

Cultural adaptation and Rasch psychometrics of the Substance Addiction Consequences scale

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Abstract

This study aims to adapt and evaluate the validity of the Substance Addiction Consequences scale for the Brazilian community-based addiction setting. This is a psychometric study, conducted in two stages: (1) cultural adaptation and (2) validation using the psychometric Rasch model. The Substance Addiction Consequences derived from the Nursing Outcome Classification comprises 16 items and four domains in the original instrument. We applied the original scale with 200 outpatients at two Psychosocial Care Centers for Alcohol and Drugs in São Paulo, Brazil. The four subscales are suitable for the Rasch model. In 13 of the 16 items, infits and outfits are between 0.5 and 1.5, corresponding to the model's optimal parameters. In addition, we removed one item that distorted the measurement. The psychometrics suggested that the SAC scale is valid with its 15 items and four domains. Therefore, it can be considered appropriate to use in the Brazilian community-based addiction setting.

KEYWORDS

nursing, psychometrics, substance-related disorders, validation studies

1 | INTRODUCTION

Substance addiction is a multidimensional problem with multiple impacts on people's health and lives. These impacts can be physical (physical diseases, accidents, violence), mental (mental suffering, psychiatric disorders), social (broken relationships, homelessness, poverty), and are manifested in varying degrees of severity, as they are intense, recurrent, and challenging to control. At the global level, 35 million or 13% of the people who use drugs suffer from addiction that requires treatment.¹ Despite varying according to the type of substance, route of use, and the socioeconomic and political context, the consequences are generally similar. The primary evidence harms are associated with increased mortality rates, economic costs, crime, violence,

mental conditions, social vulnerability, family, and interpersonal relationships.^{2–4}

Concerning Brazil, the addiction rate varies according to the type of substance consumed. We reach 5.1% addiction rates for marijuana, 3.5% for alcohol, 3.2% for cocaine, 2.4% for opiates, and 1.6% for crack cocaine. The country does not exhibit regional differences regarding these rates. As consequences of addiction, traffic accidents, crimes, violence, internalization symptoms (anxiety, depression), and social vulnerability are prevalent. These problems interact with inequality and the social determinants of health in the country.^{5,6}

The Nursing Outcome Classification (NOC) defines substance addiction consequences as "impairment of health status and social function due to substance addiction," a concept representing the

impact of addiction at the individual level.⁷ Given these severe consequences of addiction, health professionals must be prepared to provide adequate assistance to this population and provide effective responses to the problem.³ A study that sought to identify indicators for nursing care showed that nurses' interventions contribute in 29% of the cases to improving the health outcomes of people who use drugs. Those improvements concern quality of life, mental health, substance addiction consequences, and the number of substances consumed.⁸

There is a scarcity of studies regarding substance use psychometric properties to contribute to care planning, mainly using nursing care concepts. However, we have not found any scale validation studies that validate nursing outcomes from the NOC in Brazil. The most well-known are screening and brief interview instruments, such as AUDIT—Alcohol Use Disorders Identification Test, ASSIST—Alcohol, Smoking, and Substance Involvement Screening Test, and DUSI-R—Drug Use Screening Inventory.⁹ In addition, when related to nursing, they usually measure the attitudes of professionals and students.¹⁰

The Substance Addiction Consequences (SAC) scale was developed and clinically validated in Portugal in 2018. SAC's primary goal is to assess people's health status and social function when they have problems with substance use and then monitor their evolution. SAC is derived from the NOC outcome indicators. SAC also contributes to standardizing care in nursing and multidisciplinary teams.¹¹

The SAC scale is a 16-item scale that has demonstrated validity and reliability with good internal consistency between the items ($\alpha = .854$). Psychometrics were also valid regarding stability and adequacy of data in all items, explaining its four factors, with a variance of 59.4%. Concurrent validation was confirmed by correlational analysis. With this scale, the severity of substance addiction consequences can be assessed considering the user's perception and the professional's clinical judgment in the dimensions of psychological and family; physical and cognitive skills; self-care; economic and labor.⁸

Therefore, the SAC scale validation for Brazil may improve clinical practice with people who use drugs, increasing the accuracy of the interventions and planning more appropriately based on the addiction consequences, as it has been in Portugal.¹² Therefore, this study aimed to adapt and evaluate the validity of the Substance Addiction Consequences scale for the Brazilian community-based addiction setting.

2 | MATERIALS AND METHODS

2.1 | Design

A psychometric study consists of cultural adaptation and measurement of validity using the Rasch model.

The original SAC scale consists of 16 items considered to be indicators of substance addiction consequences according to the NOC and is divided into four domains: (1) psychological and family

(four items); (2) physical and cognitive skills (five items); (3) self-care (four items); (4) work and income (three items). The participants respond to the items using a Likert-type scale with possible responses ranging from one to five, one being high severity of drug consequences, and five, no severity. In the original study, the authors used the reference value of 48 points to determine the severity of the consequences, where less than 48 the severity is high and greater than or equal to 48, is considered not accentuated severity. Thus, in the subscales, the severity determination is above a mean of 2.5.⁸

2.2 | Sample and procedures

Based on the Rasch model, most studies work with 150–250 individual samples, on average.^{13,14} Therefore, by convenience sampling 214 outpatients of two Psychosocial Care Centers for Alcohol and Drugs III (CAPS-AD III) at the time of data collection, at least 18 years of age, without substance use effects and withdrawal signs or symptoms, were initially included in the sample. Of those who agreed to participate, we excluded 14 participants who did not complete the interview. Thus, we had a final sample of 200 participants. The CAPS-AD III is a community-based service specializing in substance use care, offering daily treatment for people who use drugs living in social vulnerability. It has multi-professional teamwork to provide care.⁶

Data collection occurred between February and December 2019 through face-to-face interviews with the participants in a private environment at CAPS-AD III. The interviewers were two nurses, a PhD candidate, and a postdoc researcher specializing in addictions. The researcher's team leaders trained them concerning understanding the construct, the meaning of the questions, and how to apply, complete, and interpret the scale results. We collected data using a digital form built by researchers. This form comprises objective questions to self-answers about socioeconomic and clinical characteristics and the SAC scale.

2.3 | Adaptation

Although the original scale is in the Portuguese language, cultural adaptation is necessary because the two cultures use different meanings, making the items challenging to understand. Therefore, we conducted the adaptation process using the Beaton et al. guidelines.¹⁴

Before being tested on the population of interest, in January 2019, a committee evaluated the SAC scale according to semantic, idiomatic, conceptual, and cultural aspects, scoring each item from 1 to 5, the closer to 5, the more adaptable the item is for the intended evaluation. The committee's composition was as follows: (i) a linguist who adapted the scale to the Portuguese language spoken in Brazil; (ii) five experts in the methodology, regarding addictive behaviors, with a PhD degree. First of all, the committee reviewed the tool and suggested changes to the items according to the Brazilian context.

Second, we performed back-translation to check if the meanings between the original instrument and the adaptation to Brazil are the same in content, which guarantees quality for the process. After that, we compared the two versions and discussed the divergences between the committee of judges and the original authors. Ultimately, the final culturally adapted version was obtained and tested with the target population using a pretest that did not raise questions about its applicability or interpretation.

2.4 | Measures and data analysis

For the psychometric validation of the SAC scale, we used the Rasch analysis approach.¹³ In addition, we used the statistical programs RStudio¹⁵ and Stata for Windows.¹⁶

To measure the scale's content, substantive, and structural validity, we opted to use the traditional Rasch Model because its techniques allow explanation of the meanings of measures from the context in which applied the instrument's items.^{17,18} In addition, Rasch's content validity verifies the goodness-of-fit of the data to the model. For example, suppose the scale meets the conditions for good measurement. In that case, the scale's substantive validity is confirmed in its ability to measure greater severity in the most severely affected individuals and differentiate people across the latent trait.

As to the Rasch analysis, items are acceptable, meeting the conditions for measurement, whenever infit and outfit values are between 0.5 and 2.0. The items whose coefficients are close to 1 are the best for measurement. From 0.5 to 1.5, they are considered excellent. Between 0 and 0.5 and 1.5 and 2, they are deemed unproductive. Items with infit and outfit greater than 2 are harmful to the analysis, indicating that they do not promote adequate measurement for the latent trait. When the value is greater than 2, it is necessary to perform an analysis with the randomness test (ZSTD). The Rasch literature considers the item to distort the desired measure. Therefore, it should be removed from the instrument when the estimated value of infit and outfit and its respective randomness test is greater than 2.¹³

The scale's structural validity is verified by a double test of unidimensionality and an examination of differential functioning of the items (DIF) across groups. To test the former, we propose two exploratory factor analyses (EFA) by principal components methods. The first EFA analyzes the correlation matrix of the raw scores. If the assumption is valid, there would be just one latent trait across the item's correlation. The second EFA is estimated on the residuals of the Rasch model. The unidimensionality assumption implies that there would be no correlation across the residuals after the Rasch analyses, which would remove the latency factor variance. If we find any other latent trait, it implies that the subscale items measure more than one unique dimension.^{13,18}

The possible raw answers for the instrument items are: (1) Very serious; (2) Severe; (3) Moderate; (4) Light; (5) None, based on the severity of consequences for the individual. We ran the first

EFA analyses on the reversed raw scores (4—Very severe; 3—Severe; 2—Moderate; 1—Mild; 0—No) to determine the crescent of severity, from 0 to 4, and to facilitate interpretability. After that, we conducted the item characteristic curve (ICC) for each of the 16 items. As intermediate categories of response do not differentiate in severity, we proposed a dichotomous Rasch model. Afterward, we ran the EFA of the residuals. We also calculated the DIF to check if there is a difference in the scale's performance by gender (men and women), age (persons under 40 years or 40 years or older), and income (people with no income or having income). The last step of the data analysis is the display of Person-Item Maps, which identifies the distribution of severity and items difficulties.^{13,18} The complete Rasch analysis data is available on-demand from referees.

2.5 | Ethical procedures

Approval by the Ethics Committee of the University of São Paulo School of Nursing and Municipal Health Department of São Paulo (References 3.167.092/2019 and 3.248.662/2019). The research participants, both judges and service users, were assigned to sign the free and informed consent.

3 | RESULTS

3.1 | Sample characteristics

Of the 200 participants, there was a predominance of males ($n = 167$; 83.5%), heterosexuals ($n = 179$; 89.5%), brown people ($n = 101$; 50.5%), single people ($n = 145$; 72.5%), and homelessness ($n = 154$; 77%). The average age was 43.8 years (Standard Deviation (SD) = 10.4). Regarding education, 36% (72) reported having 10–12 years of study, 34.5% (69) of 4–6 years and 22.5% (45) of 7–9, and only 2.5% (5) reported more than 12 years. About the employment, 63.5% (127) were unemployed and with monthly income from 1 to 3 times the minimum wage (USD 173.77), 61.5% (123) due to social income. Moreover, most ($n = 128$; 64%) reported no contact with family members or other support networks.

The duration of substance use ranged between 20 and 30 years ($n = 58$; 29%). Most of the participants were multiple drug users with addiction problems, using alcohol ($n = 165$; 82.5%), tobacco ($n = 136$; 68%), cocaine ($n = 96$; 48%), marijuana ($n = 90$; 45%), and crack ($n = 88$; 44%). The consumption pattern was predominantly daily ($n = 99$; 49.5%), and 8% (16) of the participants reported abstinence. Only 16 (2.5%) of the subjects reported using injectable substances. Common mental disorders appear expressively. First, mood disorders ($n = 88$; 44%), followed by anxiety ($n = 69$; 34.5%) and psychosis ($n = 27$; 13.5%). Second, arterial hypertension ($n = 27$; 13.5%) and respiratory diseases ($n = 20$; 10%) predominated physical conditions. In general, this population does not receive any type of care other than CAPS-AD III.

3.2 | Substance addiction consequences

The participants of this study have a total average of 43.97 (SD = 9.67) on the original SAC scale, considered to be cases with high severity (above 48). The more severe dimensions indicate harms of substance use are in economic and labor issues (mean = 2.18). In this area, 70.8% of participants were severe, followed by psychological and family (mean = 2.4; 58.2%), physical and cognitive skills (mean = 2.91; 41.2%), and finally self-care (mean = 3.30; 35.8%). In an item-by-item analysis, those with the highest proportion of people with problems classified as severe are the difficulty of maintaining income ($n = 176$; 88%) and employment ($n = 159$; 79.5%), followed by a reduction in physical activity ($n = 144$; 72%) and family problems ($n = 130$; 65%).

3.3 | Cultural adaptation

From the judges' assessment, the total score average of items evaluation was 4, and 11 items (68,7%) received the maximum score (5). Items 10, 12, and 16 received below-average scores (2–3) and were adapted changing the terminology to more colloquial language and idiosyncratic terms for Portuguese spoken in Brazil. Altered items 10 (from polyconsumption for the use of various substances), 12 (from illicit to illegal), and 16 (from absenteeism to constant absences), and the Likert measures 1 (from severe to very severe) and 2 (from substantial to severe). After applying the instrument with users in the test phase, four participants suggested the change in item 11 of the scale due to specificities of the Brazilian context regarding the controversy between the abstinence and harm reduction approaches. Therefore, from "lack of motivation for abstinence," it changed to "lack of motivation for change," understanding that it would be possible to encompass both questions according to the subjects' choices.

3.4 | Rasch psychometrics

The exploratory factor analysis of the subscales in Table 1 indicates a definite solution factor for three of the four subscales, with a potential secondary dimension, less relevance, in the subscale of physical domain and cognitive skills. We point out that the second dimension is associated with Item 9 (the 5th scale subitem for physical and cognitive ability). Item 9 factorial load with the first dimension is only -0.14 and with the second of about 0.94 , which indicates the second dimension corresponding to this item.

Table 2 presents the Rasch model results, where 13 of the 16 items are considered excellent (from 0.5 to 1.5). Items 4 (outfit 1.508) and 12 (infit 0.481), are considered unproductive. Item 9 (outfit 2.099) is harmful to the analysis, which was already identified as problematic in the previous factor analysis. When we analyzed ZSTD, its respective randomness test is greater than 2, which means it distorts the desired measure and should be removed from the instrument.

TABLE 1 Factorial analysis of the gross scores of the four subscales

	Psychological and family	Physical and cognitive ability	Self-care	Economic and labor
Units of variance				
Factor 1	2.06 ^a	2.56 ^a	1.33 ^a	1.72 ^a
Factor 2	0.93	1.30 ^a	0.97	0.87
Factor 3	0.59	0.59	0.95	0.42
Factor 4	0.43	0.45	0.75	
Factor 5		0.24		
Loads on Factor 1				
1st subscale item	0.85	0.87	0.41	0.87
2nd subscale item	0.80	0.91	0.71	0.81
3rd subscale item	0.75	0.82	0.73	0.55
4th subscale item	0.38	0.47	0.36	
5th subscale item		-0.14		

^aUnits of variance after varimax rotation.

The analysis of the main components of its residuals is presented in Table 3. Subscales 1, 3, and 4 show no residual dimension, confirming its unidimensionality of latent variable, without the need to exclude items. In subscale 2, physical and cognitive skills, there is an indication of unidimensionality violation by Item 9. The DIF analysis showed overlap between all analyzed items' responses, which suggests the items perform similarly across groups. It was impossible to achieve the differential functioning analysis for sex on the fourth subscale, as no female persons responded positively (severe or very severe) to Item 15.

The Person-Item map in Figure 1 showed that the instrument has less severe, intermediate, and more severe items in its composition. For example, subscale (1)—Psychological and family has more items marked as intermediate. Less severe items would improve subscale one, in contrast to subscale (4)—Work and income, needing more intermediate items. The Person-Item map of subscale 2 indicates a significant discrepancy between Item 9 and other scale items.

Therefore, as all analysis indicates the unfitness of Item 9, we opted to exclude the item in the Brazilian instrument and to maintain the others as in the original scale to support comparative studies. In this case, we suggest the reference value to determine the severity of the addiction consequences 45 points and the subscales to maintain a mean of 2.5.

4 | DISCUSSION

We found the validity of evidence from psychometric Rasch analysis with 13 of the 16 items of the SAC scale that infits and outfits correspond to the model's optimal parameters. Thus, the instrument

TABLE 2 Rasch model analysis of the items of the four subscales

	%	Severity	χ^2	DF	p	Outfit mean square	Infit mean square	Outfit (ZSTD)	Infit (ZSTD)
I. Psychological and family									
Item 1 - Sadness	56.0%	0.125	93.314	132	.996	0.702	0.729	-4.001	-4.017
Item 2 - Isolation/loneliness	55.5%	0.152	116.993	132	.821	0.880	0.892	-1.482	-1.495
Item 3 - Anxiety	56.5%	0.098	122.833	132	.704	0.924	0.935	-0.919	-0.875
Item 4 - Problems in family relationships	65.0%	-0.374	200.501	132	.000	1.508 ^a	1.417	4.616	4.679
II. Physical and cognitive ability									
Item 5 - Cognitive impairment	38.0%	0.126	92.146	147	1.000	0.623	0.701	-3.523	-3.441
Item 6 - Difficulty memorizing daily routine	32.5%	0.518	103.848	147	.997	0.702	0.778	-2.149	-2.227
Item 7 - Inability to make daily decisions	28.0%	0.875	98.294	147	.999	0.664	0.772	-1.975	-2.088
Item 8 - Difficulty in performing housekeeping	36.0%	0.264	124.596	147	.910	0.842	0.929	-1.225	-0.694
Item 9 - Reduced physical activity	72.0%	-1.784	310.634	147	.000	2.099 ^b	1.198	4.368 ^b	2.347 ^b
III. Self-care									
Item 10 - Use of various substances	54.5%	-1.331	156.617	162	.605	0.961	1.040	-0.282	0.617
Item 11 - Lack of motivation for change	26.5%	-0.065	113.811	162	.998	0.698	0.778	-2.968	-2.917
Item 12 - Participation in illegal activities	4.0%	2.901	119.587	162	.995	0.734	0.481 ^a	-0.298	-1.985
Item 13 - Concern about own health problems	58.5%	-1.506	149.983	162	.741	0.920	0.889	-0.559	-1.695
IV. Economic and Labor									
Item 14 - Difficulties maintaining employment	79.5%	-0.298	70.367	108	.998	0.646	0.652	-3.463	-3.492
Item 15 - Difficulties maintaining income	88.0%	-1.411	77.180	108	.989	0.708	0.740	-1.214	-1.487
Item 16 - Constant absences from work or school	45.0%	1.709	65.875	108	1.000	0.604	0.692	-2.734	-3.682

Note: %, share of respondents that Answers 1 and 2 in the raw scores; Severity, estimated log-odds of the item difficulty; χ^2 , item chi-square; DF, degrees of freedom; ZTDS, randomness test of INFIT and OUT means squared.

^aUnproductive items between 0 and 0.5 and 1.5 and 2.0.

^bHarmful item greater than 2 observations.

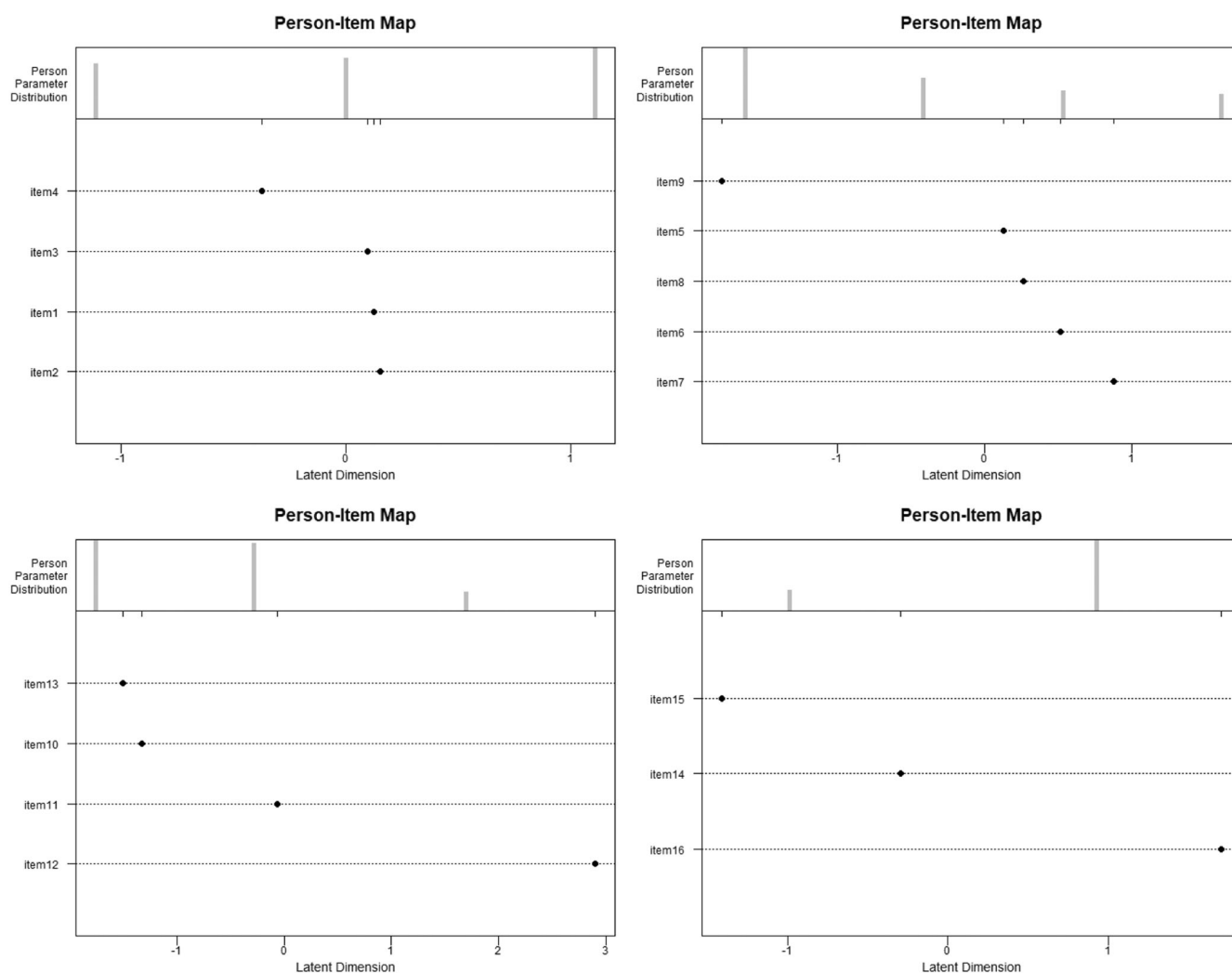
TABLE 3 Factorial analysis of the residuals for the four subscales of the Substance Addiction Consequence scale

	Psychological and family	Physical and cognitive ability	Self-care	Economic and labor
Units of variance				
Factor 1	1.43	1.66	1.51	1.64
Factor 2	1.39	1.23	1.42	1.37
Factor 3	1.29	1.19	1.03	0.01
Factor 4	0.00	0.88	0.06	
Factor 5		0.08		
Loads on Factor 1				
1st subscale item	-0.16	0.74	-0.73	0.97
2nd subscale item	1.03	0.66	-0.15	-0.09
3rd subscale item	-0.19	-0.14	-0.05	-0.82
4th subscale item	-0.55	-0.15	0.97	
5th subscale item		-0.79		

culturally adapted to the Brazilian population without distorting the theoretical and scientific content with the semantic adaptations. Three items were considered unproductive, but only one distorted the subscales measures, which were removed. All subscales were unidimensional. The items and people distribution graphs are generally heterogeneous regarding the severity of the condition, which is good to measure different people with different consequences in the same construct.

In all these data analyses, it is essential to note that the sample size in the Brazilian study was larger than for the original research. In Brazil, the sample is more vulnerable regarding their social aspects, with almost 10 points of severity difference with the Portugal population.

In addition, the authors opted not to include the indicator of withdrawal symptoms suggested by NOC in the original study. This decision was justified by not being a common consequence for the population of Portugal,⁸ which is different in the Brazilian context.⁵ These differences are commonly observed in validation studies and may reflect some differences in the scales' performance.¹⁸

**FIGURE 1** Person-item map of the Substance Addiction Consequences subscales

Regarding the unproductivity of the items, the probable lack for item 12 (Participation in illegal activities) may be related to the percentage of positive answers, which classified the item as severe. Only 4% responded positively to this item, which may be related to "social convenience bias." Social convenience bias happens when participants deny illicit/illegal behaviors due to social stigma and is observed in validation studies with psychoactive substance users.¹⁹ Furthermore, the association of illicit activities with the population of substance users also justifies this result. It confirms the complexity of this measure as an indicator in health services, especially in countries with criminalizing policies.¹

Item 4 (Problems in the family relationship) suggests unproductivity but can be related to the measure's breadth and complexity, which may have interfered in the answers about good or bad family relationships. This subjective concept may be interpreted differently by users and professionals due to family background. This fact may impact the results due to non-standard responses expected by the measure. For example, people who use drugs, especially homeless people, as in the case of this study, often experience family problems, and most of them report the breaking of a relationship.^{20,21}

The item assessing if substance use has affected the family relationship surprisingly showed results as "without consequences" from those without family. However, this may be considered a severe consequence for health professionals. Therefore, in further studies, we suggest the possibility of modifying this item.

For Item 9 (Reduced physical activity), the Rasch analysis shows that this item measured another dimensionality in subscale 2. The unidimensionality aspect confirmed by factor analysis showed that Item 9 is associated with a secondary dimension of subscale 2. The reduction in physical activity is a consequence widely reported by the sample as being severe (72%). However, it is measured by a unique item within the subscale for physical and cognitive skills with four items, and because of this, the physical issue appears to be a secondary dimension. Concerning two other researchers conducted in the same community centers of this study, physical activity does not appear as a priority of intervention for substance users in vulnerable situations in this specific region of São Paulo, Brazil, which is justified for the emergency problems like social risk.^{6,21} Therefore, we understood that removing item 9 from the SAC scale for use in this context would not negatively care about the problem. Due to the extreme exclusion situation of this population, the physical activity item, as it is a less chosen need to work and seen as a minor emergency by the participants, showed a scarcity of the item for the total scale.

So, the proposed Brazilian version of SAC is an instrument with 15 items and four subscales now called: (1) Psychological and family; (2) Functionality; (3) Self-care; (4) Work and income.

Several studies demonstrate the Rasch model in research evaluating the properties of scales for nursing practice. As a robust method, it fills gaps such as invariance and other traditional problems.^{17,22} Additionally, the Rasch model is a practical, promising, and advantageous scale analysis method. It provides methodological support and can assess clinical validation of nursing diagnoses and NOC outcomes which corroborates our results.²³

We highlight the complexity of phenomena related to substance use for a vulnerable group and its consequences depending on the social, political, and cultural contexts. For this reason, not all dimensions fit the scales. Nevertheless, scales to measure these constructs are tools to support the professionals' clinical work and not limit it. It is essential to ponder each subject's life moment at the time of a study. The professional needs to promote and motivate thoughtful responses to each item and consider that the scales alone are not enough to build psychosocial care.²⁴

This study's limitations include employing a different validation method from the original scale. Nevertheless, we justify its robustness and untraditional as indicated in the literature and the significant difference in the study context with a large sample and different profiles. It is also a limitation that we do not use convergent or divergent validation with supported instruments. Furthermore, the results cannot be generalized as they represent two Brazilian centers. More studies with different participants and settings are needed to validate this scale in general addiction services, which could have another configuration.

Theoretically, we advanced in a potential contribution to psychometric in the mental health field using the Rasch model validating an instrument derived from NOC that may help address the field gap of the nursing systematization content. Regarding the implications for clinical practice, the SAC scale can guide care practice to assess the consequences of alcohol and other drug use for vulnerable populations. In addition, it is a resource for good practices to identify and provide care for the complex interface of the substance use problem between the biopsychosocial domains.

This study provides psychometric validity evidence for the SAC scale for Brazil, which enables concluding that the SAC scale with 15 items version is adapted and validated for use in the studied community-based centers. Further studies are needed with more comprehensive samples to determine if item exclusion is favorable. We recommend future directions, such as including this scale in the routine of the multidisciplinary team to verify its performance and contributions to the construction of care.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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