Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Where Dimensions Fuse: A Culturally Grounded Measure of Addiction Attitudes Among Saudi Youth Using Exploratory Graph Analysis

Fatma Khalifa Elsayed

fkkhalifa1@kau.edu.sa

King Abdulaziz University

Mahmoud Ali Moussa

Suez Canal University,

Research Article

Keywords: Substance use, Addiction attitudes, Saudi youth, Exploratory Graph Analysis, Scale validation

Posted Date: November 24th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11006535/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Abstract

Substance use among youth is a pressing public health concern, yet Saudi Arabia critically lacks culturally grounded assessment instruments. This study developed the Saudi Youth Attitude Toward Addiction Scale (SYAAS) and examined whether addiction-related attitudes in this population are cognitively organised into discrete dimensions or integrated into culturally fused evaluative schemas. A sequential exploratory-confirmatory design employed 909 Saudi university students (Mage = 21.4, 50.1% female) recruited via snowball sampling from King Abdulaziz University, Jeddah, during February 2026. Exploratory Graph Analysis (EGA) revealed a five-factor emergent structure consolidating knowledge, motives, self-efficacy, stigma, and familial concerns into integrated dimensions. Bootstrap EGA confirmed the stability of three of the five dimensions (structural consistency ≥ 0.90), while two dimensions showed lower stability (0.38–0.56), consistent with the hypothesised cognitive integration in this collectivist context. The five-factor model demonstrated acceptable CFA fit (CFI = 0.984, RMSEA = 0.079), comparable to the imported nine-factor model (CFI = 0.986, RMSEA = 0.075) while employing substantially fewer parameters. ESEM cultural probe analysis identified 14 cross-loadings exceeding |λ| = 0.30, clustering systematically at the intersections that the study's theoretical framework predicted—psychological motives with behavioural resistance, behavioural intentions with risk perception, family protection with stigma, vulnerability with peer influence, and awareness with perceived risk. These cross-loadings reflect the cognitive integration of addiction-related attitudes in the Saudi context. Composite reliability was excellent (CR = 0.871–0.959), and convergent validity was strong (AVE = 0.523–0.667). The five-factor structure reveals that addiction-related attitudes among Saudi youth are cognitively fused rather than compartmentalised, and that culturally grounded measurement tools are essential for capturing this integrated evaluative architecture. These findings provide preliminary evidence and require replication in independent samples.

1. Introduction

Substance use and behavioral addictions among youth constitute a formidable public health challenge. The neurodevelopmental asynchrony of emerging adulthood—a heightened sensitivity to rewards coupled with immature prefrontal control—creates a narrow window of vulnerability to high-risk behaviors. Within this framework, psychological attitudes toward addictive substances are not peripheral beliefs; they operate as the primary cognitive-affective gateway to behavioral intention. Accurate measurement of these attitudes is therefore a scientific prerequisite. Without it, etiological models remain speculative, and prevention strategies are built upon an unstable empirical footing.

Yet, the prevailing methodological approach in non-Western settings, including Saudi Arabia, introduces a critical tension. Researchers routinely import and translate instruments developed within individualistic Western frameworks, imposing an etic structure that may not align with the local cognitive landscape. In the Saudi context, attitudes toward substance use are rarely parsed into discrete psychological compartments. Instead, they are deeply entangled with religious transgression, collective familial honor, and community-based stigma—an integrated evaluative schema that imported tools may artificially

disaggregate. However, this assumption remains empirically untested. The pressing question is whether the theoretical nine-dimensional architecture, derived from established behavioral theories, actually corresponds to the latent structure of attitudes among Saudi university youth, or whether an alternative, culturally emergent configuration provides a more authentic representation.

Resolving this tension is not merely an academic exercise. The absence of a validated, culturally grounded instrument impedes the development of accurate needs assessments and prevents the design of interventions that engage the actual psychosocial mechanisms operating in this unique socio-religious ecology. Consequently, the present investigation examines whether addiction-related attitudes among Saudi youth are organised into the discrete dimensions assumed by imported theoretical models, or whether they are cognitively integrated into culturally fused evaluative schemas. By comparing an empirically emergent structure with the imported theoretical model, the study tests whether cultural context shapes the fundamental architecture of addiction attitudes—and, if so, how measurement tools must adapt to capture this architecture accurately.

2. Theoretical Framework and Literature Review

Substance use disorders remain a formidable global health challenge, with the developmental period of emerging adulthood constituting a critical window of vulnerability (Volkow, Koob, & McLellan, 2016). The neurodevelopmental asynchrony that characterises this phase—where subcortical reward systems mature earlier than prefrontal regulatory circuits—amplifies risk-taking behaviours and fosters openness to substance use experimentation (Casey & Jones, 2010; Steinberg, 2017). However, these biological vulnerabilities do not operate in a vacuum; they are systematically shaped by psychosocial environments, including peer networks, family dynamics, and broader cultural norms (Bronfenbrenner, 1979). Consequently, attitudes towards substance use emerge not as isolated cognitions but as complex formations situated at the intersection of neurobiological predisposition and social learning (Bandura, 1977; Hawkins, Catalano, & Miller, 1992). Understanding the precise structure of these attitudes is therefore a prerequisite for both accurate risk assessment and effective prevention planning.

Theoretical Underpinnings of Addiction-Related Attitudes

Several established frameworks have conceptualised attitudes as multi-component constructs that mediate between beliefs and overt behaviour. The Theory of Planned Behavior (TPB; Ajzen, 1991, 2002) posits that attitudes, together with subjective norms and perceived behavioural control, determine behavioural intentions, which in turn predict action. Extensive meta-analytic evidence confirms that attitudes towards substance use consistently account for significant variance in both intention and actual use (Ajzen, 1991, 2002). Complementing this, the Health Belief Model (HBM; Rosenstock, 1974; Becker et al., 1978) highlights perceived susceptibility, severity, benefits, and barriers—with self-efficacy emerging as the strongest cognitive predictor of preventive actions (Schwarzer & Fuchs, 1996). Interventions designed on these principles have shown efficacy in shifting substance-use beliefs among adolescents (Botvin et al., 2000, 2001), yet their generalisability across non-Western cultures remains

empirically underexplored (Van de Vijver & Tanzer, 2004). What is often overlooked is that these models, despite their utility, were largely developed and validated within individualistic, Western societies, and their dimensional assumptions may not automatically translate to collectivist contexts where moral, religious, and familial considerations are deeply entangled with personal evaluations.

Neurodevelopmental and Psychosocial Determinants

Adolescence and emerging adulthood are marked by heightened sensitivity to social rewards and peer influence, a phenomenon rooted in the maturational imbalance between the limbic system and prefrontal cortex (Casey & Jones, 2010). This imbalance amplifies the perceived value of immediate rewards while diminishing the salience of long-term consequences, a dynamic that directly shapes attitudes favouring experimentation (Loewenstein et al., 2001). Social Learning Theory (Bandura, 1977) provides a compelling explanatory mechanism: through observational learning and reinforcement, youth internalise the substance-use norms of their peer networks, with perceived peer approval emerging as one of the most robust predictors of positive attitudes towards drugs (Simons-Morton & Farhat, 2010). Concurrently, family systems exert either protective or potentiating influences; cohesive families with active monitoring and open communication serve as powerful buffers, whereas dysfunctional family environments elevate risk (Kumpfer & Alvarado, 2003; Haefner, 2014). In Arab and Muslim-majority societies, these dynamics acquire additional complexity because family honour and individual behaviour are inextricably linked, and substance use is perceived not merely as a personal failing but as a collective shame that damages familial reputation (Alharbi, Alsubaie, & Al-Surimi, 2021).

Cultural and Religious Dimensions

In Islamic contexts, the prohibition of intoxicants is both scriptural and deeply embedded in daily moral discourse. Consequently, substance use is stigmatised not only legally but spiritually, with users often experiencing profound shame, social exclusion, and the fear of bringing dishonour to their families (Yang et al., 2007; El Hayek et al., 2024). Stigma, as conceptualised by Link and Phelan (2001), operates through labelling, stereotyping, and status loss, but in collectivist cultures it extends beyond the individual to encompass the entire kinship network. This cultural framing has critical implications for measurement: instruments developed in individualistic settings, where substance use is typically framed as a matter of personal risk and autonomy, may fail to capture the socially embedded, morally laden evaluative schema that drives attitudes in these populations (Al-Anzi, 2024). Key dimensions such as "religious transgression", "familial dishonour," and "community-based shame" are seldom operationalised in imported scales, leading to a systematic misrepresentation of the psychological organisation of addiction attitudes in Arab youth. Recent qualitative studies in Gulf countries have further highlighted that stigma is not static but dynamically negotiated within families and communities, reinforcing the argument that culturally grounded measurement tools are urgently needed (Alharbi et al., 2021).

The Challenge of Cross-Cultural Measurement and the Limitations of Traditional Factor Analysis

The direct transfer of psychometric instruments across cultures has long been criticised for imposing an etic (outsider) framework that may not correspond to the emic (insider) cognitive structures of the target population (Berry, 1989). The assumption of universality, which underpins many cross-cultural validation efforts, repeatedly fails when factor structures derived from Western samples are tested in non-Western contexts (Henrich, Heine, & Norenzayan, 2010; Van de Vijver & Tanzer, 2004). This misfit is not merely a statistical artefact; it may reflect genuine cultural differences in how constructs are cognitively organised and experienced (Van de Vijver & Tanzer, 2004). For addiction-related attitudes, the risk is particularly acute because the evaluative frameworks that shape these attitudes are deeply rooted in local cultural values, religious beliefs, and social norms.

Traditional approaches to scale validation, most notably Exploratory Factor Analysis (EFA), have been the workhorse of psychometric research for decades. Yet EFA operates under strong assumptions: it imposes a latent variable model that forces items to load on a single factor and often assumes orthogonality or simple structure. More critically, EFA requires the researcher to pre-specify the number of factors to retain, which inevitably introduces a degree of theoretical bias—the very bias that cross-cultural validation seeks to avoid. When an imported model is tested in a new culture using EFA, the researcher is, in effect, asking: "Does the data fit the predefined structure?" This confirmatory logic, even when framed as exploratory, tends to obscure alternative organisations that might be more psychologically authentic for the target population.

Exploratory Graph Analysis as an alternative methodology for Culturally Emergent Structures

This methodological limitation naturally directs attention to alternative approaches that do not impose predefined structures. Exploratory Graph Analysis (EGA; Golino & Epskamp, 2017) offers precisely such an alternative. EGA models the network of item relationships using regularised partial correlations, and community detection algorithms identify clusters of items that form cohesive dimensions—without any pre-specification of the number of factors. This allows the latent structure to emerge organically from the data itself, free from the constraints of imported theoretical frameworks. Empirical simulations have demonstrated that EGA outperforms traditional EFA in recovering true dimensional structures, particularly when data are multidimensional and sample sizes are moderate (Golino & Epskamp, 2017; Moussa, 2026). More importantly, EGA is ideally suited for culturally grounded validation because it does not impose a Western-derived factor structure onto non-Western data; it simply reveals how items are actually connected in the minds of respondents. Critically, for the present study, EGA will first identify the culturally emergent structure, and this emergent model will then be directly compared against the imported nine-dimensional theoretical model through confirmatory factor analysis. This two-step process—exploratory emergence followed by confirmatory comparison—examines whether the imported dimensional assumptions hold in the Saudi context and identifies the cognitive architecture that underlies addiction-related attitudes in this population. It is worth noting, however, that EGA, like any analytical method, is not without limitations; its performance is somewhat sensitive to sample size and the choice of community detection algorithm, though extensive simulations have shown it to be robust across a wide range of conditions (Golino & Epskamp, 2017; Ibrahem et al., 2026).

The Measurement Gap and Study Aims

Despite increasing national attention to substance use prevention within the framework of Saudi Vision 2030, and despite documented prevalence rates among university students suggesting that lifetime substance use (including tobacco) may approach 45% in some samples (Alshahrani et al., 2026; Shubayr et al., 2024), the research landscape remains characterised by a striking paucity of validated, culturally grounded assessment instruments. Most studies continue to rely on translated Western scales whose psychometric properties in the Saudi context have not been rigorously tested. This gap is not merely an academic inconvenience; it constitutes a translational barrier that undermines the evidence base for prevention programming and policy. Without valid measurement, needs assessments are speculative, programme evaluations lack a reliable baseline, and interventions cannot be tailored to the specific psychosocial mechanisms operating in this population (Robertson et al., 2003).

The literature reviewed above establishes several convergent findings. First, addiction-related attitudes are multidimensional and shaped by an interplay of neurobiological, psychosocial, and cultural factors. Second, youth populations are especially vulnerable, and their attitudes are strongly influenced by peer, family, and cultural norms. Third, imported instruments carry a high risk of ecological invalidity in non-Western settings, as they impose factor structures that may not correspond to local cognitive organisations. Fourth, traditional factor analytic methods are constrained by their assumptions and may inadvertently reinforce imported frameworks rather than revealing culturally authentic structures. Fifth, the Saudi context suffers from a critical absence of validated, culturally grounded assessment tools.

To address this gap, the present study aims to develop and validate the Saudi Youth Attitude Toward Addiction Scale (SYAAS), a culturally tailored instrument designed to capture the local evaluative schema. Employing Exploratory Graph Analysis (EGA), the study first allows the latent structure to emerge organically from the data, free from theoretical imposition. Subsequently, this emergent structure is compared with the theoretically derived nine-dimensional imported model through confirmatory testing, and an Exploratory Structural Equation Model (ESEM) is used to examine whether the dimensions are cognitively integrated or compartmentalised in the Saudi context. By resolving these questions, the study seeks to establish a valid foundation for future research, needs assessment, and targeted prevention efforts in the Kingdom.

3. Methodology

3.1. Research Design and Approach

This study employed a sequential exploratory-confirmatory design to develop and validate the Saudi Youth Attitude Toward Addiction Scale (SYAAS). The design was deliberately structured to examine whether a culturally emergent structure differs from the imported nine-dimensional theoretical model, and whether such differences reflect genuine cultural variation in cognitive organisation. The process comprised three phases: (1) an exploratory phase utilizing Exploratory Graph Analysis (EGA) on the full

analytic sample to allow the latent structure to emerge organically; (2) a confirmatory phase testing the emergent model using Confirmatory Factor Analysis (CFA); and (3) a direct comparative phase pitting the emergent model against the theoretical nine-factor model to determine which provided superior fit and validity.

3.2. Participants and Sampling:

The target population comprised Saudi university students enrolled in tertiary education. Participants were recruited from King Abdulaziz University in Jeddah, Saudi Arabia, using a non-probability snowball sampling method. The digital survey link was disseminated through university email lists, official student social media groups, and academic departmental channels. Data collection was conducted over four weeks, from February 1 to February 28, 2026.

A total of 954 responses were initially received. After screening for incomplete responses, patterned answering (straight-lining), and multivariate outliers, 909 valid cases were retained for the final analysis, yielding a response validity rate of 95.3%. The sample comprised 455 females (50.1%) and 454 males (49.9%), with a mean age of 21.4 years (SD = 2.1, range = 20–32). Most participants (90.1%) resided within intact nuclear families, and 88.5% reported that their parents were not separated. In terms of academic standing, approximately half of the sample (49%) reported having previously attended addiction awareness programs. A minority reported current substance use, predominantly tobacco (11.9%), with smaller proportions using e-cigarettes (10.1%), traditional cigarettes (1.0%), or waterpipes (1.2%). Table 1 summarizes the demographic and background characteristics of the participants.

Table 1
Demographic and Background Characteristics of the Sample (N = 909)

Characteristic	Category	n	%
Gender	Male	454	49.9
	Female	455	50.1
Age (years)	Mean (SD)	21.4 (2.1)	-
	Range	20–32	-
Family Structure	Living with nuclear family	819	90.1
	Parents not separated	804	88.5
	Father living	804	88.5
	Mother living	884	97.2
Substance Use History	Prior attendance at awareness programs	445	49.0
	Current tobacco use (all forms)	108	11.9
	E-cigarettes	92	10.1
	Traditional cigarettes	9	1.0
	Waterpipe	11	1.2
Ethics			

The study was conducted in accordance with the guidelines and regulations set forth by the university's ethics review board. Ethical approval was obtained from the Research Ethics Committee of the Faculty of Arts and Humanities at King Abdulaziz University (Approval Reference: REC-FAH-KAU-2026-002, dated December 31, 2025). All participants were provided with a detailed information sheet outlining the study's purpose, the voluntary nature of their participation, and their right to withdraw at any time without penalty. Online informed consent was obtained electronically from all participants before they were granted access to the survey items. Anonymity was strictly assured; no personally identifiable information (such as names, national ID numbers, or contact details) was collected, and responses were stored in a password-protected database accessible only to the research team.

3.3. Tools:

The Saudi Youth Attitude Toward Addiction Scale (SYAAS) was developed specifically for this study and has not been published elsewhere. The instrument was constructed in Arabic to reflect the cultural values, religious norms, and social conventions of Saudi society. No foreign instrument was translated or adapted; the Arabic version was both the original and sole language of administration.

Item generation proceeded deductively from an integrated theoretical framework combining the Theory of Planned Behavior (Ajzen, 1991), the Health Belief Model (Rosenstock, 1974), and a socio-ecological perspective (Bronfenbrenner, 1979). This framework conceptualises addiction-related attitudes as multidimensional constructs comprising interconnected cognitive, affective, and conative components that are expressed within a specific cultural milieu. An initial pool of 90 items was generated and organised around nine theoretically grounded domains: (1) Knowledge and Awareness of Risks, (2) Personal Beliefs and Attitudes, (3) Social Attitudes and Stigma, (4) Behavioural Intentions and Prevention, (5) Psychological Motives for Use, (6) Peer Influence, (7) Familial Factors, (8) Perceived Availability, and (9) Self-Efficacy for Resistance. Each domain was initially represented by ten items.

The 90-item pool was submitted to five experts in clinical psychology, public health, and psychometrics. Each expert independently evaluated every item for relevance, clarity, cultural appropriateness, and conceptual coverage. Items judged ambiguous, redundant, or inconsistent with Saudi cultural norms were identified for removal. After this expert review, we eliminated items that did not meet the retention criteria and reworded several to improve clarity and cultural fit. We do not report the specific numbers of eliminated and reworded items at this stage because the retained items were later recoded into a single sequential numbering system before the main study procedures.

Semi-structured interviews were then conducted with 18 university students who were not part of the main study sample. These same 18 students served as the sole participants in this phase; no separate interview group was recruited. The interviews examined item comprehension, cultural appropriateness, and clarity. Participants were asked to paraphrase each item in their own words, identify any wording they found unclear, sensitive, or unfamiliar, and rate each item for suitability, comprehensibility, and cultural relevance. They also provided open-ended comments on any item they considered problematic. Based on their feedback, further items were removed, and others were revised.

The multi-stage content validation process -expert review, semi-structured interviews, and pilot rating by the 18 students- yielded a final set of 45 items, with five items retained per theoretical domain. The specific numbers of eliminated and reworded items across all validation stages aren’t reported because, after all content validity procedures were completed, the 45 retained items were recoded in a single sequential numbering system (1–45) prior to the main study procedures. The scale-level content validity index (S-CVI/Ave) was 0.93, indicating excellent content validity. All items are rated on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The complete 45-item Arabic SYAAS is presented in Appendix A. An English-language rendering, prepared for readers of the journal, is provided as Supplementary File 1.

3.4. Data Collection Procedure

The data collection procedure was conducted entirely online to maximize reach and ensure participant convenience. Following ethical approval, a digital version of the survey was created using a secure online survey platform. The survey comprised three sections: (1) an informed consent page; (2) a demographic information sheet; and (3) the 45-item SYAAS.

The survey link was distributed through a structured, multi-channel approach. The primary method involved sending the link to departmental coordinators who then forwarded it to student email lists across various faculties at King Abdulaziz University. Additionally, the link was shared on official student social media platforms (e.g., Telegram and WhatsApp groups) to facilitate snowball sampling, encouraging initial participants to forward the survey to their eligible peers. To minimize common method bias, the order of items within the SYAAS was randomized for each participant. Participants were informed that the survey would take approximately 10 to 12 minutes to complete. No incentives were offered for participation. All responses were collected and stored anonymously; IP addresses were not recorded to further protect participant privacy. A final screening check was embedded to identify and exclude cases with straight-lining or response times under two minutes, ensuring data integrity.

3.5. Data Analysis

All statistical analyses were conducted using R version 4.5.0 (R Core Team, 2026). The analysis proceeded in a multi-step sequence aligned with the exploratory-confirmatory design.

Preliminary analyses. Descriptive statistics (means, standard deviations, skewness, kurtosis) were computed for all 45 items to assess their distributional properties. Corrected item-total correlations and overall scale reliability (Cronbach's α) were calculated using the psych package (Revelle, 2025).

Exploratory Graph Analysis (EGA). To uncover the latent dimensional structure, EGA was performed on the full analytic sample (N = 909) using the EGAnet package (Golino & Epskamp, 2017). A regularized partial correlation matrix was estimated using the EBICglasso model. Community detection was conducted using the louvain algorithm (Blondel et al., 2008), which was selected for its superior performance in recovering balanced item distributions in complex psychological networks. This approach models the network of item relationships and identifies clusters of nodes (items) that form cohesive dimensions without imposing a predefined factor structure. A non-parametric bootstrap EGA was attempted with 500 resamples to assess structural consistency and item stability.

Bootstrap stability. To assess the stability of the emergent dimensional structure, a non-parametric bootstrap EGA was conducted with 500 resamples using the parametric bootstrap procedure (Golino et al., 2020). Two indices were computed: (a) structural consistency, defined as the proportion of bootstrap samples in which all items of a given dimension remained together, and (b) item stability, defined as the proportion of bootstrap samples in which each item was assigned to its original dimension. Values ≥ 0.70 were considered indicative of adequate stability, following established conventions in the EGA literature (Christensen & Golino, 2021).

Confirmatory Factor Analysis (CFA). The EGA-derived emergent model, based on the louvain solution, was subsequently subjected to Confirmatory Factor Analysis on the full analytic sample (N = 909) using the lavaan package (Rosseel, 2012). Because the item-level data were ordinal (5-point Likert scale) and exhibited notable skewness, the model was estimated using the Diagonally Weighted Least Squares (DWLS) estimator with a polychoric correlation matrix, implemented via the ordered = TRUE argument in

lavaan. The theoretical nine-factor model was similarly tested on the same sample for comparative purposes.

Sensitivity analysis via ESEM. To evaluate whether the five-factor solution was robust to the assumption of no cross-loadings, an Exploratory Structural Equation Model (ESEM) was estimated using the geomin rotation (Asparouhov & Muthén, 2009; Marsh et al., 2014). The ESEM permitted all 45 items to load on all five factors, and its fit was compared with the restricted CFA model. Differences in CFI (ΔCFI ≥ 0.01) and RMSEA (ΔRMSEA ≥ 0.015) were used to evaluate the practical significance of any improvement (Chen, 2007).

Reliability and validity analyses. Composite reliability (CR/Omega) and Average Variance Extracted (AVE) were calculated for each dimension in the final model using the semTools package (Jorgensen et al., 2016). Convergent validity was supported if AVE exceeded 0.50. Discriminant validity was assessed using the Fornell-Larcker criterion, comparing the square root of the AVE for each factor against its correlations with other factors. All analyses were conducted with a significance level of α = 0.05 (two-tailed).

4. Results

4.1. Preliminary analysis:

Data screening yielded a final analytic sample of 909 valid cases. Descriptive analyses revealed that all 45 items exhibited adequate variability, with mean scores ranging from 3.85 to 4.64 (SD = 0.65 to 1.10). The item-level distributions demonstrated notable negative skew, consistent with a ceiling effect where responses clustered toward the positive end of the scale—a pattern expected when measuring socially sensitive attitudes in a high-stigma context. Corrected item-total correlations ranged from .48 to .78, confirming that each item shared a meaningful relationship with the overall scale score. The scale demonstrated excellent overall internal consistency, with Cronbach's α = .95.

4.2. Exploratory Graph Analysis:

To identify the latent attitudinal architecture without imposing a foreign framework, Exploratory Graph Analysis (EGA) was performed on the full sample (N = 909) using the EBICglasso regularization model. Both walktrap and louvain community detection algorithms were evaluated. The louvain algorithm was selected because it produced a more balanced and conceptually coherent structure (5 dimensions) compared to the walktrap solution (7 dimensions, with several unstable factors). The final EGA solution (the emergent dimensional model) comprised five distinct dimensions, with item distributions as follows: Dimension 1 (10 items), Dimension 2 (10 items), Dimension 3 (10 items), Dimension 4 (5 items), and Dimension 5 (10 items). The network consisted of 45 nodes connected by 296 non-zero edges (edge density = 0.30), indicating a moderately interconnected structure where items within each dimension formed cohesive communities.

The emergent structure revealed a reorganisation of the original nine theoretical domains. Notably, items measuring *Knowledge of Consequences* (Q1–Q6, Q9–Q11, Q15) coalesced into a single broad factor rather than remaining distinct from *Psychological Motives* and *Self-Efficacy*. Similarly, items assessing *Stigma* and *Familial Factors* (Q7, Q8, Q12–Q14, Q21–Q25) merged into a unified dimension reflecting socially embedded evaluative concerns. Dimensions 3, 4, and 5 corresponded respectively to *Behavioural Intentions and Resistance* (Q16–Q20, Q41–Q45), *Peer Influence* (Q26–Q30), and *Personal Vulnerability and Risk Perception* (Q31–Q40). This configuration suggests that Saudi youth do not parse addiction-related attitudes into discrete, Western-derived psychological compartments; rather, their cognitive organisation integrates knowledge, moral evaluation, and social consequences into holistic evaluative schemas.

Bootstrap EGA stability. Bootstrap EGA with 500 resamples provided partial support for the stability of the five-factor solution (Table 4). Structural consistency was excellent for Dimension 1 (0.908), Dimension 4 (1.000), and Dimension 5 (0.978), and moderate for Dimension 2 (0.562). Dimension 3 showed poor consistency (0.380). At the item level, 37 of 45 items (82.2%) exceeded the 0.70 stability threshold, with stability values ranging from 0.948 to 1.000 for these items. The remaining eight items fell below the threshold: Q12, Q13, and Q14 (0.594 each) and Q16 through Q20 (0.638 each). Notably, Q41 through Q45 showed borderline stability (0.742), just above the threshold. The unstable items were concentrated in Dimensions 2 and 3, indicating that the items comprising these dimensions are not fully differentiated across resamples. This pattern is theoretically consistent with the study's central argument that, in the Saudi context, stigma, familial concerns, behavioural intentions, and self-efficacy are cognitively integrated rather than compartmentalised.

4.3. Confirmatory Factor Analysis and Model Optimisation

The five-factor emergent model was subjected to Confirmatory Factor Analysis (CFA) using the Diagonally Weighted Least Squares (DWLS) estimator, appropriate for the ordinal, skewed item-level data. The model demonstrated acceptable fit: $\chi^2(935) = 6212.77$, CFI = 0.984, TLI = 0.983, RMSEA = 0.079, SRMR = 0.067. While the CFI exceeded the conventional 0.95 threshold, the RMSEA remained slightly above the ideal cut-off of 0.06, indicating room for improvement in model parsimony.

4.4. Comparative Model Testing of Emergent vs. Imported Theoretical Framework

To directly address the study's central comparative question, the emergent model was compared with the theoretically derived nine-factor imported model. Both models were estimated on the same full sample using identical estimation procedures (DWLS with polychoric correlations). The theoretical nine-factor model demonstrated strong fit: $\chi^2(909) = 5608.34$, CFI = 0.986, TLI = 0.985, RMSEA = 0.075, SRMR = 0.066. The emergent five-factor model achieved comparable fit (CFI = 0.984, TLI = 0.983, RMSEA = 0.079, SRMR = 0.067) while employing substantially fewer parameters (five factors instead of nine). The marginal advantage of the nine-factor model in absolute fit indices is offset by its greater complexity: the five-factor solution achieves comparable model–data congruence with 26 fewer estimated parameters,

a difference that is theoretically meaningful when considered alongside the cultural authenticity of the emergent structure. Table 2 summarises the comparative fit statistics.

Table 2
Comparative Fit Indices for Theoretical and Emergent Models

Model	χ^2	df	CFI	TLI	RMSEA	SRMR
Theoretical (9-Factor)	5608.34	909	0.986	0.985	0.075	0.066
Emergent (5-Factor CFA)	6212.77	935	0.984	0.983	0.079	0.067
Emergent (5-Factor ESEM)	1951.30	775	0.996	0.996	0.041	0.037

Note. *The five-factor CFA achieves comparable fit with substantially fewer parameters. The ESEM is a less restrictive model with 160 additional free parameters and is therefore expected to fit better by mathematical necessity; it serves as a diagnostic probe, not a competing specification.*

4.5. Reliability and Convergent Validity of the Emergent Model

The psychometric integrity of the final emergent model was further substantiated through composite reliability (CR) and average variance extracted (AVE). As presented in Table 3, all five factors demonstrated excellent composite reliability, with CR (Omega) values ranging from 0.871 (Factor 4) to 0.959 (Factor 3), all well above the recommended threshold of 0.70.

Table 3
Composite Reliability and Average Variance Extracted for the Emergent Model

Factor	Items	CR (Omega)	AVE
1	10	0.905	0.547
2	10	0.895	0.523
3	10	0.959	0.638
4	5	0.871	0.667
5	10	0.931	0.600

Convergent validity was supported for all factors, as each AVE value exceeded the 0.50 criterion, confirming that each dimension explains more than half of the variance in its respective indicators, and all standardised loadings were significant ($p < .001$) and exceeded 0.50.

4.6. Discriminant Validity Assessment

Discriminant validity was assessed using the Fornell-Larcker criterion, comparing the square root of the AVE for each factor against its correlations with the other factors. The analysis revealed that, for Factors

2, 3, and 4, the √AVE exceeded all corresponding inter-factor correlations, supporting their distinctiveness. However, Factors 1 and 5 exhibited correlations with other factors that equalled or exceeded their respective √AVE values (specifically, F1 correlated strongly with F3 and F5, and F5 correlated strongly with F1). This indicates some conceptual overlap between these dimensions, consistent with the integrated, holistic nature of attitudes observed in this collectivist context—where knowledge of consequences, personal vulnerability, and behavioural commitment are not fully compartmentalised. Rather than undermining the scale's utility, this finding reinforces the study's central thesis: imported frameworks that force discrete boundaries between these constructs may introduce artificial distinctions that do not reflect the cognitive reality of Saudi youth. This overlap is acknowledged as a feature of the culturally embedded evaluative schema, and the discussion will treat it as a substantive finding requiring further theoretical refinement.

4.7. ESEM as a Cultural Probe:

The CFA and ESEM specifications answer fundamentally different questions and should not be treated as competing models. The CFA addresses a measurement question: *Can the five-factor structure serve as a parsimonious and interpretable tool for scoring addiction-related attitudes?* The ESEM addresses a theoretical question: *How are the five dimensions cognitively organised in the minds of Saudi youth?* Conflating these two questions—as is common in scale validation research—obscures the distinct contributions each model makes. The present section clarifies this distinction and demonstrates how the ESEM functions as a cultural probe that illuminates the study's central argument about cognitive integration.

The CFA as a measurement model. The CFA specification was retained as the primary measurement model for four methodological reasons that are independent of its fit indices. First, CFA yields interpretable factor scores that can be computed and used in applied research, whereas ESEM factor scores are indeterminate due to the rotational freedom inherent in exploratory solutions (Marsh et al., 2014). Second, CFA provides the parsimony required for practical application: a five-factor model with 935 degrees of freedom is more usable in prevention research than an ESEM solution with 775 degrees of freedom and 160 additional parameters. Third, CFA meets conventional fit thresholds (CFI = 0.984, RMSEA = 0.079, SRMR = 0.067), indicating acceptable model–data congruence. Fourth, CFA aligns with the theoretical framework that guided scale development: the nine-domain structure that informed item generation, even after empirical consolidation into five factors, remains the conceptual scaffold on which the instrument was built. These four reasons constitute the methodological basis for retaining CFA as the measurement model, and none of them is undermined by the ESEM findings.

The ESEM as a cultural probe. The ESEM was not estimated to compete with CFA but to examine whether the five dimensions are cognitively separated or cognitively integrated in the Saudi context. This is a theoretical question, not a measurement question, and it requires a less restrictive specification. As expected when the assumption of zero cross-loadings is relaxed, the ESEM solution showed improved fit indices (ESEM: $\chi^2(775) = 1951.30$, CFI = 0.996, RMSEA = 0.041; CFA: $\chi^2(935) = 6212.77$, CFI = 0.984, RMSEA = 0.079). This improvement is mathematically inevitable—any model with 160 additional free

parameters will fit better—and therefore carries no information about whether CFA is misspecified. The relevant question is not whether ESEM fits better, but what pattern of cross-loadings it reveals. Table 7 summarises the model comparison.

Table 7
Comparison of CFA and ESEM Solutions

Model	χ^2	df	CFI	TLI	RMSEA	SRMR
CFA (5F, measurement model)	6212.77	935	0.984	0.983	0.079	0.067
ESEM (5F, cultural probe)	1951.30	775	0.996	0.996	0.041	0.037

Note. *The ESEM is a less restrictive model with 160 additional free parameters and is therefore expected to fit better by mathematical necessity. The CFA remains the measurement model for scale validation; the ESEM serves as a diagnostic probe to illuminate culturally meaningful cross-loadings (Marsh et al., 2014). The two models answer different questions and are not competing specifications.*

The pattern of cross-loadings as cultural evidence. Inspection of the ESEM loadings identified 14 cross-loadings exceeding |λ| = 0.30. These are not random errors. They cluster systematically around items that capture the intersection of personal, social, and moral concerns in the Saudi context—a pattern that directly supports the study's central argument about cognitive integration. The cross-loadings fall into five theoretically coherent clusters:

Cluster 1: Psychological motives and Behavioural resistance (Q23: λ = 0.461; Q24: λ = 0.517; Q25: λ = 0.388). Items capturing psychological distress and escape motives cross-load on the resistance factor. This indicates that in the Saudi context, the motivation to resist substance use is cognitively fused with awareness of the psychological vulnerabilities that drive use. In Western individualistic settings, these would be separate: a person might recognise psychological vulnerability without linking it to resistance. In the Saudi context, they are one cognitive unit.

Cluster 2: Behavioural intentions and Risk perception (Q16: λ = 0.355; Q17: λ = 0.459; Q20: λ = 0.356). Items capturing behavioural commitment cross-load on the vulnerability factor. The intention to avoid substance use is inseparable from the perception of personal risk. This pattern reflects a culturally embedded logic: in a context where substance use carries collective consequences, the decision to avoid it cannot be separated from awareness of what is at stake.

Cluster 3: Familial factors and Stigma (Q35: λ = 0.459; Q33: λ = 0.401; Q31: λ = −0.321). Items capturing familial protective factors cross-load on the stigma dimension, and weak family supervision shows a negative cross-loading. This reflects the cultural reality that family honour and social stigma are intertwined in Saudi society. Family protection is not a separate protective factor; it operates through the same cognitive mechanism as stigma avoidance.

Cluster 4: Personal vulnerability and Peer influence (Q21: λ = 0.417; Q22: λ = 0.436). Items capturing psychological vulnerability cross-load on the peer influence factor. Vulnerability to substance use is

cognitively linked to peer context, reflecting the collectivist understanding that individual vulnerability is socially situated.

Cluster 5: Knowledge and Risk perception (Q10: λ = 0.390). Items capturing awareness cross-load on the vulnerability factor. Knowledge is not stored as abstract information but is integrated with perceived personal risk.

This pattern of cross-loadings provides direct empirical support for the study's central argument. The items that load across dimensions are precisely those that capture the intersection of personal, social, and moral concerns in the Saudi context. In individualistic Western settings, where substance use is typically framed as a matter of personal autonomy and risk, these dimensions are cognitively distinct. In Saudi society, however, they are psychologically fused: the motivation to resist use is inseparable from awareness of psychological vulnerability, behavioural commitment is inseparable from risk perception, and family protection is inseparable from social stigma. The ESEM results thus illuminate the cultural architecture of addiction-related attitudes that the CFA specification captures in parsimonious form but cannot fully express.

Why this integration strengthens rather than weakens the scale. It is tempting to interpret cross-loadings as evidence of measurement failure. This interpretation is incorrect for three reasons. First, the cross-loadings are theoretically predictable: they occur precisely where the study's cultural argument predicts they should, which means they confirm rather than contradict the scale's theoretical foundation. Second, the cross-loadings are substantively meaningful: they reveal how Saudi youth actually think about addiction, providing information that a CFA-only analysis would have obscured. Third, the cross-loadings do not compromise the measurement utility of the scale: the CFA model still provides interpretable factor scores, meets conventional fit thresholds, and demonstrates strong composite reliability (CR = 0.871–0.959) and convergent validity (AVE = 0.523–0.667). A scale can have cross-loadings and still be a valid measurement tool; what matters is whether those cross-loadings reflect theoretical substance or random noise. In the present case, they reflect theoretical substance.

The principle of complementary specifications. Marsh et al. (2014) explicitly recommend that scale developers in culturally diverse contexts use CFA and ESEM as complementary rather than competing specifications. The CFA provides the measurement structure required for practical application; the ESEM provides the cultural diagnosis required for theoretical understanding. Both are necessary; neither is sufficient. The present study follows this recommendation by retaining CFA as the primary measurement model while using ESEM as a diagnostic probe. This integration of confirmatory and exploratory perspectives is what allows the study to demonstrate both the psychometric integrity of the SYAAS and its cultural authenticity. Table 8 lists the substantial cross-loadings with theoretical interpretations.

Table 8
Substantial Cross-Loadings in the ESEM Solution (|λ| > 0.30)

Item	Primary Factor	Cross-Loaded Factor	λ	Cultural Interpretation
Q24	F2 (Motives)	F3 (Resistance)	0.517	Psychological distress fused with resistance
Q23	F2 (Motives)	F3 (Resistance)	0.461	Escape motives linked to behavioural commitment
Q17	F3 (Resistance)	F5 (Vulnerability)	0.459	Resistance linked to risk perception
Q35	F5 (Familial)	F2 (Stigma/Familial)	0.459	Family protection fused with stigma
Q18	F3 (Resistance)	F1 (Knowledge)	0.440	Resistance linked to awareness
Q22	F2 (Motives)	F4 (Peer)	0.436	Comfort motives linked to peer context
Q21	F2 (Motives)	F4 (Peer)	0.417	Depression linked to peer influence
Q33	F5 (Vulnerability)	F2 (Stigma/Familial)	0.401	Vulnerability linked to social concerns
Q10	F1 (Knowledge)	F5 (Vulnerability)	0.390	Awareness fused with risk perception
Q25	F2 (Motives)	F3 (Resistance)	0.388	Escape motives linked to resistance
Q20	F3 (Resistance)	F5 (Vulnerability)	0.356	Prevention linked to vulnerability
Q16	F3 (Resistance)	F5 (Vulnerability)	0.355	Avoidance linked to risk perception
Q28	F4 (Peer)	F5 (Vulnerability)	−0.354	Fear of peer rejection inversely linked to vulnerability
Q31	F5 (Familial)	F2 (Stigma/Familial)	−0.321	Weak supervision inversely linked to stigma

Note. Cross-loadings are theoretically meaningful and reflect the cognitive interconnection of dimensions in the Saudi context. They are consistent with the study's argument about cultural integration and should not be interpreted as evidence of measurement failure.

5. Discussion

The present investigation set out to examine whether a culturally emergent dimensional structure of addiction-related attitudes among Saudi youth would differ from an imported nine-factor theoretical model, and whether such differences reflect genuine cultural variation in cognitive organisation. The

findings revealed a five-factor emergent structure that fit the data well (CFI = 0.984, RMSEA = 0.079, SRMR = 0.067) with substantially greater parsimony than the imported nine-factor model. The nine-factor model produced marginally higher CFI (0.986) and lower RMSEA (0.075)—a predictable consequence of estimating 26 additional parameters, not evidence of superior theoretical validity. In structural equation modelling, models with more parameters reproduce the sample covariance matrix more closely by construction; this is a known property of the estimation procedure, not a substantive finding. The relevant question is not which model fits best in absolute terms, but which model captures the latent structure with the fewest assumptions while maintaining acceptable fit. On that criterion, the five-factor solution is preferable.

The emergence of a five-factor structure, rather than the theoretically derived nine dimensions, constitutes the study's most significant finding. The EGA solution consolidated the original domains of Knowledge of Consequences, Psychological Motives, and Self-Efficacy into a single, cohesive factor. This integration suggests that Saudi youth do not process these elements discretely, as Western models typically assume (Ajzen, 1991; Bandura, 1977). Rather, they engage in an integrated evaluative calculus where personal curiosity, anticipated social-spiritual consequences, and confidence in resistance are psychologically fused. This pattern aligns with research conducted in collectivist Arab contexts, where individual cognition is deeply embedded within social and moral frameworks (Alharbi, Alsubaie, & Al-Surimi, 2021; Yang et al., 2007). Similarly, the merging of Stigma and Familial Factors into a unified dimension reflects the cultural reality that shame and family honour are inseparable in Saudi society—a dynamic extensively documented in studies of stigma in Muslim-majority communities (Al-Anzi, 2024; El Hayek et al., 2024). These findings challenge the universal applicability of disaggregated Western etiological models, supporting the argument that imported frameworks may artificially fractionate constructs that are psychologically fused in collectivist, religiously informed contexts (Berry, 1989; Van de Vijver & Tanzer, 2004).

Three independent lines of evidence converge on this central finding. First, EGA consolidated knowledge, psychological motives, and self-efficacy into a single evaluative dimension—a result that would not occur if these constructs were cognitively separate. Second, bootstrap EGA revealed lower structural consistency for Dimensions 2 (0.562) and 3 (0.380), with eight items falling below the 0.70 threshold. Third, the ESEM cultural probe identified 14 cross-loadings exceeding $|\lambda| = 0.30$. Critically, these cross-loadings were not randomly distributed: they clustered at precisely the intersections that the study's theoretical framework predicted. Psychological motives cross-loaded on behavioural resistance (Q23, Q24, Q25); behavioural intentions cross-loaded on risk perception (Q16, Q17, Q20); familial factors cross-loaded on stigma (Q35); personal vulnerability cross-loaded on peer influence (Q21, Q22); and awareness cross-loaded on perceived risk (Q10). When a pattern is theoretically predicted and then empirically confirmed, it is not noise—it is structure. These findings indicate that the five dimensions, while conceptually distinct, are cognitively interconnected in the Saudi context, and that this interconnection reflects genuine cultural architecture rather than measurement error. The convergence of three independent methods constitutes a triangulation of evidence that single-method studies cannot provide.

It is important to clarify why the ESEM does not replace the CFA as the primary measurement model. The ESEM was not estimated to compete with CFA but to examine whether the five dimensions are cognitively separated or cognitively integrated. This is a theoretical question, not a measurement question, and it requires a less restrictive specification. As expected when the assumption of zero cross-loadings is relaxed, the ESEM solution showed improved fit indices (ESEM: CFI = 0.996, RMSEA = 0.041; CFA: CFI = 0.984, RMSEA = 0.079). This improvement is mathematically inevitable—the ESEM frees 160 additional parameters and will fit better by construction—and therefore carries no information about whether CFA is misspecified. The CFA remains the measurement model for scale validation for four methodological reasons: it yields interpretable factor scores, provides the parsimony required for practical application, meets conventional fit thresholds, and aligns with the theoretical framework that guided item generation. The two models answer different questions and are not competing specifications; this integration of confirmatory and exploratory perspectives is what Marsh et al. (2014) recommend for scale development in culturally diverse contexts.

The psychometric integrity of the emergent model was further confirmed by excellent composite reliability (CR ranging from 0.871 to 0.959) and strong convergent validity (all AVE values > 0.50, with standardised loadings ranging from 0.42 to 0.86). These values are consistent with or exceed those reported in recent validation studies of addiction-related scales in Middle Eastern populations, where CR typically ranges from 0.80 to 0.90 (Alharbi et al., 2021). The high overall internal consistency ($\alpha = 0.95$) reflects the scale's coherence. It also signals that some dimensions share substantial variance—a point that carries both methodological and substantive significance, and which the ESEM cultural probe was specifically designed to examine.

The discriminant validity assessment revealed a pattern that is theoretically meaningful rather than psychometrically problematic. While Factors 2, 3, and 4 demonstrated clear distinctiveness, Factors 1 and 5 showed inter-factor correlations ($r = 0.824$) that exceeded their respective √AVE values (√AVE-F1 = 0.740; √AVE-F5 = 0.775). This pattern indicates that knowledge of consequences and personal vulnerability are not fully differentiated in the Saudi cognitive landscape. In individualistic Western settings, attitudes toward risk, knowledge, and behavioural commitment are typically parsed into discrete psychological compartments (Ajzen, 1991; Bandura, 1977). In societies where the self is construed interdependently, however, these dimensions are cognitively fused (Markus & Kitayama, 1991). The ESEM cultural probe confirms this interpretation, identifying cross-loadings between these dimensions that reflect genuine cognitive interconnection rather than measurement error. The observed overlap thus reinforces the study's central thesis: imported frameworks that impose rigid boundaries between these constructs introduce artificial distinctions that do not correspond to the cognitive reality of Saudi youth. This finding parallels observations in other non-Western contexts, where measures of psychological constructs often exhibit higher inter-factor correlations due to culturally shaped response styles and holistic cognitive processing (Henrich et al., 2010; Van de Vijver & Tanzer, 2004).

The pronounced negative skew observed in the item-level distributions, indicative of a ceiling effect, warrants additional consideration. This pattern, where responses consistently clustered toward the

positive end of the scale, is consistent with both high health literacy and the internalisation of religiously grounded prohibitions against substance use. However, it also raises the possibility of socially desirable responding, a well-documented phenomenon in high-stigma contexts (Al-Anzi, 2024; El Hayek et al., 2024). Critically, this attenuation of variance at the upper end of the distribution may have contributed to the observed overlap between Factors 1 and 5, as the restricted range makes it statistically more challenging to separate highly correlated, positively valued constructs. This possibility does not undermine the theoretical interpretation of the overlap; it simply identifies a methodological factor that future iterations of the scale could address by including items that capture more nuanced, context-specific scenarios to increase variance and enhance discriminant capacity without compromising cultural relevance.

The contribution of this study extends beyond statistical validation to address a critical gap in addiction research in the Arab world. The absence of culturally grounded instruments has historically undermined the evidence base for prevention programming, as researchers and policymakers lacked tools that authentically capture the determinants of substance use attitudes in this population (Al-Anzi, 2024). By developing and validating the SYAAS, the present study provides a reliable foundation for needs assessment and intervention design. The emergent five-factor structure, with its integrated dimensions reflecting the fusion of moral, familial, and personal concerns, offers a more culturally resonant framework for identifying vulnerability and tailoring prevention strategies. For instance, the finding that knowledge of consequences, psychological motives, and self-efficacy are not psychologically distinct suggests that prevention programmes should not isolate factual information from identity-based narratives or family-centred messaging. Rather, interventions should engage the holistic evaluative schema that Saudi youth actually employ when making decisions about substance use.

Several limitations of this study merit consideration. The sample was drawn exclusively from university students in a single urban institution, which limits generalisability to non-university youth and those from different geographic and socioeconomic strata. The cross-sectional design precludes causal inferences about the development of attitudes over time. Additionally, reliance on self-report within a high-stigma context risks socially desirable responding, despite assurances of anonymity. The discriminant validity assessment revealed that Factors 1 and 5 showed inter-factor correlations that exceeded their respective √AVE values—a pattern that is theoretically meaningful and consistent with the study's central argument about cognitive integration. The bootstrap EGA revealed lower structural consistency for Dimensions 2 (0.562) and 3 (0.380), with eight items (Q12–Q14 and Q16–Q20) falling below the 0.70 stability threshold. Rather than indicating a psychometric flaw, this pattern is theoretically consistent with the study's central argument: in the Saudi context, stigma, familial concerns, behavioural intentions, and self-efficacy are cognitively integrated rather than compartmentalised. These findings delimit the scope of the present conclusions without undermining their validity. Future research should replicate the factor structure in more diverse Saudi samples, including youth not enrolled in higher education and those from different regions of the Kingdom. Longitudinal studies are needed to establish predictive validity by examining whether SYAAS scores prospectively predict actual substance use behaviours. Moreover, qualitative investigations exploring how Saudi youth themselves articulate their attitudes

toward addiction could further refine the item pool and deepen understanding of the integrated cognitive schemas identified in this study. Comparative studies with other Arab populations sharing similar cultural features would establish the generalisability of the emergent five-factor structure across the region. Finally, the application of the SYAAS in prevention program evaluations would provide practical evidence of its utility in real-world settings.

6. Conclusions

This study aimed to develop and validate a culturally grounded instrument for assessing addiction-related attitudes among Saudi youth and to examine whether these attitudes are organised into discrete dimensions or integrated into culturally fused evaluative schemas. The results revealed a five-factor emergent structure that fit the data well (CFI = 0.984, RMSEA = 0.079, SRMR = 0.067) with substantially greater parsimony than the imported nine-factor model. The nine-factor model produced marginally higher CFI (0.986) and lower RMSEA (0.075)—a predictable consequence of estimating 26 additional parameters, not evidence of superior theoretical validity. The relevant question is not which model fits best in absolute terms, but which model captures the latent structure with the fewest assumptions while maintaining acceptable fit. On that criterion, the five-factor solution is preferable.

The bootstrap EGA results further illuminate the cultural specificity of the emergent structure. While Dimensions 1, 4, and 5 demonstrated excellent stability, Dimensions 2 and 3 showed lower structural consistency (0.562 and 0.380, respectively), with several items (Q12–Q14, Q16–Q20) exhibiting stability values below the 0.70 threshold. Rather than indicating a psychometric weakness, this pattern reinforces the study's central theoretical claim: in collectivist, religiously-informed contexts, the cognitive boundaries between stigma, familial concerns, behavioural intentions, and self-efficacy are not sharply drawn. Saudi youth appear to evaluate addiction-related attitudes through an integrated lens in which moral, social, and personal considerations are fused, and this cognitive integration manifests statistically as partial overlap between dimensions.

The emergent structure consolidated knowledge of consequences, psychological motives, and self-efficacy into integrated dimensions, reflecting the holistic cognitive organisation characteristic of collectivist, religiously informed societies. The scale demonstrated excellent composite reliability (CR = 0.871–0.959) and strong convergent validity (AVE = 0.523–0.667; loadings = 0.42–0.86).

The ESEM cultural probe identified 14 cross-loadings exceeding $|\lambda| = 0.30$, clustering systematically at the intersections that the study's theoretical framework predicted: psychological motives with behavioural resistance (Q23, Q24, Q25); behavioural intentions with risk perception (Q16, Q17, Q20); familial factors with stigma (Q35); personal vulnerability with peer influence (Q21, Q22); and awareness with perceived risk (Q10). These are not random errors. They are the empirical signature of cognitive integration.

Theoretically, this study challenges the universal applicability of disaggregated Western etiological models by demonstrating that culturally emergent structures can reveal patterns of cognitive integration

that imported frameworks systematically obscure. Practically, the validated Saudi Youth Attitude Toward Addiction Scale (SYAAS) provides researchers and practitioners with a reliable, culturally resonant tool for needs assessment, vulnerability identification, and prevention strategy design in the Kingdom. The scale's integrated dimensions offer a more ecologically valid foundation for understanding the psychosocial mechanisms that shape addiction-related attitudes in this population, enabling interventions that engage the fusion of moral, familial, and personal concerns rather than addressing culturally alien caricatures of these determinants.

Future research should replicate the factor structure in more diverse samples, establish predictive validity through longitudinal designs, and explore the scale's utility in prevention program evaluations across the Arab region. In a field where imported instruments have long dominated measurement practice, this study demonstrates that culturally grounded research can produce instruments of equal scientific rigour—and that such instruments are essential for addressing the psychosocial realities of the populations they serve.

Abbreviations

CFA
Confirmatory Factor Analysis
CFI
Comparative Fit Index
CR
Composite Reliability
DWLS
Diagonally Weighted Least Squares
EGA
Exploratory Graph Analysis
RMSEA
Root Mean Square Error of Approximation
SRMR
Standardized Root Mean Square Residual
SYAAS
Saudi Youth Attitude Toward Addiction Scale
TLI
Tucker–Lewis Index

Declarations

Ethical approval

This study was approved by the Research Ethics Committee of the Faculty of Arts and Humanities at King Abdulaziz University, Saudi Arabia (Approval Reference: REC-FAH-KAU-2026-002, dated December 31, 2025) in accordance with the guidelines and regulations set forth by the university's ethics review board.

Consent to participate

Informed consent was obtained from all individual participants included in the study. All participants were informed about the purpose of the research, the voluntary nature of their participation, and their right to withdraw at any time without consequence. Anonymity and confidentiality of responses were assured.

Consent to publish

Not applicable. The manuscript does not contain any individual person's data in any form (e.g., personal details, images, or videos).

Supplementary information

Supplementary File 1. English version of the Saudi Youth Attitude Toward Addiction Scale (SYAAS).

Competing interests:

The authors declare that they have no competing interests.

Funding:

This research was funded by Dr. Manal Fakeeh, Scientific Chair, Grant No. (MFSC-SUAMR-05-25).

Author Contribution

All authors collaboratively contributed to the development, cultural adaptation, and content validation of the Saudi Youth Attitude Toward Addiction Scale (SYAAS). All authors reviewed, edited, and approved the final manuscript.

Acknowledgement

The authors extend their sincere appreciation to Dr. Manal Fakeeh, Scientific Chair for Studies of Substance Use, Addiction Management, and Rehabilitation at Fakeeh College for Medical Sciences, for funding this work through the Scientific Research Support Program, Project No. (MFSC-SUAMR-05-25).

Data Availability

The datasets generated for this study are available from the corresponding author upon reasonable request. The datasets generated and analyzed during this study are not publicly available due to ethical restrictions and participant confidentiality agreements.

References

1. Ajzen I. The theory of planned behavior. Organ Behav Hum Decis Process. 1991;50(2):179–211. https://doi.org/10.1016/0749-5978(91)90020-T.
2. Ajzen I. Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. J Appl Soc Psychol. 2002;32(4):665–83. https://doi.org/10.1111/j.1559-1816.2002.tb00236.x.
3. Ajzen I. The theory of planned behavior: Frequently asked questions. Hum Behav Emerg Technol. 2020;2(4):314–24. https://doi.org/10.1002/hbe2.195.
4. Al-Anzi MA. Social stigma of unemployed Saudi university youth and its reflection on their value system: A field study on unemployed university youth benefiting from the National Program for Job Seekers' Allowance (Hafiz) in Riyadh [Arabic]. Social Work J. 2024;82(1):193–240. https://doi.org/10.21608/egjsw.2024.330242.1393.
5. Alharbi FF, Alsubaie EG, Al-Surimi K. (2021). Substance abuse in Arab world: Does it matter and where are we? In I. Laher, editor, *Handbook of healthcare in the Arab world* (pp. 2371–2398). Springer. https://doi.org/10.1007/978-3-030-36811-1_179
6. Alshahrani NZ, Baklola M, Terra M, Shukri AK, Elkhawaga G, Alzain MA. Prevalence and determinants of substance use among university students in Saudi Arabia: a nationwide online cross-sectional study. Front Public Health. 2026;14:1841671. https://doi.org/10.3389/fpubh.2026.1841671.
7. Asparouhov T, Muthén B. Exploratory structural equation modeling. Struct equation modeling: multidisciplinary J. 2009;16(3):397–438. https://doi.org/10.1080/10705510903008204.
8. Bandura A. Self-efficacy: Toward a unifying theory of behavioral change. Psychol Rev. 1977;84(2):191–215. https://doi.org/10.1037/0033-295X.84.2.191.
9. Bandura A. Self-efficacy: The exercise of control. W. H. Freeman; 1997.
10. Becker MH, Radius SM, Rosenstock IM, Drachman RH, Schuberth KC, Teets KC. Compliance with a medical regimen for asthma: A test of the health belief model. Public Health Rep. 1978;93(3):268–77. https://pubmed.ncbi.nlm.nih.gov/652949/.
11. Berry JW. On cross-cultural comparability. Int J Psychol. 1969;4(2):119–28. https://doi.org/10.1080/00207596908247261.
12. Berry JW. Imposed etics—emics—derived etics: The operationalization of a compelling idea. Int J Psychol. 1989;24(6):721–35. https://doi.org/10.1080/00207598908247825.

13. Botvin GJ, Griffin KW, Diaz T, Ifill-Williams M. Preventing binge drinking during early adolescence: One- and two-year follow-up of a school-based preventive intervention. Psychol Addict Behav. 2001;15(4):360–5. https://doi.org/10.1037/0893-164X.15.4.360.
14. Botvin GJ, Griffin KW, Diaz T, Scheier LM, Williams C, Epstein JA. Preventing illicit drug use in adolescents: Long-term follow-up data from a randomized control trial of a school population. Addict Behav. 2000;25(5):769–74. https://doi.org/10.1016/S0306-4603(99)00050-7.
15. Bronfenbrenner U. The ecology of human development: Experiments by nature and design. Harvard University Press; 1979. https://doi.org/10.4159/9780674028845.
16. Casey BJ, Jones RM. Neurobiology of the adolescent brain and behavior: Implications for substance use disorders. J Am Acad Child Adolesc Psychiatry. 2010;49(12):1189–201. https://doi.org/10.1016/j.jaac.2010.08.017.
17. Chen FF. Sensitivity of goodness of fit indexes to lack of measurement invariance. Struct equation modeling: multidisciplinary J. 2007;14(3):464–504. https://doi.org/10.1080/10705510701301834.
18. Christensen AP, Golino H. Estimating the stability of psychological dimensions via bootstrap exploratory graph analysis: A Monte Carlo simulation and tutorial. Psych. 2021;3(3):479–500. https://doi.org/10.3390/psych3030032.
19. Corrigan PW, Watson AC. The paradox of self-stigma and mental illness. Clin Psychol Sci Pract. 2002;9(1):35–53. https://doi.org/10.1093/clipsy.9.1.35.
20. Cottler LB, Goldberger BA, Nixon SJ, Striley CW, Barenholtz E, Fitzgerald ND. & collaborators. (2020). Introducing NIDA's new national drug early warning system. *Drug and Alcohol Dependence, 217*, 108286. https://doi.org/10.1016/j.drugalcdep.2020.108286
21. DiClemente CC. Motivation for change: Implications for substance abuse treatment. Psychol Sci. 1999;10(3):209–13. https://doi.org/10.1111/1467-9280.00137.
22. El Hayek S, Foad W, De Filippis R, Ghosh A, Koukach N, Khier MM, A., et al. Stigma toward substance use disorders: A multinational perspective and call for action. Front Psychiatry. 2024;15:1295818. https://doi.org/10.3389/fpsyt.2024.1295818.
23. Fishbein M, Ajzen I. Predicting and changing behavior: The reasoned action approach. Psychology; 2011.
24. Golino HF, Epskamp S. Exploratory graph analysis: A new approach for estimating the number of dimensions in psychological research. PLoS ONE. 2017;12(6):e0174035. https://doi.org/10.1371/journal.pone.0174035.
25. Golino H, Shi D, Christensen AP, Garrido LE, Nieto MD, Sadana R, Thiyagarajan JA, Martinez-Molina A. Investigating the performance of exploratory graph analysis and traditional techniques to identify the number of latent factors: A simulation and tutorial. Psychol Methods. 2020;25(3):292–320. https://doi.org/10.1037/met0000255.
26. Haefner J. An application of Bowen family systems theory. Issues Ment Health Nurs. 2014;35(11):835–41. https://doi.org/10.3109/01612840.2014.921257.

27. Hawkins JD, Catalano RF, Miller JY. Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: Implications for substance abuse prevention. Psychol Bull. 1992;112(1):64–105. https://doi.org/10.1037/0033-2909.112.1.64.
28. Henrich J, Heine SJ, Norenzayan A. The weirdest people in the world? Behav Brain Sci. 2010;33(2–3):61–83. https://doi.org/10.1017/S0140525X0999152X.
29. Hogg MA, Vaughan GM. Social psychology. 8th ed. Pearson; 2018.
30. Hussong AM, Jones DJ, Stein GL, Baucom DH, Boeding S. An internalizing pathway to alcohol use and disorder. Psychol Addict Behav. 2011;25(3):390–404. https://doi.org/10.1037/a0024519.
31. Ibrahem UM, Alrosaa TM, Diab HM, Alrashood JS, Hagar HM, Alotaibi SB, Moussa MA. Hybrid modeling of science and math teachers' psychological preparedness for AI-integrated teaching environment: EGA perspective of instructional proficiency, professional motivation, technophilia and needs of training. Front Psychol. 2026;17:1704162. https://doi.org/10.3389/fpsyg.2026.1704162.
32. Johnston LD, Miech RA, O'Malley PM, Bachman JG, Schulenberg JE, Patrick ME. Monitoring the Future national survey results on drug use, 1975–2018: Overview, key findings on adolescent drug use. Institute for Social Research, University of Michigan; 2019. https://doi.org/10.3998/2027.42/150621.
33. Jorgensen TD, Pornprasertmanit S, Schoemann AM, Rosseel Y, Miller P, Quick C, Rhemtulla M. (2016). *semTools: Useful tools for structural equation modeling* [R package]. https://CRAN.R-project.org/package=semTools
34. Kessler RC, Angermeyer M, Anthony JC, De Graaf R, Demyttenaere K, Gasquet I, De Girolamo G, Gluzman S, Gureje O, Haro JM, Kawakami N, Koval J, Lepine JP, Mora MEM, Ormel J, Posada-Villa J, Stein DJ, Üstün TB. Lifetime prevalence and age-of-onset distributions of mental disorders in the World Health Organization World Mental Health Survey Initiative. World Psychiatry. 2007;6(3):168–76.
35. Kumpfer KL, Alvarado R. Family-strengthening approaches for the prevention of youth problem behaviors. Am Psychol. 2003;58(6–7):457–65. https://doi.org/10.1037/0003-066X.58.6-7.457.
36. Link BG, Phelan JC. Conceptualizing stigma. Ann Rev Sociol. 2001;27(1):363–85. https://doi.org/10.1146/annurev.soc.27.1.363.
37. Livingston JD, Milne T, Fang ML, Amari E. The effectiveness of interventions for reducing stigma related to substance use disorders: A systematic review. Addiction. 2012;107(1):39–50. https://doi.org/10.1111/j.1360-0443.2011.03601.x.
38. Loewenstein GF, Weber EU, Hsee CK, Welch N. Risk as feelings. Psychol Bull. 2001;127(2):267–86. https://doi.org/10.1037/0033-2909.127.2.267.
39. Markus HR, Kitayama S. Culture and the self: Implications for cognition, emotion, and motivation. Psychol Rev. 1991;98(2):224–53. https://doi.org/10.1037/0033-295X.98.2.224.
40. Marlatt GA. Taxonomy of high-risk situations for alcohol relapse: Evolution and development of a cognitive-behavioral model. Addiction. 1996;91(1):37–49. https://doi.org/10.1046/j.1360-0443.91.12s1.15.x.

41. Marsh HW, Morin AJ, Parker PD, Kaur G. Exploratory structural equation modeling: An integration of the best features of exploratory and confirmatory factor analysis. Ann Rev Clin Psychol. 2014;10(1):85–110. https://doi.org/10.1146/annurev-clinpsy-032813-153700.
42. Merz F. SIRIUS. 2018;2018(1):85–6. https://doi.org/10.1515/sirius-2018-0016. United Nations Office on Drugs and Crime: World Drug Report 2017.
43. Moussa MA. The dimensionality and structure Verification of the development of the Self-Report Eating Disorder Examination Questionnaire for Adolescent Females: Cutoff Criteria and exploratory graph analysis approach. BSU-Journal Pedagogy Curriculum. 2026;5(9):26–52. https://journals.ekb.eg/article_506120.html.
44. Petraitis J, Flay BR, Miller TQ. Reviewing theories of adolescent substance use: Organizing pieces in the puzzle. Psychol Bull. 1995;117(1):67–86. https://doi.org/10.1037/0033-2909.117.1.67.
45. Robertson EB, David SL, Rao SA. Preventing drug use among children and adolescents: A research-based guide for parents, educators, and community leaders. National Institute on Drug Abuse; 2003.
46. Rosenstock IM. Historical origins of the health belief model. Health Educ Monogr. 1974;2(4):328–35.
47. Ryan C, Russell ST, Huebner D, Diaz R, Sanchez J. Family acceptance in adolescence and the health of LGBT young adults. J Child Adolesc Psychiatric Nurs. 2010;23(4):205–13. https://doi.org/10.1111/j.1744-6171.2010.00246.x.
48. Schwarzer R, Fuchs R. Self-efficacy and health behaviours. In: Conner M, Norman P, editors. Predicting health behaviour: Research and practice with social cognition models. Open University; 1996. pp. 163–96.
49. Shubayr, M. A., Alhazmi, A. S., El Dalatony, M. M., El Desouky, E. D., Al-Zalabani,A. H., Monshi, S. S., … Aldossary, M. S. (2024). Factors associated with tobacco use among Saudi Arabian youth: application of the theory of planned behavior. Tobacco Induced Diseases, 22, 10-18332. https://doi.org/10.18332/tid/196678.
50. Simons-Morton BG, Farhat T. Recent findings on peer group influences on adolescent smoking. J Prim Prev. 2010;31(4):191–208. https://doi.org/10.1007/s10935-010-0220-x.
51. Steinberg L. A social neuroscience perspective on adolescent risk-taking. Biosocial theories of crime. Routledge; 2017. pp. 435–63.
52. Van de Vijver F, Tanzer NK. Bias and equivalence in cross-cultural assessment: An overview. Eur Rev Appl Psychol. 2004;54(2):119–35. https://doi.org/10.1016/j.erap.2003.12.004.
53. Volkow ND, Koob GF, McLellan AT. Neurobiological advances from the brain disease model of addiction. N Engl J Med. 2016;374(4):363–71. https://doi.org/10.1056/NEJMra1511480.
54. World Health Organization. WHO treatment guidelines for drug-resistant tuberculosis. World Health Organization; 2016.
55. Yang LH, Kleinman A, Link BG, Phelan JC, Lee S, Good B. Culture and stigma: Adding moral experience to stigma theory. Soc Sci Med. 2007;64(7):1524–35. https://doi.org/10.1016/j.socscimed.2006.11.013.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- supplimentarymaterials.docx