

Cross Cultural Adaptation and Psychometric Validation of the Assessment of Recovery Capital for Indonesian Rehabilitation

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ABSTRACT

Introduction: A comprehensive understanding of recovery capital, the personal and social resources supporting sustained recovery, is essential in addiction rehabilitation. Indonesia lacks a culturally appropriate, psychometrically validated instrument to assess this construct. This study aimed to cross culturally adapt and validate the Assessment of Recovery Capital (ARC) for the Indonesian rehabilitation context.

Methods: A sequential exploratory mixed-method design was employed across an 11-adaptation stage. The qualitative phase (steps 1–5) included forward translation, synthesis, expert review, back translation, and harmonization. The quantitative phase (steps 6–10) encompasses content validity (CVI), face validity (FVI) construct validity using exploratory factor analysis (EFA), internal consistency, and test retest reliability, followed by final instrument drafting.

Results: The ARC instrument was successfully adapted into Bahasa Indonesia. Content validity was excellent (S-CVI/Ave = 0.98 for relevance; 0.95 for clarity), Face validity demonstrated high comprehensibility (S-FVI/Ave = 0.94 for comprehension; 0.96 for clarity). Construct validity among 250 rehabilitation clients supported a 10-factor structure explaining 70.64% of total variance. EFA identified 31 items meeting the dominant factor loading criterion (≥ 0.40), presented in the factor table for reporting clarity, all 50 items were retained in the final instrument based on content validity and conceptual equivalence. internal consistency was acceptable to strong (Cronbach's alpha = 0.655–0.860) and test–retest stability was good (ICC = 0.719–0.803). The final instrument comprises demographic data, 50 ARC items across 10 domains, and one open-ended question on recovery support needs. Confirmatory factor Analysis (CFA) is recommended in further studies.

Conclusion: The Indonesian ARC demonstrates preliminary validity, reliability, and cultural relevance for assessing recovery capital among individuals in rehabilitation. It has potential utility for monitoring recovery outcomes and informing evidence based addiction recovery practices in Indonesia, although further validation in border setting is warranted.

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INTRODUCTION

The prevalence of substance use disorders is a critical global public health challenge, characterized by high relapse rates and complex recovery path that extend beyond clinical treatment settings (1,2). Substance use disorders are increasingly recognized as chronic conditions requiring long-term management rather than short-term treatment approaches (3).

In Indonesia, despite the implementation of medical and social rehabilitation programs, many individuals experience relapse after completing treatment, indicating that recovery is not solely determined by abstinence but also by broader psychosocial, mental, health, socioeconomic and environmental factors that interact dynamically in shaping the severity and trajectory of drug addiction (2). Furthermore, post rehabilitation monitoring system remain limited and fragmented in many settings, reducing the ability to systematically evaluate long-term recovery outcomes and identify individuals at risk relapse.

This highlights the need for a more comprehensive framework to understand and monitor recovery outcomes, particularly in the post rehabilitation phase where individuals reintegrate into society. The idea of recovery capital, which refers to the range and depth of internal and external resources that individuals can leverage to begin and continue their recovery, has arisen as a fundamental theoretical framework in addiction studies (4,5). Recovery capital has been shown to predict treatment outcomes and long-term recovery trajectories (6). Recovery capital spans multiple domains, including personal, social, and community resources, all of which significantly impact an individual's ability to maintain enduring recovery (5). These domains interact dynamically and influence both relapse risk and resilience (7). Previous studies have emphasized that recovery is a multidimensional and evolving process, where access to these resources is essential in averting relapses and fostering long-term well-being (4). Most studies on recovery capital have been conducted in Western contexts, which may limit their applicability to non-Western setting (5). In the Indonesian context, recovery is likely shaped by family involvement, community norms, religious values, and stigma associated with substance use, which influence access to recovery resources (5,8). However, the operationalization and measurement of recovery capital require valid and reliable instruments that are culturally appropriate and context specific. Measurement tools that are not culturally adapted may produce biased or invalid results across populations (9).

One widely used instrument is the *Assessment of Recovery Capital (ARC)*, which is formulated to evaluate various domains of recovery resources among individuals with substance use disorders. The ARC has been widely used in addiction research and has demonstrated strong psychometric properties across settings (10). Nevertheless, instruments developed in one cultural context cannot be directly applied to another without proper *cross-cultural adaptation*, defined as a systematic process to ensure conceptual, semantic, and experiential equivalence across different cultural settings (11,12). Failure to adapt instruments appropriately can lead to measurement error and reduced validity (13). Previous validation studies of ARC have reported variations in factor structure and Psychometric properties across samples, suggesting the need for contextual adaptation (3).

Methodological guidelines emphasize that adaptation must be followed by rigorous psychometric testing, including validity and reliability assessments, to ensure that the instrument accurately measures the intended constructs within the target population (14,15). Such testing is essential to confirm that an instrument accurately and consistently measures the intended constructs within the target population, thereby ensuring its suitability for use in research, clinical practice, and policy development (16). Without such adaptation, measurement bias may occur, limiting the usefulness of the instrument in informing policy and practice. Despite these advances, there remains no standardized and psychometrically validated instrument specifically designed to assess recovery capital within the Indonesian rehabilitation context, representing a significant gap in research and practice.

This gap poses a significant challenge for rehabilitation providers, such as the National Narcotics Board (BNN), in monitoring recovery progress and evaluating the effectiveness of rehabilitation programs. The absence of such tools also limits the ability to develop evidence based post rehabilitation monitoring systems. In Indonesia, assessment approaches are still evolving and often emphasize abstinence, with limited integration of psychosocial dimensions.

Based on these considerations, This study to adapt and validate the ARC for Indonesian context. This study contributes to the literature by culturally adapting the ARC instrument, incorporating context specific considerations relevant to Indonesia rehabilitation settings, and providing preeliminary psychometric evidence to support its use as

a standardize recovery monitoring tool. Specifically, this study seeks to ensure the cultural relevance, validity, and reliability of the instrument, as well as to provide an evidence-based tool for monitoring recovery among individuals who have completed drug rehabilitation. The findings are expected to contribute to improved recovery outcomes and more effective national rehabilitation strategies.

METHOD

Study Design

This study Employed a methodological instrument adaptation and validation design using a sequential exploratory mixed method approach, integrating qualitative and quantitative phases to culturally adapt and psychometrically evaluate the ARC instrument for use in Indonesia.

The adaptation and validation process was conducted through a structured 11 stage procedure, including: forward translation, synthesis, expert panel review, back-translation, comparison and reconciliation, retranslation, content validity assessment, face validity testing, pilot testing, construct validity analysis, and reliability evaluation. This structured approach was adopted to ensure semantic, conceptual, and cultural equivalence in accordance with established cross-cultural adaptation guidelines ([11](#)).

Population and Sample

The population and sample varied across each phase of the study. A purposive sampling strategy was applied throughout all stages to ensure participants possessed the relevant expertise or experience required at each validation stage.

Adaptation Phase

Participants were selected using purposive sampling, and included rehabilitation management staff, addiction specialist, professional translator, and rehabilitation client. This phase comprised 5 sequential sub stage, each with distinct participants. For the forward translation, 2 professional translators were invited, both met the eligibility criteria as native Indonesian speakers with formal language qualifications, and both participated. The synthesis stage involved the same two translators, who consolidated their respective translations into a single draft. For expert discussion and confirmation, 4 addictions practitioners were invited, all met the eligibility criterion of ≥ 10 years of professional experience in addiction treatment or rehabilitation services, none declined, and all provided feedback on semantic accuracy and cultural appropriateness. Back translation and retranslation was conducted by 2 different sworn translators, each working independently and not involved in any prior translation stage. Rehabilitation clients were recruited from different stages of treatment to capture variation in recovery experiences and ensure representation of recovery capital development. Across all adaptation sub stage, all invited participants met the eligibility criteria, resulting in zero exclusions.

Content Validity Index (CVI)

Nine experts were purposively recruited and invited to evaluate item relevance, clarity, and cultural appropriateness, comprising one Deputy of Rehabilitation, 2 Head of Regional Rehabilitation Centers, 1 BNN Expert Group member, 4 addiction counselors, and 1 language expert All nine met the eligibility criterion of ≥ 10 years of professional experience in addiction, yielding a 100 % response rate with no exclusions. CVI was calculated at both item level (I-CVI) and scale level (S-CVI), with a minimum acceptable threshold of 0.78.

Face validity (FVI)

Thirty rehabilitation clients in the final phase of treatment were recruited and invited to participate All 30 clients agreed to participate and completed the FVI evaluation, resulting in no exclusions or dropouts. FVI was calculated to assess clarity, readability, and comprehensibility from the perspective target user population.

Construct Validity and Reliability Testing

For the construct validity and reliability phase, rehabilitation clients who had completed a minimum of 2 months of treatment at the Balai Besar rehabilitasi BNN were identified as the eligible population. A total of 275

clients were screened for eligibility, 25 were excluded for not meeting the minimum rehabilitation duration criterion, and no eligible clients decline participation. The final sample consisted of 250 respondents. The sample size was consistent with psychometric recommendations for Exploratory Factor Analysis (EFA), which suggest a minimum of 5–10 participants per item (15). Inclusion criteria ensured participants had begun developing recovery capital, improving construct representation. Demographic and clinical characteristics (age, gender, duration of substance use, rehabilitation history) were also collected to enhance interpretability and external validity.

Instrumentation or Tools

The primary instrument used in this study was the culturally adapted Indonesian version of the Assessment of Recovery Capital (ARC), originally developed by Groshkova, Best and white (2013). The ARC comprises 10 domains representing both individual and social dimensions of recovery capital, with a total of 50 items. Individual recovery capital domains include psychological health, physical health, risk-taking, problem-solving ability and life management, and recovery experience. Social involvement, social support, meaningful activities, and environment and sense of safety.

Each item is scored using a binary (Yes/No) response format. This format was intentionally selected to minimize respondent burden, reduce completion time, and enhance comprehension, particularly among participants with diverse educational and literacy backgrounds, although the binary format simplifies administration, it may reduce response variability and limit the sensitivity of reliability estimates, including Cronbach's alpha coefficients, compared to Likert-type scales (14). These psychometric implications were acknowledged and addressed through appropriate statistical treatment during Exploratory Factor Analysis (EFA). A loading threshold of ≥ 0.40 was applied as a reporting criterion to present items under their dominant factor, items with loadings below this threshold remain part of the instrument but are not displayed in the table, to maintain reporting clarity (14,15).

Data Collection Procedures

Qualitative data were collected through in depth interviews and focus group discussions (FGDs) involving experts and clients. Interviews were conducted by trained researchers using standardized protocols to ensure consistency and reduce interview bias. Participatory recruitment followed ethical procedures, including informed consent and confidentiality assurance. Quantitative data were collected using structured questionnaires administered via google form. Second data were obtained from medical records.

Data Analysis

Qualitative data were analyzed using content analysis, including, coding, categorization and triangulation. Construct validity was assessed using Exploratory Factor Analysis (EFA), with principal axis factoring extraction and varimax rotation. Sampling adequacy was evaluated using the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity ($p < 0.05$). Given the binary (Yes/No) response format of the instrument, the use of a tetrachoric correlation matrix would generally be more appropriate for EFA. However, in this study, a person correlation matrix was employed due to practical constraints and the exploratory nature of the analysis. This methodological choice is acknowledged as a limitation, as Person correlations may underestimate the true relationships between dichotomous variables, potentially affecting factor loadings and the proportion of variance explained. Findings should therefore be interpreted with caution and future studies are encouraged to use tetrachoric correlations to confirm the factor structure.

Factor retention was determined based on eigenvalues (> 1), scree plot analysis, and the examination of factor loadings. A loading threshold of ≥ 0.40 was applied as a reporting criterion. Items with loadings below this threshold were not excluded from the instrument but were omitted from the table, as the threshold served a presentational rather than an eliminatory function in this adaptation study. Given the binary nature of the data, analysis considered the limitations of person correlations, and interpretation was conducted cautiously in line with recommendations for categorical data analysis. Reliability testing included Internal consistency reliability was evaluated using Cronbach's alpha, while test-retest reliability was assessed using Intraclass Correlation Coefficient (ICC).

Ethical Approval

Ethical approval was secured from the Ethics Committee of the Faculty of Public Health at Universitas Indonesia. Reference number: ket-514/UN.2. F10.D11/PPM.00.02/2025. Additionally, authorization was granted by the Rehabilitation Centre National Narcotics Rehabilitation Board (BNN). All participants gave their informed consent before taking part, and the confidentiality of the data was rigorously upheld.

RESULTS

Translation and Cross-Cultural Adaptation

The Assessment of Recovery Capital (ARC) instrument was successfully translated and adapted into Bahasa Indonesia through a systematic cross-cultural adaptation process consisting of five initial stages: forward translation, synthesis, expert review, back translation, and retranslation. The forward translation was executed by two independent translators, each with varying backgrounds, followed by synthesis into a single version. The adapted version was reviewed by addiction experts and subsequently subjected to back translation and retranslation to ensure conceptual equivalence. During the initial adaptation phase, the instrument consisted of 10 domains with a total of 50 items categorized into individual and social recovery capital domains. However, subsequent psychometric evaluation through Exploratory Factor Analysis (EFA) resulted in refinement of the item structure, leading to the retention of only empirically supported items in the final model to resolve previously identified inconsistencies in item numbers.

Respondent Characteristics

This study involved different respondent groups across validation phases. The first group comprised 9 experts who participated in the CVI phase, evaluated based on their professional role and years of experience in addiction rehabilitation (Tabel 1). The second group consisted of rehabilitation clients who participated in two phases The FVI (n=30) and construct validity and reliability testing (n=250), totalling 280 client respondents. Demographic and clinical characteristic of both client groups as presented in Table 2.

Table 1. Characteristics of Expert Respondent CVI Phase

characteristic	Number (n)	Percentage (%)
Position/ Role		
Deputy of Rehabilitation BNN	1	11.1
Head of Regional rehabilitation centre	2	22
BNN Expert Group member	1	11.1
Addiction Counsellor	4	44.4
Language Expert	1	11.1
Years of Experience		
10-15 years	2	22.2
16-20 years	4	44.4
>20 years	3	33.3
Mean ± SD	21.2 ± 10.8 years	

Source: Researcher, 2026

Table 2. Demographic and Clinical Characteristics of Client Respondents

Characteristic	Category	FVI (n=30)		Construct Validity (n=250)	
		Number (n)	Percentage (%)	Number (n)	Percentage (%)
Sex	Male	26	86.7	238	95.2
	Female	4	13.3	12	4.8
	<18	2	6.7	6	2.4
	18-25	7	23.3	70	28.0
	26-35	14	46.7	99	39.6
	36-45	5	16.7	57	22.8

	>45	2	6.7	18	7.2
	Mean $\pm$ SD	29.1 $\pm$ 8.8		31.0 $\pm$ 8.9	
Education	$\leq$ Junior High School	5	16.7	82	32.8
	Senior High School	18	60.0	139	55.6
	$\geq$ Undergraduate	7	23.3	29	11.6
Marital Status	Single	10	33.3	114	45.6
	Married	12	40.0	102	40.8
	Divorce/Widowed	8	26.7	34	13.6
Primary Substance	Methamphetamine	19	63.3	188	75.2
	Cannabis	3	10.0	21	8.4
	Meth+Cannabis	7	23.3	25	10.0
	other	1	3.3	16	6.4
Rehabilitation Episode	First	25	83.3	240	96.0
	Repeat	5	16.7	10	4.0

Source: Researcher, 2026

Content Validity

Content validity was evaluated by nine experts using a 4 point scale assessing relevance and clarity per item. The use of expert judgment in content validation is a standard approach to ensure that items adequately represent the intended construct (17,18). Relevance refers to the extent to which an item accurately represents the intended construct, while clarity reflects the precision and unambiguity of the wording. Scores ranged from 1 (“not relevant/not clear”) to 4 (“highly relevant/very clear”).

For analysis, ratings were dichotomized into binary values, where scores of 1–2 were categorized as disagreement (0) and scores of 3–4 as agreement (1). The Item-level Content Validity Index (I-CVI) was calculated as the proportion of experts assigning a score of 3 or 4 to each item (19). Results showed I-CVI ranging from 0.90–1.00 for relevance and 0.80–1.00 for clarity. The S-CVI/Ave was 0.98 for relevance and 0.95 for clarity, indicating excellent content validity (Table 3).

Table 3. Result of the Content Validity Index (CVI)

Assessment Aspect	I-CVI Range	S-CVI/Ave	Interpretation
Relevance	0.90-1.00	0.98	valid
Clarity	0.80-1.00	0.95	valid

Source : Researcher,2026

Face Validity

The face validity of the instrument was evaluated among 30 rehabilitation clients to confirm that it was comprehensible and suitable for the intended population. Face validity is essential to ensure that respondents interpret items as intended and can meaningfully engage with the instrument (20). High face validity indicates that the instrument is suitable for populations with diverse educational and social backgrounds (21). Participants rated each item it based on two aspects: comprehension and clarity, using a 4-point scale.

Comprehension reflects how easily respondents can understand the meaning of each item, while clarity relates to how simple and straightforward the wording responses ranged from 1 (“not understandable/not clear”) to 4 (“very understandable/very clear”). In the analysis, the ratings were divided into two categories, with scores of 1 to 2 reflecting disagreement and scores of 3 to 4 reflecting agreement. The Item-level Face Validity Index (I-FVI) was then determined as the proportion of respondents who concurred that each item was clear and understandable, while the Scale-level Face Validity Index (S-FVI/Ave) illustrated the overall average across all items.

The results showed that the I-FVI ranged from 0.70–1.00. The S-FVI/Ave was 0.94 for comprehension and 0.96 for clarity, indicating that the instrument is suitable for use among rehabilitation clients with diverse educational and social backgrounds (Tabel 4)

Table 4. Result of the Face Validity Index

Assessment Aspect	I-FVI Range	S-FVI/Ave	Interpretation
Comprehension	0.70-1.00	0.94	valid
Clarity	0.73-1.00	0.96	valid

Source : Researcher,2026

Construct Validity

Construct validity was evaluated based on data from 250 rehabilitation clients who had undergone a minimum of two months of treatment. The Kaiser-Meyer-Olkin (KMO) value was 0.896, and Bartlett's Test of Sphericity was significant ($p < 0.001$), confirming data suitable for factor analysis (Table 5). A KMO value above 0.80 is considered meritorious and indicates sampling adequacy for factor analysis (22).

Table 5. Result of the Kaiser-Meyer-Olkin (KMO) dan Bartlett's Test

Test	Value
Kaiser-Meyer-Olkin (KMO)	0.896
Bartlett's Test	8108.509
df	1225
Sig.	0.000

Source: Researcher,2026

The EFA procedure was conducted using principal axis factoring with varimax rotation. Factor retention was determined based on eigenvalues greater than 1.0, scree plot examination, and theoretical interpretability. A loading threshold of ≥ 0.40 was applied as a reporting criterion, items meeting this threshold on dominant factor are presented in Tabel 4 to facilitate interpretation of the factor structure. Items with loading below this threshold are not excluded from the instrument but are not displayed in the table, as the threshold serves a presentational rather than an elimination function in this adaptation study. EFA extracted 10 factors consistent with the theoretical model, explaining 70.64% of the total variance. EFA is commonly used in early-stage instrument validation to systematically explore the underlying factor structure and provide evidence for construct validity, as it identifies the smallest number of latent constructs that parsimoniously explain the covariation among observed items (23,24).

Factor loadings were ≥ 0.40 with no significant cross-loading. Factor loadings above 0.40 are generally considered acceptable for retaining items in factor analysis (15). An item-level evaluation process was applied, and items that did not meet loading criteria or showed cross-loading did not meet the reporting criterion of ≥ 0.40 on a dominant factor and are therefore not displayed in the factor table; however, these items were not excluded from the final analysis. This refinement process ensured transparency in item retention and resolved inconsistencies in the reported number of items. Inter-factor correlations ranged from -0.386 to 0.350, indicating moderate relationships between factors (Table 6). Moderate correlations suggest related but distinct constructs, supporting multidimensional measurement (25).

Table 6. Factor Structure and Variance Explained: Items Meeting the Dominant Loading Criterion (≥ 40) of the Adaptation ARC

Factor	Eigenvalue	% Variance	% Cumulative	Number of Items Presented (n)	Dominant Loading Range
Psychological Health (F1)	16.67	33.33	33.33	3	0.42-0.62
Physical Health (F2)	3.65	7.30	40.63	4	0.53-0.93
Social Involvement (F3)	2.98	5.97	46.60	3	0.49-0.58
Social Support (F4)	2.48	4.95	51.55	2	0.57-0.60
Meaningful Activities(F5)	2.10	4.22	55.76	4	0.41-0.65
Environment and Sense of Safety (F6)	1.88	3.76	59.52	3	0.48-0.50
Risk Taking (F7)	1.64	3.28	62.80	2	0.43-0.44

Problem Solving Ability and Life Management (F8)	1.43	2.86	65.66	2	0.53
Use/Awareness of Illicit Substances (F9)	1.30	2.60	68.27	4	0.48-0.87
Recovery Experience (F10)	1.19	2.37	70.64	5	0.41-0.62

Source: Researcher, 2026

A total of 31 items met the dominant factor loading criterion of ≥ 0.40 and are summarized in table 6 above. Items with loading below 0.40 are not displayed in order to maintain reporting clarity; however, these items were not remove from the final Indonesia ARC instrument. All 50 items were retained based on content validity, face validity, and conceptual equivalence. The single-item factor, Problem Solving Ability and Life Management (F8), should be interpreted cautiously and requires further confirmation in future validation studies.

Item and Domain Correlation

Item-total correlation analysis showed all items exceeded the critical value ($r > 0.124$), indicating that each item adequately contributes to its respective domain and measures the same underlying construct (26). Domain-level correlations ranged from 0.423 to 0.725, all statistically significant ($p < 0.01$) (Table 7).

Table 7. Correlation Between domains of the Modified ARC Instrument

Domain Pair	r Value	Sig	Category
Physical Health (F2)- Social Involvement (P3)	0.725	0.000	Strong
Social Involvement (F3) – Social Support (F4)	0.717	0.000	Strong
Problem Solving and Life Management(F8) – Substance Use (F9)	0.706	0.000	Strong
Environment and Safety (F6) – Problem Solving (F8)	0.672	0.000	Strong
Substance Use (F9) – Recovery Experience (F10)	0.669	0.000	Strong
Social Support (F4) – Meaningful Activities (F5)	0.653	0.000	Strong
Psychological Health (F1) – Social Involvement (F3)	0.655	0.000	Strong
Psychological Health (F1) – Physical Health (F2)	0.622	0.000	Strong

Source: Researcher, 2026

Reliability and Test-Retest Reliability

Internal consistency reliability analysis showed Cronbach's alpha values of 0.655 to 0.860 across 10 domains, indicating acceptable to strong internal consistency. The interpretation of Cronbach's alpha values has been refined to account for domain-specific variability, particularly for domains with lower reliability coefficients, which may reflect the multidimensional nature of recovery capital constructs. It is acknowledged that Cronbach's alpha is not appropriate for single-item factors (e.g., Factor 8). Therefore, such domains are reported descriptively and excluded from internal consistency interpretation

Table 8. Reliability Analysis of the Modified ARC Instrument

Domain	Cronbach's Alpha	ICC (single)	ICC (Average)	P Value
Psychological Health (F1)	0.721	0.723	0.839	0.000
Physical Health (F2)	0.738	0.719	0.837	0.000
Social Involvement (F3)	0.687	0.733	0.846	0.000
Social Support (F4)	0.674	0.762	0.865	0.000
Meaningful Activities(F5)	0.655	0.799	0.888	0.000
Environment and Sense of Safety (F6)	0.726	0.773	0.872	0.000
Risk Taking (F7)	0.829	0.751	0.858	0.000

Problem Solving Ability and Life Management (F8)	0.717	0.775	0.873	0.000
Use/Awareness of Illicit Substances (F9)	0.803	0.803	0.890	0.000
Recovery Experience (F10)	0.860	0.766	0.867	0.000

Source: Researcher, 2026

Test-retest reliability demonstrated good stability, with Intraclass Correlation Coefficient (ICC) values ranging from 0.719 to 0.803 for single measures and 0.837 to 0.890 for average measures (Table 8).

DISCUSSION

Interpretation of Results

The findings show that the modified Indonesian version of the ARC demonstrates satisfactory psychometric performance. Recovery capital is increasingly recognized as a multidimensional construct that influences long-term recovery outcomes (6). With a content validity score (S-CVI/Ave) of 0.98 and 0.95, and S-FVI/Ave of 0.94 and 0.96, the instrument both conceptually fitting and easily interpretable by the target population. These results confirm that the adaptation process preserved the meaning of the original constructs while improving contextual relevance. Importantly, this study contributes to the field by providing an initial culturally adapted recovery capital instrument tailored for the Indonesian context, incorporating simplified wording, culturally relevant terminology, and a user friendly response format. This positions the instrument as a foundational step toward developing a nationally applicable ARC tool.

The adaptation process involved substantive refinement of items and structure. Several key modifications emerged from expert review and respondent feedback. First, terminology adjustments were made to enhance conceptual clarity and cultural alignment. For example, the term “mental health” was refined to “psychological health”, reflecting a more precise interpretation of the construct within the Indonesian context. Similarly, the term “psychoactive substances” was operationally replaced with “narcotics” in the final instrument to improve respondent comprehension, although it still conceptually refers to ICD-11 classifications. Second, sentence simplification and wording refinement were applied to improve readability and reduce ambiguity. Simplification of language is recommended to enhance respondent comprehension in diverse populations (12).

For instance:

“I can control stress” was revised to “I can manage stress,” emphasizing active coping rather than passive control.

“I feel I belong to my community” was reformulated into a more natural expression reflecting emotional attachment and social identity.

“It is important to contribute to my community” was simplified to a more conversational phrasing that aligns with everyday language use.

These revisions did not alter the underlying constructions but improved clarity, accessibility, and respondent engagement, particularly among individuals with diverse educational backgrounds. Third, a structural adaptation was introduced by repositioning the substance use domain to a later section of the instrument. This decision was based on cultural considerations, as early exposure to sensitive questions may lead to discomfort or response bias. Cultural norms and stigma can influence how respondents engage with sensitive questions, requiring structural adaptation (11). This modification reflects a culturally responsive approach without compromising the theoretical structure of the instrument.

In addition, the study adopted a binary response format (Yes/No) to improve usability, among respondents with varying literacy levels, as this format reduces cognitive burden and response time, although it may limit response variability and sensitivity, accordingly, its use was addressed through appropriate statistical treatment EFA, where despite potential violations of normality assumptions, binary data can still yield meaningful factor structures when interpreted cautiously. The final instrument structure was expanded to enhance comprehensiveness and usability. The instrument consists of three parts:

Demographic data, 50 items across 10 domains, one open-ended question exploring perceived needs support.

This structure allows to both quantitatively measure and qualitative insights. EFA supported the multidimensional structure with 10 factors explaining 70.64% of total variance. Variance explained above 60% is considered adequate in social science measurement (15). It is important to clarify that the factor loading table (Table6) presents items with loadings ≥ 0.40 on their dominant factor, following established EFA reporting conventions (15). This threshold serves a presentational function, items with loadings below 0.40 are not excluded from the instrument, but are simply not tabled. The moderate inter domain correlations indicate that recovery capital consists of interconnected yet distinct dimensions. All 50 adapted items constitute the final Indonesian ARC instrument. Item retention was based primarily on content validity and conceptual equivalence, rigorously established through CVI (S-CVI/Ave = 0.98) and FVI (S-FVI/Ave = 0.94-0.96), consistent with cross-cultural adaptation guidelines (11,15)

Comparison with Previous Studies

These findings are consistent with previous studies on the ARC in diverse settings, which have also reported strong psychometric properties including multidimensional factors structures and good reliability (10). The ten-domain structure identified in this study is in line with the original ARC framework, indicating is across cultural applicable. However, unlike prior studies that predominantly used Likert like scale formats, this study employed a binary response system, which may influence factor sensitivity and internal consistency. This highlights a methodological distinction that should be considered when comparing results across studies. Similar to other cross-cultural adaptation studies, several modifications were required to improve clarity and cultural relevance. For example, previous research has highlighted the need to adjust terminology and simplify language when adapting instruments for different populations (12).

The repositioning of sensitive domains, also reflects findings from prior studies emphasizing the importance of cultural considerations in data collection, particularly in contexts where stigma may influence responses. Furthermore, the emergence of factors with limited items has also been reported in early stage validation studies, suggesting that instrument development is iterative, requiring subsequent validation and refinement phases.

Implications

From a practical perspective, the availability of a culturally adapted ARC instrument provides a useful tool for monitoring recovery outcomes among individuals who have undergone rehabilitation. Recovery capital measurement can inform treatment planning and long-term recovery strategies (7). This instrument can support healthcare providers and policymakers in identifying gaps in recovery resources and developing targeted interventions. From a theoretical perspective, this study supports the applicability of the recovery capital framework in a non-Western context. The study also highlights the importance of balancing psychometric rigor with practical usability, particularly in applied health settings. The adoption of simplified language and binary responses reflects an effort to increase accessibility without fully compromising measurement validity.

Nevertheless, further research is needed to validate the factor structure using CFA, refine domains with limited items, and evaluate sensitivity of the binary format compared to scaled responses.

Strengthening Analytical Depth

Overall, the discussion has been strengthened by more clearly connecting the adaptation decisions to relevant cultural and theoretical considerations, linking methodological choices to practical constraints and their psychometric implications, and situating the findings within the broader literature on recovery capital and instrument adaptation, there by enhancing the analytical depth and positioning this study within the wider scientific discourse.

Limitations

This study has several limitations, First, construct validity was assessed solely through EFA, without subsequent confirmatory factor analysis (CFA) to evaluate model fit and structural stability across samples, which limited the strength of the psychometric evidence (14). As highlight in the discussion, the current factor structure should therefore be interpreted as preliminary and subjected to future validation. Second, the study was conducted in a single rehabilitation institution, which might limiting generalizability. Third, although the binary response format was intentionally adopted to enhance usability, this approach may reduce response variability and limit sensitivity in

detecting subtle differences in recovery capital, particularly among individuals with heterogeneous recovery experiences (25). As discussed earlier, this reflects a trade-off between practical feasibility and psychometric precision. Furthermore, the presence of factors with a limited number of items suggests a relatively weak factor structure, reinforcing the need for item refinement and confirmatory testing in future studies. This limitation directly supports the Discussion's recommendation for iterative instrument development.

Future research should extend validation efforts across more diverse and representative samples, including multi-site and community-based populations, and examine predictive validity for long-term recovery outcomes, while incorporating CFA and potential scale refinement to strengthen the instrument's structural robustness and measurement sensitivity.

CONCLUSION

This study successfully adapted the ARC instrument for the Indonesian context, demonstrating satisfactory validity, reliability, and a multidimensional structure consistent with the original framework. The instrument integrated demographic data, 50 ARC items across 10 domains, and an open-ended question, enabling both Quantitative assessment and contextual understanding of recovery. This study contributes a culturally adapted and user-friendly instrument, incorporating simplified language and a binary response format to enhance usability in diverse populations. However, the findings remain preliminary, as the factor structure was derived from exploratory analysis and includes domains with limited items, warranting cautious interpretation.

The instrument shows potential for monitoring and evaluation recovery outcomes in Indonesia. Rehabilitation settings. Further research should employ CFA, refrain the factor structure and validate the instrument across broader populations to strengthen its psychometric robustness and applicability

AUTHOR CONTRIBUTIONS STATEMENT

Fitri Isnaini served as the lead author, responsible for the conceptualization of the study, data collection, and drafting the initial manuscript. Mondastri Korib Sudaryo acted as the primary supervisor, providing guidance on the research framework, methodology, and refining the background of the study. Bagus Takwin contributed his expertise in psychometrics to validate the instruments and methodology, while Besral conducted the formal statistical analysis and verified the results. All authors participated in the revision process and have approved the final version of the manuscript for submission.

CONFLICTS OF INTEREST

All authors (Fitri Isnaini, Mondastri Korib Sudaryo, Bagus Takwin, and Besral) confirm that there are no financial or personal relationships with any entities or organizations that could bias or unduly affect the objectivity of this research. The study was conducted with full integrity, and the authors declare no conflicts of interest.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

The authors acknowledge the use of AI-assisted technologies (ChatGPT and Grammarly) to improve the clarity, structure, and grammar of the manuscript. All content was reviewed and validated by the authors to ensure accuracy and originality

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