital through mindfulness may reduce the need for such maladaptive coping strategies (Hsiao et al., 2018; Lin, 2019). For instance, research by El-Ashry and Abdelaal found that mindfulness significantly mediated the relationship between impulsive sensation seeking and readiness for change in individuals with substance use disorders, pointing to the importance of intermediate psychological constructs (El-Ashry & Abdelaal, 2025).

Furthermore, the moderating role of contextual and cultural factors in shaping these relationships has also gained attention. Barré et al. reported that mindfulness served as a protective factor against increased alcohol and tobacco use among hospital workers during the COVID-19 lockdown, highlighting the adaptability of mindfulness across stress contexts (Barré et al., 2022). Garrison et al. further emphasized that technology-assisted mindfulness training (e.g., smartphone applications) significantly reduced cravings and increased self-regulation in individuals with substance use disorders, suggesting that mindfulness is both scalable and adaptable for adolescent populations as well (Garrison et al., 2020). These findings underscore the growing consensus that mindfulness not only directly lowers substance use but may also do so by increasing individual psychological strengths that serve as mediators of behavior change.

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Despite growing empirical support, some studies have questioned the replicability of mindfulness's mediating effects, particularly when assessed through self-report measures. For example, Hsiao et al. found limited evidence for mindfulness as a mediator of relapse prevention outcomes, attributing inconsistencies to variations in program adherence and participant engagement (Hsiao et al., 2018). Nevertheless, the majority of studies continue to support the view that mindfulness contributes to both immediate reductions in risk behavior and longer-term enhancement of psychological wellbeing. In a study of Malaysian university students, Ramli and colleagues found that mindfulness moderated the effects of academic stress on self-regulation, providing additional support for its buffering capacity in the face of environmental demands (Ramli et al., 2018).

In addition to its psychological benefits, mindfulness has also been linked to neurobiological changes associated with addiction regulation. Neuroimaging studies suggest that mindfulness may downregulate activity in brain regions associated with craving and compulsivity while enhancing function in areas linked to self-awareness and inhibitory control (Shorey, Brasfield, et al., 2014; Shorey, Gawrysiak, et al., 2014). These neural shifts may further strengthen psychological capital by reinforcing an individual's sense of self-efficacy and goal-directed behavior, thereby disrupting the cognitive-emotional cycles that perpetuate substance use.

The relevance of this model is particularly significant in adolescence, where both mindfulness and psychological capital are still in developmental flux. Intervening during this critical period may not only prevent the escalation of substance use behaviors but also instill durable psychological competencies that serve individuals into adulthood. Shorey et al. have called for greater inclusion of mindfulness- and acceptance-based approaches in adolescent substance use treatment, especially those targeting cognitive restructuring and emotional literacy (Shorey et al., 2017). Integrating psychological capital into this framework provides a more holistic model that accounts for both risk and resilience, offering a stronger foundation for preventive interventions and educational policies.

Taken together, the literature provides compelling evidence for a model in which mindfulness is negatively associated with substance use tendency, both directly and through its positive influence on psychological capital. While much of the current evidence has emerged from clinical populations, there is growing support for extending this research to non-clinical adolescent samples in educational settings. Understanding the mediating role of psychological capital can inform more nuanced and targeted prevention strategies that cultivate mindfulness alongside internal psychological strengths, thereby addressing the root psychological mechanisms that underlie substance use behaviors. In light of these considerations, the present study seeks to examine the structural relationship between mindfulness and substance use tendency in a sample of Iranian high school students, with psychological capital serving as a mediating variable.

2. Methods and Materials

2.1. Study Design and Participants

This research employed a descriptive-correlational design using the structural equation modeling (SEM) approach. The statistical population comprised all senior secondary school students (grades 10 to 12) in Tehran, which totaled approximately 252,000 individuals during the spring of 2024. Following Kline's recommendation regarding the 10:1 participant-to-parameter ratio in structural equation modeling, the target sample size was initially set at 400. However, to compensate for potential attrition and the exclusion of incomplete or invalid responses, a final sample of 450 students was selected. Given the broad and diverse nature of the population, a multistage cluster sampling method was employed. Tehran was divided into five geographic zones—north, south, east, west, and central—and one district from each zone was randomly selected. Within each chosen district, one boys' school and one girls' school were selected randomly. All research-related authorizations were obtained through official correspondence with the Ministry of Education and the relevant school administrations, ensuring informed consent procedures were followed with all student participants.

The city of Tehran was first divided into five geographic sectors—north (districts 1, 3, 4), south (districts 16, 17, 18, 19), east (districts 8, 13, 14, 15), west (districts 2, 5, 9), and central (districts 6, 7, 10, 11, 12). One district from each sector was randomly drawn. Following the formal procedures of the Ministry of Education, the principal investigator obtained an introduction letter from the university and submitted it to the research officer (Ms. Nazari) at the central office. Upon approval, permissions were forwarded to the selected districts, where further randomization determined one girls' school and one boys' school per district. Introduction letters for school access

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were issued for both the female researcher and a male colleague. The school principals provided written approval for student participation, and informed assent forms were distributed along with the questionnaires. Written, anonymous, and informed consent was obtained from all participants prior to data collection.

2.2. Measures

2.2.1. Substance Use Tendency

The Substance Use Tendency Questionnaire, originally developed by Mousavi and colleagues in 1999, was used to assess the degree of inclination toward substance use among adolescents. This instrument consists of 16 items grouped into three components: environmental (family and kinship factors), individual (personality and psychological characteristics), and social (peer influence and broader social context). The questionnaire was administered in paper format and is particularly suitable for adolescents, students, and individuals undergoing addiction rehabilitation. Items were scored on a five-point Likert scale ranging from 1 (very low) to 5 (very high), with the total score calculated by summing all item responses. In the current study, internal consistency reliability was confirmed through Cronbach's alpha, with coefficients of 0.78, 0.83, and 0.76 for the environmental, individual, and social dimensions, respectively, indicating acceptable reliability. Prior studies had also reported reliability coefficients ranging from 0.76 to 0.90, supporting the robustness of the scale (Khan Mohammadi et al., 2023).

2.2.2. Mindfulness

To assess levels of mindfulness, the Adolescent and Adult Mindfulness Scale (AAMS) developed by Dratman, Gloub, Ougansian, and Reed in 2018 was utilized. This 19-item measure captures four key dimensions of mindfulness: present-focused attention (awareness of thoughts, emotions, and surroundings), non-reactivity (regulation of secondary cognitive processes such as rumination), non-judgmental stance (neutral observation of one's own and others' experiences), and self-acceptance (embracing thoughts and feelings without suppression). The items were rated on a five-point Likert scale from 1 (never) to 5 (always). The scale was administered in paper format in a calm and secure environment without researcher interference. Separate validation procedures were conducted for specific age groups, particularly distinguishing among early adolescence, late adolescence, and adulthood (Yousefi & Sefarzadeh, 2023). In this study, Cronbach's alpha coefficients for the four subscales were 0.73 for present-focused attention, 0.75 for non-reactivity, 0.81 for non-judgment, and 0.84 for self-acceptance. The overall reliability reported in the original validation by Dratman et al. was 0.81, and face validity was confirmed.

2.2.3. Psychological Capital

To evaluate psychological capital, the Psychological Capital Questionnaire (PCQ) by Luthans et al. (2007) was employed. This self-report instrument contains 24 items across four components: self-efficacy, resilience, hope, and optimism, with six items per domain. The questionnaire was also administered in paper format under standardized conditions. Each item was rated on a six-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). Subscale scores were derived from specific item groupings (e.g., items 1–6 for self-efficacy, 7–12 for hope, etc.), and total scores were used to classify respondents into low, moderate, or high levels of psychological capital (Saadati & Parsakia, 2023). In the current research, Cronbach's alpha coefficients were calculated for each dimension: 0.74 for self-efficacy, 0.79 for resilience, 0.72 for hope, and 0.81 for optimism, indicating satisfactory internal consistency. External validation by Luthans et al. reported similar coefficients, ranging from 0.80 to 0.88 for the subscales and 0.91 for the total psychological capital construct.

2.3. Data Analysis

For data summarization and descriptive analysis, statistical measures such as mean and standard deviation were employed to characterize the variables and demographic attributes of the sample. Inferential statistics were conducted using structural equation modeling (SEM) via AMOS version 22. Pearson correlation analyses were also performed to examine the relationships among the variables. The SEM analysis enabled simultaneous assessment of direct and indirect effects between mindfulness, psychological capital, and substance use tendency, allowing for a comprehensive examination of the mediating role of psychological capital within the hypothesized model.

3. Findings and Results

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The demographic composition of the sample revealed that a majority of the participants were female students, comprising 54% of the total sample, while male students accounted for 46%. The highest frequency and percentage belonged to students in the 11th grade, representing 35.0% of the sample, whereas the lowest was observed among 12th-grade students, who made up 31.5%. In terms of age distribution, the age group of 16 to 17 years held the largest proportion, also comprising 35.0% of the participants, while the smallest proportion was seen in the 17 to 18-year-old age group, which accounted for 31.5% of the sample.

Table 1

Descriptive Statistics for Study Variables and Subscales

Variable	Subscale	Mean (M)	Standard Deviation (SD)
Substance Use Tendency	Environmental Factors	17.4	0.3
	Individual Factors	16.1	3.2
	Social Factors	18.7	3.5
Mindfulness	Present-Focused Attention	21.0	2.7
	Non-Reactivity	20.5	2.9
	Non-Judgment	19.8	2.6
	Self-Acceptance	18.4	2.4
Psychological Capital	Self-Efficacy	22.7	3.4
	Hope	24.5	3.7
	Resilience	23.8	3.3
	Optimism	25.1	3.6

The descriptive analysis indicates that among the subscales of substance use tendency, the social factors dimension had the highest mean (M = 18.7, SD = 3.5), suggesting a notable influence of peer and environmental social contexts. In the mindfulness construct, the highest mean was observed for present-focused attention (M = 21.0, SD = 2.7), indicating a relatively stronger ability among participants to maintain awareness in the present moment. Among the components of psychological capital, optimism scored the highest (M = 25.1, SD = 3.6), reflecting a generally positive outlook toward the future among the adolescents. Overall, the observed values suggest moderate to high levels of mindfulness and psychological capital, alongside varying degrees of vulnerability to substance use based on different psychological and environmental factors (Table 1).

Table 2

Pearson Correlation Matrix Among Study Variables

Variables	1	2	3
1. Substance Use Tendency	1		
2. Mindfulness	−.28	1	
3. Psychological Capital	−.30	.40	1

The correlation analysis revealed significant and negative relationships between substance use tendency and both mindfulness ($r = -.28$, $p < .01$) and psychological capital ($r = -.30$, $p < .01$), indicating that higher levels of mindfulness and psychological capital are associated with lower tendencies toward substance use. Additionally, there was a significant and positive correlation between mindfulness and psychological capital ($r = .40$, $p < .01$), suggesting that individuals with higher mindfulness are also likely to exhibit greater psychological resources such as hope, resilience, optimism, and self-efficacy. These findings support the hypothesized associations among the variables and provide a foundation for further examination through structural equation modeling (Table 2).

Table 3

Direct, Indirect, and Total Effects of Mindfulness on Substance Use Tendency via Psychological Capital

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Predictor	Mediator	Outcome	Direct Effect	Indirect Effect	Total Effect
Mindfulness	Psychological Capital	Substance Use Tendency	−.28	−.12	−.40

As shown in Table 3, the direct effect of mindfulness on substance use tendency is −0.28, and the indirect effect mediated by psychological capital is −0.12, resulting in a total effect of −0.40. The indirect effect is statistically significant at $p < .01$, indicating that psychological capital partially mediates the relationship between mindfulness and substance use tendency. This finding suggests that higher mindfulness is associated with higher psychological capital, which in turn leads to lower tendencies toward substance use.

Table 4

Sobel Test Results for Indirect Effect of Mindfulness via Psychological Capital

Independent Variable	Indirect Effect via Mediator	Sobel Test Statistic	*p*-value	Significance
Mindfulness	−.12	3.21	< .01	Significant

According to Table 4, the Sobel test statistic was 3.21 with a p-value less than .01, confirming that the indirect effect of mindfulness through psychological capital on substance use tendency is statistically significant. This result strengthens the evidence that psychological capital serves as a meaningful mediating mechanism in the model.

The adequacy of the proposed structural model was evaluated using several standard goodness-of-fit indices. The criteria by Hu and Bentler (1999) were used as a benchmark, which suggest that Comparative Fit Index (CFI) and Goodness-of-Fit Index (GFI) values above .90, and Root Mean Square Error of Approximation (RMSEA) values below .08 indicate a good model fit.

Interpretation of these indices demonstrates that the model has an overall good fit to the data. The Chi-square value is non-significant ($p = .058$), indicating that there is no substantial discrepancy between the observed and modeled covariance matrices. The RMSEA value of .059 falls within the acceptable range, reflecting a close fit. CFI and TLI values both meet or exceed the .90 threshold, which further supports the model's strong explanatory power. Although GFI is slightly below .90 at .89, it remains within an acceptable range, and AGFI at .87 supports good model adequacy (Table 5).

Taken together, these findings indicate that the model demonstrates a statistically significant and theoretically meaningful structure. The protective role of mindfulness against substance use tendency is both direct and indirect, with psychological capital emerging as a significant mediator. These results confirm the conceptual framework, highlighting the importance of enhancing psychological resources as a pathway to reduce maladaptive behavioral tendencies such as substance use. Given the robust fit indices and significant pathways, the model requires no post hoc modifications and can be considered a valid representation of the underlying psychological processes within this adolescent population.

Table 5

Goodness-of-Fit Indices for the Structural Model

Fit Index	Recommended Value	Model Value	Fit Evaluation
Chi-square (χ^2)	$p > .05$	$\chi^2 = 135.2$, $p = .058$	Acceptable fit
RMSEA	< .08	.059	Good fit
CFI	> .90	.92	Excellent fit
TLI	> .90	.90	Excellent fit
GFI	> .90	.89	Acceptable fit
AGFI	> .85	.87	Good fit

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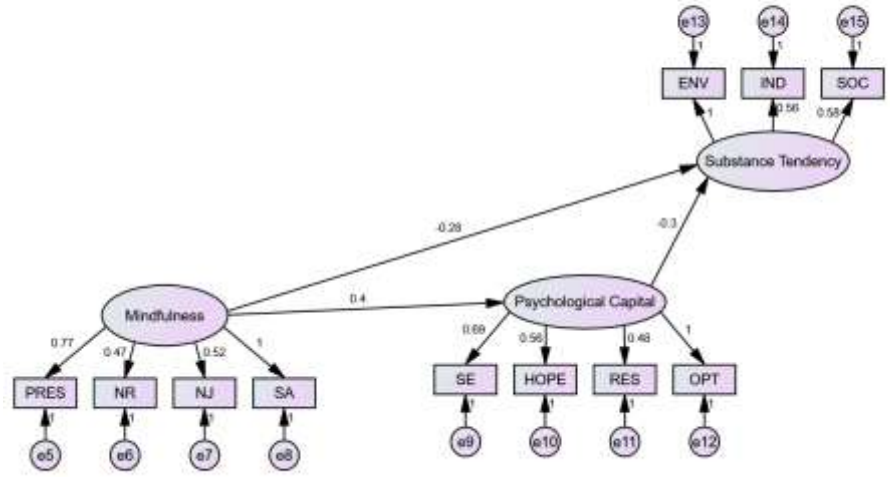
Figure 1

Model with Standard Coefficients



4. Discussion and Conclusion

The present study aimed to investigate the relationship between mindfulness and substance use tendency among adolescents, with psychological capital as a mediating variable. The findings demonstrated a significant negative relationship between mindfulness and substance use tendency, both directly and indirectly through psychological capital. This suggests that higher levels of mindfulness are associated with reduced inclination toward substance use and that part of this protective effect is explained by the enhancement of psychological capital—including self-efficacy, resilience, hope, and optimism. These findings reinforce the conceptual premise that mindfulness functions not only as a regulatory trait but also as a psychological catalyst that strengthens internal adaptive resources, thereby reducing vulnerability to risk behaviors.

The negative direct effect of mindfulness on substance use tendency aligns with a robust body of literature underscoring the role of mindfulness in reducing maladaptive coping mechanisms, including drug and alcohol consumption. Mindfulness, particularly in adolescents, enhances attentional control, promotes present-focused awareness, and mitigates impulsive reactions to distressing stimuli (Single & Keough, 2020; Smith-Russell & Bowen, 2023). These mechanisms likely interrupt the cognitive-affective loops that often lead to substance use as a form of emotional avoidance or immediate gratification. This interpretation is supported by studies such as those by Shorey et al., which found that mindfulness-based group therapy significantly reduced relapse rates and cravings in clinical populations with substance use disorders (Shorey et al., 2017). Similarly, research by Roos et al. demonstrated the effectiveness of rolling admission mindfulness-based relapse prevention programs, showing significant reductions in the severity of substance use and improvements in psychological well-being among participants (Roos et al., 2018).

In addition to the direct relationship, the study also identified a significant indirect path through psychological capital, confirming the mediating role of this construct. Adolescents who reported higher mindfulness levels also exhibited greater psychological capital, which in turn was associated with lower substance use tendencies. This supports the broaden-and-build theory, which posits that mindfulness facilitates the accumulation of durable personal resources such as optimism, hope, and resilience, thereby enhancing the individual's ability to cope adaptively with life stressors (Baptista et al., 2022; Barros et al., 2021). The mediating function of psychological capital is consistent

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with the findings of El-Ashry and Abdelaal, who reported that mindfulness significantly mediated the link between impulsive sensation seeking and readiness for behavioral change in clients with substance use disorders (El-Ashry & Abdelaal, 2025). Similarly, research by Lu et al. identified psychological strengths as key predictors of reduced relapse intention among individuals with a history of substance use, highlighting the importance of enhancing inner resources through psychosocial interventions (Lu et al., 2019).

The observed relationship between mindfulness and psychological capital also aligns with prior empirical findings that suggest mindfulness is positively associated with each subcomponent of psychological capital. For instance, Ramli et al. showed that mindfulness mitigated the negative effects of academic stress by enhancing self-regulation and self-efficacy among Malaysian university students (Ramli et al., 2018). Moesgen et al. reported that children from substance-involved families who participated in mindfulness-augmented prevention programs demonstrated increased emotional resilience and coping efficacy (Moesgen et al., 2019). These findings collectively support the current study's conclusion that mindfulness contributes to the strengthening of adolescents' psychological capital, which subsequently reduces their likelihood of engaging in substance use behaviors.

Moreover, the model's fit indices confirmed the theoretical adequacy and statistical validity of the hypothesized structural model. All key fit indices (CFI = .92, TLI = .90, RMSEA = .059) met or exceeded recommended thresholds, indicating that the model provides a strong representation of the data. The significance of the Sobel test further corroborated the mediating effect of psychological capital, supporting its inclusion as a pivotal variable in understanding how mindfulness impacts substance use tendencies in adolescents. These statistical outcomes lend empirical support to recent theoretical propositions emphasizing the synergistic effects of mindfulness and psychological strengths in behavioral regulation (Garrison et al., 2020; Ghazanfari & Lavasani, 2021).

This study also contributes to the literature by highlighting the importance of culturally contextualizing mindfulness-based models of behavioral risk. Adolescents in Iranian schools are subject to distinct sociocultural dynamics that may shape both their exposure to substance use and their access to psychological resources. Findings from Ramírez-Garduño et al. showed that spirituality, religiosity, and mindfulness functioned as protective factors against substance use in Mexican adolescents, underscoring the potential for mindfulness to operate effectively across diverse cultural contexts (Ramírez-Garduño et al., 2020). Likewise, Barré et al. found that mindfulness buffered the impact of environmental stressors such as COVID-19 lockdowns on increased tobacco and alcohol use among healthcare workers in France, supporting its universal applicability (Barré et al., 2022). These parallels reinforce the relevance of the current model within the Iranian educational and cultural context.

Although the findings support the hypothesized relationships, some divergence from earlier studies merits discussion. For example, Hsiao et al. found inconsistent mediation effects of mindfulness in substance use treatment when using self-reported measures, suggesting that other factors such as program adherence or treatment fidelity may moderate outcomes (Hsiao et al., 2018). While the current study did not involve an intervention-based design, it is possible that variability in adolescents' understanding and practice of mindfulness could influence outcomes. Additionally, psychological capital, while conceptualized as a mediator, may itself be influenced by other variables not accounted for in this model, such as parenting style, trauma history, or academic stress.

The theoretical implications of the study are substantial. The confirmation of psychological capital as a mediator offers a more nuanced understanding of how mindfulness translates into behavioral resilience. This supports integrative frameworks that blend mindfulness-based practices with principles from positive psychology to enhance youth mental health and behavioral regulation. Riggs et al. have advocated for such integrative models, noting that early introduction of mindfulness in school-based prevention programs can instill self-awareness and impulse control before risky behaviors manifest (Riggs et al., 2019). Incorporating psychological capital into these models adds an essential layer of adaptability and internal motivation, critical for enduring behavior change.

From an applied perspective, the findings suggest that school-based programs aiming to reduce substance use should not only incorporate mindfulness training but also explicitly target the development of psychological capital. Structured curricula that combine mindfulness meditation, cognitive-behavioral skill-building, and strengths-based reflection may foster a robust internal framework that empowers adolescents to resist peer pressure and regulate distress more effectively. Baptista et al. highlighted the practical significance of this approach by demonstrating that adolescents with higher levels of mindfulness showed

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reduced substance use even in the presence of high-risk environmental cues (Baptista et al., 2022).

Finally, the intersection of mindfulness and psychological capital has promising implications for technology-assisted prevention. Garrison et al. have shown that mindfulness training delivered via smartphone apps can effectively enhance self-regulation and reduce cravings in individuals with substance use disorders (Garrison et al., 2020). These platforms could be adapted for adolescent users to offer accessible, engaging tools that promote both mindful awareness and psychological strength. Integrating real-time feedback, gamification, and culturally relevant content may further improve user engagement and long-term efficacy.

Despite the strengths of the present study, including a large sample size and rigorous modeling approach, several limitations should be noted. First, the cross-sectional design precludes conclusions about causal directionality among mindfulness, psychological capital, and substance use tendency. Longitudinal designs are necessary to assess changes over time and to confirm mediation effects. Second, all data were collected via self-report questionnaires, which may be subject to social desirability bias and response inaccuracies, particularly regarding sensitive topics like substance use. Third, the generalizability of findings is limited to adolescents in Tehran; replication in rural settings or other cultural contexts would enhance external validity. Lastly, mindfulness was measured as a trait rather than as a practiced skill, and no behavioral or neurobiological measures were included to triangulate the results.

Future studies should consider longitudinal and experimental designs to explore how changes in mindfulness predict shifts in psychological capital and substance use behaviors over time. Additionally, qualitative methods could be employed to explore how adolescents subjectively experience mindfulness and psychological capital in their daily lives. Incorporating multi-informant data (e.g., parent or teacher ratings) and objective behavioral assessments would strengthen the methodological rigor of future work. Comparative studies across different cultures and education systems would also shed light on the universal versus context-specific pathways through which mindfulness operates in adolescent development.

Based on the findings, schools and mental health professionals are encouraged to implement mindfulness-based prevention programs that are explicitly designed to build psychological capital. Interventions should go beyond teaching mindfulness techniques alone, integrating exercises that enhance self-efficacy, encourage future-oriented thinking, and develop emotional resilience. Such programs can be embedded within school curricula, delivered in group formats, and adapted to be culturally relevant and age-appropriate. Collaboration with educational policymakers could facilitate institutional support and broader implementation. Embracing these practices may not only reduce substance use risk but also promote broader well-being and adaptive functioning among youth.

Authors' Contributions

All authors significantly contributed to this study.

Declaration

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

Transparency Statement

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

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

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

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