Received: 17 November 2023 | Revised: 6 March 2024 | Accepted: 8 March 2024

DOI: 10.1002/dad2.12591

Alzheimer's & Dementia
Diagnosis, Assessment & Disease Monitoring

RESEARCH ARTICLE

Culturally adapted cognitive assessment tool for Indigenous communities in Brazil: Content, construct, and criterion validity

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Funding information
Amazonas State Fundação de Amparo à Pesquisa do Estado do Amazonas – FAPEAM; the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES)

Abstract

INTRODUCTION: Initial dementia prevalence estimates have revealed a significant burden of the disease in Indigenous communities in Amazonas, Brazil. However, the need for culturally adapted cognitive tools poses a critical challenge when assessing cognitive performance in these communities. This study addressed this issue by culturally adapting and providing validity indicators for the Brazilian Indigenous Cognitive Assessment (BRICA) tool in Manaus, Brazil's urban multiethnic Indigenous community.

METHODS: Using a three-stage process and a stakeholder-engaged approach, the BRICA tool was culturally adapted in an urban multiethnic Indigenous community from Manaus, Brazil. The content validity index (CVI) examined inter-rater concordance between experts, while criterion and concurrent validity were performed using diagnostic consensus criteria in 141 Indigenous participants aged ≥ 50 years.

RESULTS: Findings showed evidence of content validity in terms of equivalence aspects (scale CVI [S-CVI] 0.93) and relevance ratings (S-CVI 0.85) between expert panels. The identified cut-off score of ≤ 33/39 on the BRICA demonstrated a sensitivity of 94.4%, specificity of 99.2%, positive predictive value of 94.4%, and negative predictive value of 99.2% for dementia diagnosis.

DISCUSSION: Using a stakeholder-engaged approach, we culturally adapted the BRICA tool for a Brazilian urban multiethnic Indigenous community. This comprehensive adaptation process resulted in favorable indicators of content, construct, and criteria validity for the BRICA tool. By addressing the existing bias in cognitive assessment within Indigenous communities, the BRICA tool represents a noteworthy breakthrough. Its implementation exhibits potential for improving the early detection and management of dementia among Indigenous groups.

KEYWORDS
cognitive assessment, dementia, Indigenous

Highlights

- Culturally sensitive tools are essential to assess cognition in Indigenous populations.
- An expert panel and stakeholders' perspectives were incorporated to design the Brazilian Indigenous Cognitive Assessment (BRICA) tool.
- A cognitive screening tool was adapted and validated using a stakeholder approach.
- BRICA is the first culturally sensitive cognitive tool for urban Brazilian Indigenous individuals.

1 | INTRODUCTION

Indigenous populations remain underrepresented in studies on dementia, limiting our understanding of the disease's impact on various groups and factors augmenting prevalence.[1,2] A significant barrier is the absence of culturally sensitive cognitive assessment tools considering Indigenous-specific characteristics.[1] While numerous cognitive assessment instruments are available for the broader older Brazilian population,[3] none are specifically culturally sensitive to older Brazilian Indigenous individuals.

Since the World Health Organization launched the Global Action Plan on the Public Health Response to Dementia 2017–2025,[4] noticeable strides have been made in raising global disease awareness. These advances align with action areas such as stigma reduction and resource availability for early detection and risk factor control. Nevertheless, minority groups like Indigenous individuals remain underrepresented in dementia studies, limiting our understanding of the disease's impact on diverse groups and challenges to health equity.[5,6] The few existing studies on Indigenous populations indicate a considerably variable dementia rate (0.5%–26.8%), attributed partially to methodological limitations and neuropsychological tests not designed initially to probe Indigenous cultural aspects, leading to biased cognitive assessment.[7] That lack of cognitive tools that are culturally sensitive is a significant barrier to overcoming health disparities in early diagnosis and timely intervention among minority groups.

The Kimberley Indigenous Cognitive Assessment (KICA-Cog), developed by Australian researchers, was the first cognitive assessment tool to be devised with the participation of Indigenous organizations, who shared their perspectives and experiences, rendering the tool culturally safe and valid for use in Kimberley Aboriginal Australians.[8] The KICA-Cog assesses orientation, recognition and naming, registration, verbal comprehension, verbal fluency, recall, visual naming, frontal/executive function, free recall, cued recall, and praxis. The tool comprises 16 questions with a maximum score of 39 points and a cut-off score of 33 for dementia established for remote and urban Indigenous Australian communities.[8–9]

The KICA-Cog has been adapted for Indigenous communities within Australia[9] and other countries such as Canada (CICA)[10] and Iran.[11] In Latin America, a region with a high Indigenous population and rapidly rising prevalence of dementia,[12] only one study validated a cognitive assessment tool in Indigenous people from Bolivia.[13] The evidence of dementia prevalence in these countries was obtained using verbal assessment tests validated for low-educated groups but not culturally adapted for use in Indigenous populations.[13–17]

In Brazil, prevalence studies have been conducted using traditional cognitive tests, with a cut-off point adjusted according to education and two standard deviations below the average for the general older population.[15,18] Despite the metric adjustment made to cut-off scores controlling for the education level of older Indigenous participants, this strategy fails to address the need to culturally adapt the elements of the scales (e.g., phrases, figures, tasks) and, thus, cannot measure cognition correctly because of the inclusion of elements that hold no meaning to Indigenous culture. Preserving the culture is essential to building trustful relationships and improving accessibility and usability to health-care resources.[5,6,8] That is especially relevant in urban scenarios, in which Indigenous communities confront metropolitan discrimination, exclusion, and struggle to preserve their cultural identity.[8,19] In Manaus, a metropolitan area of Amazonas, Brazil, the number of Indigenous people living in urban non-traditional land has increased considerably. The non-traditional Indigenous settlement arose when individuals from various Amazonian ethnic groups migrated to the metropolis in the 1980s for improved living conditions, employment, and health care. Confronting the adaptation to the metropolitan lifestyle with their cultural identity, these migrants tried to live in the same geographic area to support each other. That solidarity culminated in establishing an urban multiethnic Indigenous community to maintain Indigenous heritage, ensure community safety, and enhance visibility for city-dwelling natives. Designing a cognitive instrument that includes cultural elements and traditional knowledge for urban Indigenous communities is essential to promote primary prevention and increase dementia awareness.

The objective of the present study was to adapt and provide validity indicators for the Brazilian Indigenous Cognitive Assessment (BRICA) tool in an urban multiethnic Indigenous community in Manaus, Brazil.

2 | METHODS

2.1 | Adaptation of KICA-Cog for Brazilian Portuguese

After receiving permission from the authors of the original scale,[7] the process of adaptation of the KICA-Cog for Brazilian Portuguese

commenced via the recommended three-stage methodologically robust process to ensure the content of the tool was maintained, together with its psychometric properties and cultural adequacy for the urban multiethnic Indigenous community in Manaus, Brazil.[20] That community emerged in the 1980s when Indigenous people from Amazonas traditional lands migrated to Manaus for better life opportunities and in response to territorial invasions.[19] This led to profound social, cultural, identity, and linguistic transformations related to the urban environment adaptation and coexistence with Indigenous people of other ethnicities.[19] Because of that, many lost their native languages, adopting Portuguese for integration and communication. To maintain their cultural heritage in Manaus, the Indigenous community engaged in symbolic expressions like painting, dance, crafts, and community rituals that embody their ancestral knowledge and reverence for nature. This history underpins our study's approach to not translating our tools into Indigenous languages but instead integrating cultural elements aligned with the traditional knowledge and life of the community.

2.1.1 | Translation of the tool from source language into the target language

The original version of the KICA-Cog in English was translated into Brazilian Portuguese by two independent translators who were not members of the research team, both fluent in English and who were Brazilian natives. A translator with expertise in cognition (T1) produced one of the translated versions. In contrast, the second version was produced by a lay translator but with semantic, cultural, and conceptual mastery of Brazilian Portuguese (T2) to incorporate the language used by the Brazilian population in general.[21]

2.1.2 | Synthesis of translated versions

A third translator produced a synthesized version of the scale (T3) after analysis of the differences in translations T1 and T2,[22] and the resultant tool was designated the BRICA.

2.1.3 | Back-translation, and assessment by original authors

Version T3 of the scale was back-translated into English by a native speaker of Portuguese who was fluent in English, and also by a native speaker of English who was fluent in Portuguese.[23] After back-translation, the team of authors of the original version of the KICA assessed the instrument to identify differences in cultural or idiomatic expressions that might affect the items and the purpose of their respective measurements. The authors approved the back-translation with no suggestions for changes.

RESEARCH IN CONTEXT

1. **Systematic review**: Despite increased risk factors like lower education levels, hypertension, diabetes, sedentary lifestyle, and obesity among Indigenous communities, dementia research remains limited. This disparity significantly arises from the lack of culturally adapted tools representing Indigenous roots and characteristics.
2. **Interpretation**: Our study, however, took a significant step forward by tailoring and validating a culturally safe and valid cognitive assessment tool for an urban Indigenous community in Amazonas, Brazil, using a stakeholder-engaged approach. This tool has shown considerable cultural adequacy and reliability for dementia screening among Indigenous adults of middle age and older.
3. **Future directions**: Addressing the current bias in cognitive assessment within Indigenous societies, our tool embodies remarkable progress. It holds promise for enhancing early dementia detection and treatment management within Indigenous populations.

2.2 | Content validity of BRICA

2.2.1 | Content validity by expert panel

A panel of five expert judges qualified in health anthropology, geriatrics and gerontology, language, and nursing independently analyzed the adequacy of versions T1, T2, and T3 of the scale for semantic, idiomatic, cultural, and conceptual equivalence.[24] For each of these domains and each tool item, the judges attributed a score on a Likert-type scale (1 = not equivalent; 2 = uncertain; 3 = equivalent). In addition, the judges assessed clarity of language, representativeness or theoretical relevance, and practical pertinence, answering the following questions: Is this item clear to you? Is this item relevant for assessing the phenomenon from a theoretical standpoint? Is this item important for assessing the phenomenon in practice? Answers were given on a Likert-type scale (1 = no; 2 = requires major change; 3 = requires minor change; 4 = yes). The study researchers discussed the judges' suggestions, and after reaching consensus, the pretest version of the BRICA was obtained.

2.2.2 | Content validity by stakeholders

The pretest version of the BRICA was submitted to the stakeholders advisory board (SAB) comprising an urban Indigenous certified nursing assistant, two primary care nurses from the Indigenous area, six local Indigenous community members, and an Indigenous research assistant. The SAB was organized with the assistance of Indigenous leaders and by health managers responsible for the area of the urban

Indigenous community of Manaus. The team of researchers received support from an Indigenous researcher whose involvement in the study led to the construction of new information derived from co-learning between traditional and scientific Indigenous knowledge.[25] Each item of the pretest version of the BRICA was discussed together with researchers and SAB members, and the adjustments were incorporated after reaching a consensus. The aspects of the BRICA evaluated were task comprehension, clarity of language, adequacy for age group, objectiveness of prompts, and adequacy of images.

2.3 | External validation of BRICA

2.3.1 | Study participants and setting

The study occurred within an urban multiethnic Indigenous community in Manaus, Amazonas State, Brazil. The chosen community encompassed 34 distinct Indigenous ethnicities (tribes), representing ≈ 11.1% of Brazil's 305 officially recognized Indigenous groups. That community is distinguished by its considerable population and the diverse ethnicities in one urban setting in Manaus. The most prominent ethnic groups were the Baré, representing 21% of the community population, followed by the Kokama at 15%, and the Tukano at 11%. That community consisted of 341 households, housing 1290 residents, according to data from the Organization of Indigenous People of Manaus and Surrounding Regions (COPIME). To be eligible for inclusion, community members had to: be ≥ 50 years, self-identify as Indigenous, and reside in the urban setting, comprising 167 individuals as the target population. From the target population, 26 individuals were not included in the final sample due to the following reasons: did not understand Portuguese ($n = 3$), not found at household ($n = 5$), severe visual deficit ($n = 2$), refused to take part ($n = 10$), residing < 6 months in an urban area ($n = 1$), and died before data collection ($n = 5$). Consequently, the study proceeded with a final sample of 141 Indigenous participants.

The study was approved by the research ethics committee of the University of São Paulo School of Nursing (EEUSP) under permit No. 4.252.377 and by the National Research Ethics Committee (CONEP), permit No. 4.396.738. All participants signed the consent form.

2.3.2 | Data collection procedure

The data were collected at the participants' houses between August 2021 and January 2022, the season with less rain. The study was publicized via videos and social media with the help of SAB members and community leaders. All households registered at the local health service with a resident aged ≥ 50 years were visited, and those interested in taking part were included in the study. Moreover, we covered the community area extending > 27.65 square kilometers through systematic door-to-door visits with the Indigenous community leaders' support to ensure an equal chance of participation for eligible individuals in our research. We informed the community about the study and forthcoming research visits through proactive communication. In a previously scheduled interview at the participant's household, the tests were applied, including the BRICA, along with the questionnaire collecting sociodemographic data and health habits.

As a benefit to the community, any health issues identified during the health assessment were quickly dealt with in the most urgent cases (very high blood pressure and acute pain), while other needs requiring appointments with specialists, exams, and medication, among others, were notified to the local health team so that these could be addressed. Given the priorities, the assessments of those individuals needing urgent care were rescheduled for later.

2.3.3 | Diagnostic consensus

Cognitive tests were applied in the following order: (1) Mini-Mental State Examination (MMSE) served as a test for global cognitive function; (2) Brief Cognitive Screening Battery (BCSB) was used to test delayed recall of standard figures represented as printed drawings (including a shoe, house, comb, airplane, turtle, book, spoon, tree, and bucket), involving immediate and delayed recovery (after 5 minutes); (3) Verbal Fluency (VF)—animals and fruit category test was also used, featuring cut-off scores standardized according to low educational level[18,26–28] and previously implemented in studies with Indigenous people;[13,15] (4) Pfeffer Functional Activities Questionnaire (FAQ) evaluated functional capacity;[29] and (5) BRICA.

Following the core clinical criteria for all-cause dementia,[30] the performance on these cognitive tests was examined for cognitive or behavioral (neuropsychiatric) symptoms by two clinical experts, a non-indigenous neurologist and a primary care provider with expertise in dementia and Indigenous health. They independently reviewed the cognitive and functional evaluation results, except for the BRICA, as it was not considered for consensus diagnosis. Based on their assessments, the participants were categorized into three groups: cognitively unimpaired, cognitive impairment not dementia (CIND),[26–28] or dementia. This classification was derived from cognitive and functional evaluation results following the recommendations from the National Institute on Aging–Alzheimer's Association workgroups on core clinical criteria for all cause-dementia,[30] and adjusted for the participant's education level,[13,16,26,29] as previously described elsewhere.[13,15] Participants were sorted as (1) cognitively unimpaired if no cognitive and functional impairments were detected, or functional impairment was purely due to physical constraints, not cognitive dysfunction; (2) CIND if solely cognitive impairment was present; and (3) dementia if both cognitive and functional impairments were detected.

2.3.4 | Construct validity: convergent and divergent validity

Convergent validity was analyzed based on the correlation between BRICA and MMSE, BCSB, and VF scores.[18,26–28] Divergent validity was determined by comparing BRICA scores to the other cognitive test scores in cognitively unimpaired, CIND, or dementia participants.

2.3.5 | Criterion validity: concurrent

Concurrent criterion validity involved verifying if the BRICA measure's sensitivity, specificity, and accuracy were consistent with the established diagnostic standards using general and class statistics.

2.4 | Data analysis

Content validity was evaluated using the item content validity index (I-CVI) and scale content validity index (S-CVI).[31] The I-CVI was determined by calculating the ratio of expert agreement considering just the quantitative evaluations that received maximum scores by the judges, divided by the total of evaluations. The S-CVI was determined by calculating the average I-CVI across items.[32] Both indices were computed to ensure consensus among the review panel regarding the tool's equivalence, language representativeness, and pertinence.[32]

The search for evidence of external validation began with the descriptive analysis of the scales, considering the total sample and later by group. Regarding construct divergent (discriminant), the one-way analysis of variance test was used, with Welch correction, to test the hypothesis that BRICA measures for the three cognitive status groups (cognitively unimpaired, CIND, and dementia) differed, thereby confirming the construct validity of the tool. On pairwise multiple comparison of groups, the Games–Howell pairwise comparison of means was used for the BRICA and BCSB, whereas the Tukey honestly significant difference pairwise comparison of means was used for the MMSE and VF tests. Correlation of the BRICA with cognitive tests was used to determine construct validity. Convergent validity was assessed using Pearson product–moment correlation between scores on the BRICA versus the MMSE, BCSB, and VF tests. Moderate correlation coefficients are ideal for confirming convergent validity for the scale.[32]

The Youden *J* index metric was used to capture participant performance and establish suitable cut-off points for the BRICA based on general statistics on the pairs of cut-off points according to the cognitive classifications of cognitively unimpaired, CIND, and dementia. The process adopted entailed generalizing the search for cut-off points for a random number of groups, an exhaustive search of all possible cut-off points, to maximize some metric. The metric used was at the 85 mark on the Youden Index, attained by summing sensitivity plus specificity and selecting the point with the highest sum possible. A confounder matrix was constructed to show how the classification behaved according to the cut-off points found.

Statistics were generated on this pair of cut-off points for both the accuracy that correctly produced the proportion of correctly predicted cases, and the measure of concordance between observed data and that predicted by the Cohen kappa coefficient and for the measure of agreement between observed and predicted data considering the order produced by the Cohen kappa coefficient with quadratic weighted kappa. The class statistics showed the performance of cut-off points, as if each of the groups were a positive category, specifying the proportion of positive cases in the sample (prevalence), proportion of positive cases predicted as positive (sensitivity), proportion of negative cases classified as negative (specificity), proportion of cases classified as positive that were positive (positive predictive value [PPV]), and the proportion of cases classified as negative that were negative (negative predictive value [NPV]). All statistical analyses were performed using the R statistics package, version 4.3.0.

3 | RESULTS

3.1 | Sample characteristics

The external validity of the tool was analyzed using a sample of 141 individuals, predominantly female (58.2%), aged from 50 to 90 years (mean = 61.9 years, standard deviation [SD] ± 9.2), with low education level (mean = 5.7 years, SD ± 4.4, range: 0–18 years, 15.6% illiterate), and 56.7% living in extreme poverty. Hypertension (46.4%), smoking (53.9), alcohol abuse (24.1%), and obesity (body mass index ≥ 32 kg/m^2) emerged as the most common chronic conditions. In terms of diagnostic consensus, 75.9% were categorized as cognitively unimpaired ($n = 107$), 11.3% as CIND (n 16), and 12.8% were diagnosed with dementia ($n = 18$).

3.2 | Transcultural validity

The scale underwent adjustments during the stages of translation and analysis by the panel of experts and stakeholders to maintain cultural and linguistic equivalence (Table 1). The final version of BRICA was the one suggested by stakeholders in consensus with researchers (Table 1).

3.3 | Content validity

Content validity analysis by the judges identified a S-CVI of 0.93 and I-CVIs ranging from 0.70 to 1.00. Only item 4.2 (Table 1) had a low value (I-CVI = 0.70). Non-equivalent (undecided and non-equivalent) items were adapted as outlined in Table 1. Regarding the relevance of the items, the S-CVI is 0.85, and the I-CVIs range from 0.73 to 1.00. Item 2 had a value deemed low (I-CVI 0.73) and was adapted (Table 1).

In addition, the panel of experts suggested that the figures be represented in their proper format, that is, in the form of photographs instead of line drawings. However, photographs led to visualization problems, influencing the identification of the object and, hence, impacting the naming process. These difficulties arose chiefly in participants who had mild visual deficits and were also influenced by the quality of the paper, printing, and image resolution. The photographic images were adapted to line drawings in response to stakeholder suggestions. The visualization problems were not apparent when the figures were conveyed as black-and-white line drawings; therefore, this format was adopted in the final version of the tool.

In the validation by stakeholders, the primary suggestions for change versus the scale suggested by the expert panel were like the figures from the tool and the items "orientation," "recognition," and "naming" (Table 1). Regarding the figures, the suggestions were to replace the figures with others that better represented the culture and everyday life of the urban multiethnic Indigenous community of

TABLE 1 Original KICA-Cog scale items and modifications suggested by the expert panel and stakeholders for content validation.

Sections	Item	Original KICA-Cog	Content validity expert panel	Content validity stakeholders
Title	-	Kimberley Indigenous Cognitive Assessment (KICA)	Brazilian Indigenous Cognitive Assessment (BRICA)	Brazilian Indigenous Cognitive Assessment (BRICA)
Instructions	-	I'd like to see if you can remember things. I'll ask you some questions.	I'd like to see if you can remember things. I will make you a few questions	I'd like to see if you can remember things. I will make you a few questions
Orientation	1	Is this week pension/pay week?	What month of the year are we?	What month of the year are we?
	2	What time of year is it now?	What time of year is it now?	Are we in a period of high or low water in the rivers in this region?
	3	What is the name of this community/place	What is this place where we are?	What is this place where we are?
Recognition and naming	4	Hold up each item in turn and ask What do you call this? Comb Pannikin (cup) Matches	Hold up each item in turn and ask What do you call this? Comb Mug Matches	Hold up each item in turn and ask What do you call this? Comb Mug Mirror
Immediate memory	5	Hold up each item in turn and ask: I'm going to put this one here, this one here… Now don't forget where I put them.	Hold up each item in turn and ask: I'm going to put this one here, this one here… Now don't forget where I put them	Hold up each item in turn and ask: I'm going to put this one here, this one here… Now don't forget where I put them.
	6	Tell me about the objects I have shown you	Tell me about the objects I have shown you	Tell me about the objects I have shown you
Listening comprehension	7	Close your eyes	Close your eyes	Close your eyes
	8	First, point to the sky, and then point to the ground	First, point to the sky, and then point to the ground	First, point to the sky, and then point to the ground
Verbal fluency	9	Tell me the names of all the animals that people hunt	Tell me the names of all the animals that people hunt	Tell me animal names.
Delayed recall	10	Where did I put the comb? Where did I put the matches? Where did I put the pannikin?	Where did I put the comb? Where did I put the matches? Where did I put the mug?	Where did I put the comb? Where did I put the mirror? Where did I put the mug?
Visual naming	11	I'll show you some pictures. You tell me what they are. Remember these pictures for later on. Point to each picture and ask What's this? (Show boomerang as example). Point each figure and ask: What is this? (Show a bow and arrow as an instance). Now remember them because I'll ask you one more time: boy, emu, billy/fire, crocodile, bicycle	I will show you some figures. You will tell me what they are. Point each figure and ask: What is this? (Show a bow and arrow as example). Now remember them because I'll ask you one more time: boy, emu, fire, crocodile, bicycle	I will show you some figures. You will tell me what they are. Point each figure and ask: What is this? (Show a tree as example). Now remember them because I'll ask you one more time: hoe, jaguar, basket, pineapple and canoe
Executive functioning	12	Look at this. Now you copy it. Show alternating crosses and circles	Look at this. Now you copy it. Show crosses and circles	Look at this. Now you copy it. Show crosses and circles
Free recall	13	You remember those pictures I showed you before? What were those pictures? Tell me (Show boomerang as example)	You remember those pictures I showed you before? What were those pictures? Tell me	You remember those pictures I showed you before? What were those pictures? Tell me Show a tree as example)
Cued recall	14	Which one did I show you before? (one of three pictures, use boomerang page as example)	Which one did I show you before? (one of three pictures, use the bow and arrow as example)	Which one did I show you before? (one of three pictures, use the tree as example)
Praxis	15	Open this bottle and pour water into this cup	Open this bottle and pour water into this cup	Open this bottle and pour water into this cup
	16	Show me how to use this comb	Show me how to use this comb	Show me how to use this comb

Note: Highlights are the modified questions after expert and stakeholders' evaluation.

TABLE 2 Pair-wise group comparison according to correction for multiple comparisons.

		Cog-unimpaired CIND	Cog-unimpaired Dementia	CIND Dementia
Games–Howell means for BRICA	Statistic	5.138	7.259	6.288
	P value	**0.004**	**< 0.001**	**< 0.001**
Tukey HSD means for MMSE	Statistic	3.715	12.812	6.601
	P value	**0.026**	**< 0.001**	**< 0.001**
Games–Howell means for BCSB	Statistic	9.333	16.203	8.031
	P value	**< 0.001**	**< 0.001**	**< 0.001**
Tukey HSD means for VF	Statistic	0.836	8.634	5.772
	P value	0.836	**< 0.001**	**< 0.001**

Note: Bolded numbers are $P \leq 0.05$.
Abbreviations: BCSB, Brief Cognitive Screening Battery; BRICA, Brazilian Indigenous Cognitive Assessment; CIND, cognitive impairment not dementia; Cog-unimpaired, cognitively unimpaired; HSD, honestly significant difference; MMSE, Mini-Mental State Examination; VF, Verbal Fluency.

Manaus. For example, on the pretest, the bonfire was rarely identified correctly, often named trunk catching fire, firewood catching fire, fire, wood, or timber. The suggestion was that the new figure depicted a single element instead of multiple elements in the bonfire, which incorporated fire, wood, and the bonfire. The bonfire was subsequently replaced by a hoe, a work utensil commonly used by the Indigenous people of Manaus. SAB members also suggested replacing the crocodile, emu, bicycle, and boy figures with animals and objects that better represent their environment, daily life, customs, and culture. Thus, jaguar, tree, basket, pineapple, and canoe were included in the visual naming task. They also recommended substituting the bow and arrow, as it is associated with stereotypes and stigma among some Indigenous ethnicities, potentially compromising the culturally sensitive criteria (i.e., objects/phrases/elements with positive representations of belonging for the Indigenous community studies, Table 1).

3.4 | Construct validity—divergent (discriminant)

Using the hypotheses test, a comparison of the mean of scores on the BRICA and other cognitive tests across the three groups (i.e., cognitively unimpaired, CIND, and dementia) revealed a difference for all hypotheses tests: BRICA (Statistic = 18.81; df = 2.25; $P < 0.001$), MMSE (Statistic = 42.01; df = 2.138; $P < 0.001$), BCSB (Statistic = 77.85; df = 2.27; $P < 0.001$), and VF (Statistic = 18.67; df = 2.138; $P < 0.001$). Using correction for multiple comparisons, the pair-wise comparison showed differences between the groups, except for the VF test, on which cognitively unimpaired did not differ from CIND (Table 2).

3.5 | Construct validity—convergent

Correlation analysis was used to determine convergent construct validity. The coefficients of correlation between BRICA and the cognitive tests indicated the following correlations: BRICA versus MMSE ($r = 0.715$; 95% confidence interval [CI]: 0.624–0.787; $P < 0.001$), BRICA versus BCSB ($r = 0.681$; 95% CI: 0.581–0.761; $P < 0.001$), BRICA versus VF ($r = 0.565$; 95% CI: 0.441–0.668; $P < 0.001$).

TABLE 3 Classification observed according to cut-off points established.

	BRICA		
Group	≤ 33	34– 36	≥ 37
Dementia	17	1	0
CIND	1	12	3
Cognitively unimpaired	0	44	63

Abbreviations: BRICA, Brazilian Indigenous Cognitive Assessment; CIND, cognitive impairment not dementia.

3.6 | Cut-off values for BRICA splitting group

The search for the ideal cut-off for the BRICA was carried out using the Youden Index, based on the sum of sensitivity and specificity. The cut-off points established were ≤ 33 for dementia and ≥ 37 for cognitively unimpaired, whereas the cut-off for CIND was between 34 and 36 (Table 3). BRICA score ranged from 0 to 39 points.

3.7 | Criterion validity—Concurrent

By correlating BRICA with the diagnostic consensus classification (dementia, CIND, and cognitively unimpaired), the tool demonstrated moderate correlation ($k = 0.670$; 95% CI: 0.563–0.776), using the quadratic weighted kappa method, which considered the order of classification (Table 4). The high sensitivity and specificity for the dementia category suggest that BRICA is particularly effective in identifying dementia patients when the cut-off is ≤ 33 is used.

TABLE 4 Class statistics of performance of BRICA cut-off points by group.

	Dementia (BRICA ≤ 33)	CIND BRICA ≥ 34 and ≤ 36	Cognitively unimpaired (BRICA ≥ 37)
Prevalence	12.8%	11.3%	75.9%
Sensitivity	94.4%	75.0%	58.9%
Specificity	99.2%	64.0%	91.2%
Positive predictive value	94.4%	21.1%	95.5%
Negative predictive value	99.2%	95.2%	41.3%

Note: Performance of cut-off points for each group treated as the positive category. The terms were defined as follows: 1. "Prevalence" denotes the proportion of positive cases in the sample; 2. "Sensitivity" refers to the percentage of positive cases that were correctly identified as positive; 3. "Specificity" illustrates the proportion of negative cases that were accurately labelled as negative; 4. "Positive Predictive Value" signifies the percentage of cases classified as positive that truly were positive, and 5. "Negative Predictive Value" denotes the proportion of cases that were classified as negative and indeed were negative.
Abbreviations: BRICA, Brazilian Indigenous Cognitive Assessment; CIND, cognitive impairment not dementia.

4 | DISCUSSION

Using the stakeholder-engaged approach,[26] the BRICA cognitive assessment scale was culturally adapted for an urban multiethnic Indigenous community in Manaus, Brazil. Specifically, estimates from the expert analysis revealed that BRICA was relevant in terms of content (clear language, representativeness, and practical pertinence) and expressed semantic, idiomatic, cultural, and conceptual equivalency for use within the urban multiethnic Brazilian Indigenous community. In addition, there was evidence of criteria and construct validity of the BRICA, demonstrating a significant correlation with other traditional cognitive assessment tools. Importantly, BRICA demonstrates the ability to discriminate between individuals with dementia and those with unimpaired cognition. Besides validity, the BRICA yields other advantages as a dementia screening tool, such as short application time, culturally sensitive content, and cost effectiveness. A valid and culturally sensitive cognitive tool can enhance early detection of dementia and timely intervention and improve cognitive outcomes among Indigenous communities.

The expert panel's consensus on the BRICA items yielded high content validity indices, indicating substantial agreement on their evaluation regarding BRICA's cultural and linguistic pertinence, and relevance. Beyond the expert panel consensus, our study included input from stakeholders to adapt BRICA. Their insights were particularly influential in enhancing the items related to orientation, recognition, naming, and both immediate and delayed recall, as well as their preferences for the figures' characteristics to reflect better their traditional knowledge, culture, and daily community life. Developing an assessment tool where Indigenous peoples see familiar elements from their everyday lives promotes a sense of inclusion and respect. This approach leads to more precise assessments that can advance healthcare quality. Corroborating our findings, the original KICA items of orientation, object recognition and naming, immediate memory, comprehension, and verbal fluency were modified to improve content validity for urban Indigenous groups in Australia.[8] In Canada, Walker et al.[32] organized a community advisory council composed of Indigenous community members, caregivers, health-care providers, and a community researcher, using culturally safe and trauma-informed approaches to develop and validate a cognitive assessment tool for First Nations communities.[32] In our study, merging expert and stakeholder feedback yielded a culturally sensitive cognitive assessment tool that is brief, valid, easy to apply, and cost-effective compared to traditional cognitive tests used in Brazilian Indigenous contexts.[15,30] Validating the BRICA marks an essential advancement in the early detection of cognitive disorders in urban Indigenous communities within the Brazilian Amazon.

Regarding criteria and construct validity, the BRICA scores demonstrated a strong correlation with cognitive assessment scales used in previous studies investigating Brazilian Indigenous populations.[13,15] Moreover, it effectively distinguished between individuals with unimpaired cognition and dementia patients. A cut-off score of ≤ 33 for dementia demonstrated exceptional sensitivity (94.44%) and specificity (99.2%), aligning with the performance of the KICA-Cog adaptation in Canadian Indigenous populations.[7,8] These outcomes reinforce the BRICA tool as a valid dementia screening resource for urban multiethnic Indigenous communities.

Comparing BRICA performance to the results of the study by Radford et al., which determined the performance of the MMSE, Rowland Universal Dementia Assessment Scale (RUDAS), and modified KICA (mKICA) against a consensus dementia diagnosis in older urban and regional Aboriginal Australians, the BRICA showed superior sensitivity (MMSE = 67.9%, mKICA = 57.1%, RUDAS = 60.7%) and specificity (MMSE = 97.6%, mKICA = 99%, and RUDAS 92.3%) for dementia. All tests were considered valid for application in this population, with the mKICA recommended for illiterate/low-educated individuals.[31]

Accuracy for classifying participants with CIND was lower than dementia classification, with 75% sensitivity and 64% specificity (cut-off point 33.5–36.5), demonstrating a lower sensitivity for detecting CIND than that obtained in similar studies.[32]

Besides validity, the BRICA yields other advantages as a dementia screening tool, such as its shorter application time (10–15 minutes), culturally appropriate content, and cost effectiveness.[13,15] These benefits stem from its concise nature, allowing faster implementation than other non-Indigenous Brazilian studies' methodologies. The traditional

cognitive tools, though popular in assessing cognitive status in elderly Brazilians,[3] tend to overestimate dementia prevalence when applied exclusively. Notably, tasks involving sentence writing or drawing elicited discomfort or embarrassment among Indigenous participants, a sentiment universally shared despite educational backgrounds.[33]

The study's limitations need to be considered when interpreting the current findings. First, data obtained from one urban multiethnic Indigenous community in Manaus might challenge the generalization of findings to the Brazilian Indigenous population. Future research should explore other regions in Brazil to ascertain the applicability and reliability of the BRICA tool within other Indigenous communities. Although the performance on the cognitive tests (MMSE, BCSB, VF, and FAQ) differed across the diagnostic groups, it is essential to highlight that these groups were defined through the combination of these tests, which might have led to the significant differences in the tests. Moreover, using culturally adapted tools for functional capacity and mood could expand current findings, as these aspects influence cognitive performance and are mediated by sociocultural factors. Despite the limitations, the novelty of BRICA lies in its creation process, involving Indigenous community members, making it the first validated tool for Brazilian urban multiethnic Indigenous populations. With a valid and culturally sensitive tool, the next step is to convene a community-based stakeholder advisory board composed of Indigenous older adults, family caregivers, and primary care providers to assess the actions, actors, context, target, and time in which the BRICA should be administered. This can potentially enhance Indigenous representation in dementia prevalence studies in lower and middle-income countries while also setting the stage for further validation as a useful screening tool for cognitive decline in regular health assessment for older Indigenous individuals.

5 | CONCLUSION

A cultural-centered approach that integrated the participants' and researchers' perspectives successfully contributed to adapting a culturally sensitive cognitive assessment tool with content and external validity evidence for detecting dementia in urban multiethnic indigenous communities. The BRICA is Brazil's first culturally sensitive cognitive tool and offers promising applications for early dementia detection among urban Indigenous populations.

AUTHOR CONTRIBUTIONS

CCB was involved in the adaptation process, data analysis, data collection, analysis of evidence of validity, data interpretation, and writing and review of the manuscript. NdasNT was involved in the translation, adaptation, data collection, and the writing and critical review of the manuscript. DFdaS and FCdaS were involved in the adaptation and translation process. VVD was involved in the adaptation process, data analysis, data collection, analysis of evidence of validity, and data interpretation. SMDB and LMF assisted in interpretation of data analysis and critical review of the manuscript. DLG was involved in the adaptation and translation process and review of the manuscript. JNST oversaw all stages of the study and review the manuscript.

ACKNOWLEDGMENTS

This study received financial support through a study scholarship granted by the public sector funding agency of Amazonas State Fundação de Amparo à Pesquisa do Estado do Amazonas – FAPEAM. Support also came from the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES).

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest. Author disclosures are available in the supporting information.

CONSENT STATEMENT

All human subjects provided informed consent.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Bezerra CC, Toledo NDN, da Silva DF, et al. Culturally adapted cognitive assessment tool for Indigenous communities in Brazil: Content, construct, and criterion validity. *Alzheimer's Dement*. 2024;16:e12591. https://doi.org/10.1002/dad2.12591