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Cross-cultural adaptation and reliability of measurements on self-reported neighborhood characteristics in ELSA-Brasil

ABSTRACT

OBJECTIVE: To describe the process involved in adapting scales for measuring neighborhood characteristics to Brazilian Portuguese.

METHODS: The dimensions addressed were social cohesion, environment suitable for physical activity, availability of healthy foods, safety, perceived violence and victimization. The adaptation process involved assessment of equivalence between the original scales and the Portuguese versions. The test-retest reliability was assessed in a subsample of 261 participants from the Brazilian Longitudinal Study for Adult Health (ELSA-Brasil), who answered the same questionnaire on two different occasions, separated by an interval of 7 to 14 days.

RESULTS: The aspects of equivalence assessed were shown to be adequate. The intraclass correlation coefficient ranged from 0.83 (95%CI 0.78;0.87) for Social Cohesion to 0.90 (95%CI 0.87;0.92) for Walking Environment. The scales showed internal consistency (Cronbach's alpha) ranging from 0.60 to 0.84.

CONCLUSIONS: The measurements on self-reported neighborhood characteristics had very good reproducibility and good internal consistency (Cronbach's alpha). The results suggest that these scales can be used in studies involving Brazilian populations with characteristics similar to those of ELSA-Brasil.

DESCRIPTORS: Human Settlements. Environmental Health. Social Environment. Quality of Life. Questionnaires. Translations. Reproducibility of Results. Multicenter Studies as Topic, methods. Cohort Studies.

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INTRODUCTION

The conditions that trigger the greatest proportion of health outcomes occur within the sociocultural environment in which individuals live, at a collective or contextual level. Over the last few decades, there has been renewed public health interest[27] in the importance of the social and geographical context, especially in places where people live, and its impact on health. Scales for assessing neighborhood characteristics have been devised in order to pick up processes that occur in ordinary residential areas in which the population shares similar physical and social environmental conditions under which routine activities take place.[18]

The effects of different neighborhoods on health have been shown, for example, in relation to the quality of life of the elderly population,[4] lifestyle habits,[15] self-reported health[22] and cardiovascular diseases.[10,11,24] Stressful factors present in the physical and social environment of the neighborhood have been shown to be positively associated with higher prevalence of diabetes,[3] obesity,[21] acute myocardial infarction,[6] smoking[13] and depression.[13] As well as diseases that can be medically diagnosed, studies have also addressed the influence of the neighborhood on subclinical markers of chronic diseases[17] and on variations in the levels of cortisol,[12] a hormone related to stress.

The contextual characteristics that potentially influence health can be grouped into socioeconomic, physical and psychosocial dimensions.[26] Secondary databases have comprised the main source of contextual information in recent studies. However, individuals' responses (primary data) to relevant questions about processes that occur in the neighborhood and also the definitions of measurements inherent to the contextual level[9,19] (e.g., the definition of "neighborhood" itself) still form gaps in the knowledge of this field.

With the objective of investigating the relationships between self-reported characteristics of the neighborhood and occurrences of cardiovascular diseases and diabetes, which constitute the main outcomes of the Longitudinal Study for Adult Health (ELSA-Brasil),[2] specific scales were included in its baseline questionnaire. Five domains were studied: social cohesion, environment suitable for physical activity; availability of healthy foods; safety in relation to crime; perceived violence; and one question about victimization.

These scales were available and had been validated only in English.[20,25] The present article describes the process of cross-cultural adaptation performed within the scope of ELSA-Brasil, and estimates for test-retest reliability.

METHODS

Instrument Selection

A bibliographic review on this topic showed that no validated instrument for measuring contextual characteristics existed among Brazilian studies published up to 2007. Among studies in other countries, two highly important studies that used self-reporting scales for measuring neighborhood characteristics relating to cardiovascular diseases were identified: the Project on Human Development in Chicago Neighborhoods (PHDCN)[25] and the Multi-Ethnic Study of Atherosclerosis (MESA).[20] In these studies, the neighborhood scales presented good reproducibility (intraclass correlation coefficient ranging from 0.73 to 0.91), which formed an important condition to be included in ELSA-Brasil.

Measurement Instruments

In ELSA-Brasil, questions that assessed the participants' perceptions regarding psychosocial and physical characteristics of the environment of their neighborhood were included. At the beginning of the section containing these questions, the interviewees were guided to think of their neighborhood as: "the general area surrounding their home where you usually perform routine activities such as going shopping, going to the park or visiting neighbors".[25]

Before answering the first set of scales, the interviewee was guided to choose the best answer among the following options: 1 – thoroughly agree; 2 – partially agree; 3 – neither agree nor disagree; 4 – partially disagree; and 5 – thoroughly disagree. These options were presented on a card, in relation to each item. This format takes into account the following scales: 1) social cohesion, with five items; 2) environment suitable for physical activity, with nine items; 3) availability of healthy foods, with four items; and 4) safety, with four items (Table 1).

Likewise, before the items on the scale about perceived violence (with five items), the interviewee was guided to answer how often the events described had happened during the past six months, according to what he/she knew about his/her neighborhood, and not just what had been witnessed or suffered, choosing the best answer among the following options: 1 – often; 2- sometimes; 3 – rarely; or 4 – never. Lastly, the interviewee was asked how long he/she had live in the neighborhood and about personal victimization: "1. Has anyone ever subjected you to violence (robbery, fighting, sexual violence or kidnapping), or has this happened to anyone who lives in your household in this neighborhood, during the time that you have

being living in this house?", with "yes" or "no" as the answer options.

Instrument Adaptation Process

The cross-cultural adaptation of the scales in English was performed in accordance with the methodology proposed by Herdman et al,[16] as already used in other studies.[1,8] This allows evaluation of six types of equivalence between the instruments in the original language and in their translations: 1) conceptual; 2) between items; 3) semantic; 4) operational; 5) measurements; and 6) functional.

In order to obtain the semantic equivalence, the translation from English into Portuguese was performed by two independent Brazilian translators who were fluent in English. Both translations were analyzed, together, by the translators and researchers from ELSA-Brasil. For each sentence, the translators evaluated the degree of difficulty that they had in performing the translation. This analysis ended with production of a consensus version of the translation, which was forwarded to a third professional for back-translation. This back-translation was performed by an American translator who was fluent in Brazilian Portuguese. This English version was compared with the original scale by two Brazilian specialists who were fluent in English, one with experience in using scales in the field of epidemiology, and the other with experience of the topic of collective effectiveness, accompanied by two researchers from ELSA-Brasil.

The strategy used consisted of three times: 1) Comparison of the back-translated scale with the original by two independent evaluators according to two criteria: a) whether there was any change in the meaning, in general terms, through dichotomous evaluation (altered/unaltered meaning); b) quality of the back-translation, in literal terms, according to evaluation using the Likert scale: 1 = Very poor, 2 = Poor, 3 = Fair, 4 = Good and 5 = Excellent; 2) Comparison between the evaluations by the two specialists in order to identify contrasts, for example a situation in which one evaluator attributed grade 2, and the other, grade 4, for the same evaluated item; 3) Individual evaluation of the item, when one of the evaluators attributed a grade less than or equal to 3 (fair, poor or very poor) or considered that the meaning of the item had been changed (differing from the original).

The translation resulting from this process was subjected to probing in order to clarify any doubts (with workers from another public institution with characteristic similar to those of ELSA-Brasil), along with three stages of pretests and two pilot studies in conjunction with other sections of the questionnaire. The final format of the scales was obtained from these stages and was included in the questionnaire.[7]

Table 1. Instruments for measuring self-reported neighborhood characteristics in the original English version and in the final Portuguese version. ELSA-Brasil, 2008.

Social Cohesion	Coesão Social
1. People around here are willing to help their neighbors	1. Na sua vizinhança, as pessoas estão dispostas a ajudar seus vizinhos
2. This is a close-knit or unified neighborhood	2. Sua vizinhança é bem unida, isto é, as pessoas são capazes de se unir em torno de interesses comuns
3. People in this neighborhood can be trusted	3. As pessoas na sua vizinhança são de confiança
4. People in this neighborhood generally don't get along with each other	4. Em geral, as pessoas na sua vizinhança NÃO se dão bem umas com as outras[a]
5. People in this neighborhood do not share the same values	5. As pessoas na sua vizinhança NÃO compartilham os mesmos padrões culturais, de comportamento, princípios éticos ou morais, entre outros[a]
Walking Environment	Ambiente para Atividade Física
1. My neighborhood offers many opportunities to be physically active	1. Sua vizinhança oferece muitas condições para que as pessoas sejam fisicamente ativas (por exemplo, possam fazer caminhada, andar de bicicleta)
2. Local sports clubs and other facilities in my neighborhood offer many opportunities to get exercise	2. Há muitas oportunidades para praticar atividades físicas ou esportes em clubes, academias ou outros espaços na sua vizinhança
3. It is pleasant to walk in my neighborhood	3. É agradável fazer caminhadas na sua vizinhança
4. The trees in my neighborhood provide enough shade	4. As árvores da sua vizinhança dão bastante sombra
5. In my neighborhood it is easy to walk to places	5. É fácil ir a pé aos lugares na sua vizinhança
6. I often see other people walking in my neighborhood	6. Frequentemente o(a) senhor(a) vê outras pessoas fazendo caminhadas na sua vizinhança

Continuation

Walking Environment	Ambiente para Atividade Física
7. I often see other people exercising (for example, jogging, bicycling, playing sports) in my neighborhood	7. *Frequentemente o(a) senhor(a) vê outras pessoas praticando atividade física na sua vizinhança (por exemplo: correndo, andando de bicicleta, praticando esportes)*
8. My neighborhood has a heavy traffic	8. *O trânsito de veículos é intenso (pesado) na sua vizinhança*[a]
9. There are many busy roads to cross when out for walks in my neighborhood	9. *É necessário atravessar muitas ruas movimentadas para fazer caminhadas na sua vizinhança*[a]
Availability of Healthy Foods	Disponibilidade de Alimentos Saudáveis
1. A large selection of fresh fruits and vegetables is available in my neighborhood	1. *Encontra-se grande variedade de frutas, verduras e legumes frescos à venda próximo à sua residência*
2. The fresh fruits and vegetables in my neighborhood are of high quality	2. *As frutas, verduras e legumes frescos à venda próximo à sua residência são de boa qualidade*
3. A large selection of low-fat products is available in my neighborhood	3. *Encontra-se uma grande variedade de alimentos com baixo teor de gordura (isto é, light/diet) à venda próximo à sua residência*
4. There are many opportunities to purchase fast-foods in my neighborhood	4. *Existem muitos lugares para lanches e refeições rápidas (fast-food) próximo à sua residência*[a,b]
Safety	Segurança
1. I feel safe walking in my neighborhood, day or night	1. *O(a) senhor(a) se sente seguro(a) andando de dia ou de noite na sua vizinhança*
2. Violence is not a problem in my neighborhood	2. *A violência É um problema na sua vizinhança*[a]
3. My neighborhood is safe from crime	3. *Sua vizinhança é segura em relação a crimes*
Perceived Violence	Violência Percebida
1. During the past six months, how often was there a fight in this neighborhood in which a weapon was used?	1. *Nos ÚLTIMOS 6 MESES, com que frequência houve brigas que tenham envolvido o uso de armas na sua vizinhança?*
2. A violent argument between neighbors	2. *Nos ÚLTIMOS 6 MESES, com que frequência houve discussão violenta entre vizinhos?*
3. A gang fight	3. *Nos ÚLTIMOS 6 MESES, com que frequência houve briga entre gangues (grupos ou facções rivais)?*
4. A sexual assault or rape	4. *Nos ÚLTIMOS 6 MESES, com que frequência houve violência sexual ou estupro?*
5. A robbery or mugging	5. *Nos ÚLTIMOS 6 MESES, com que frequência houve roubo ou assalto?*
Personal Victimization	Vitimização Pessoal
1.While you have lived in this neighborhood, has anyone ever used violence, such as in a mugging, fight, or sexual assault, against you or a member of your household anywhere in your neighborhood?	1. *Alguém já praticou violência (assalto, briga, violência sexual ou sequestro) contra o(a) senhor(a) ou contra algum morador de sua residência, nessa vizinhança, durante o tempo em que o(a) senhor(a) mora nesse local?*

[a] Item that received reverse coding
[b] Item excluded in order to increase the internal consistency of the scale

Design of the test-retest reliability study

ELSA-Brasil is a cohort study on approximately 15,000 workers at six Brazilian teaching and research institutions, both with active and with retired status, aged between 35 and 74 years of age.[2] A total of 261 volunteer participants from six ELSA-Brasil investigation centers were included in the test-retest reliability study on the neighborhood scales, in accordance with previously established quotas regarding sex, age and educational level.

Data-gathering for the "test" was performed during the processes of interviewing/examining the study participants. Each participant was invited to answer again the sections of the questionnaire that were included in the reliability study, in order to fulfill the defined sampling quota. The second application of questions (retest) of these sections was performed by the same interviewer, seven to 14 days after the first application.

Statistical Analyses on Instrument Reliability

The responses to the test and retest were inserted in a computerized database through double independent data entry in the EpiInfo software, with subsequent correction of inconsistencies.

Two components were evaluated in the test-retest reliability analysis: the internal consistency of each domain, by estimating Cronbach's alpha; and the temporal stability of the measurements, by means of the intraclass correlation coefficient (ICC) for the scores and the kappa (k) and prevalence-adjusted kappa (k*a*) indexes for the question on victimization (dichotomous yes/no). This was done according to the following characteristics of the participants: sex, age (35-54 or 55-74) and educational level (elementary, high school or higher education).

The ICC was applied to the scores, both from the test and retest, resulting from the sum of the responses obtained in each item for each scale. Some items from the scales received reverse coding (e.g., items 4 and 5 of the social cohesion scale, as shown in Table 1). For the social cohesion, environment suitable for physical activity, availability of healthy foods, and safety in relation to crimes scales, the greater the score was, the worse the quality of the set of characteristics of that domain also was. For the perceived violence scale, the greater the score was, the lower the frequency of occurrences of violence was. The reliability of the individual items of each scale was estimated using quadratic weighted kappa (κp).

The cutoffs suggested by Byrt et al[5] for classifying the level of stability of the responses were used: weak (0 to 0.20); mild (0.21 to 0.40); reasonable (0.41 to 0.60); good (0.61 to 0.80); very good (0.81 to 0.92); and excellent (0.93 to 1.00).

RESULTS

In this section, the stages for semantic, items, operational and measurement equivalence are described.

The items that comprise each scale, in the original version and the version adapted for Portuguese, are presented in Table 1.

In the stage of evaluating semantic equivalence, among the 28 items analyzed, only five presented divergence or doubt among the evaluators. Two of them were in the social cohesion domain: 1- "This is a close-knit or unified neighborhood"; 2- "People in this neighborhood generally DON'T get along with each other". In the first case, the item was translated as "very cohesive". However, according to surveys, the meaning of this term was not clear enough for the interviewees. Regarding the second item, the evaluators considered that negative expressions ("people... DON'T get along with...) might confuse the responses of the interviewees. Nevertheless, the phrasing was kept, in accordance with the original conception of the scale by Sampson et al,[25] and interviewers were given the guidance that negative expressions should be emphasized, and the word DON'T was highlighted in the questionnaire.

In the item "There are many fast-food snack-bars in my neighborhood", in the "availability of healthy foods" domain, it was decided to explain the desired meaning in the Portuguese version, while retaining the English expression "fast food", since this is used colloquially in social groups similar to the population of ELSA-Brasil.

Finally, two items in the "safety" domain deserved special attention in several stages: 1- "My neighborhood is safe from crime"; and 2- "Violence is a problem in my neighborhood". The first of these was initially translated as "My neighborhood is crime-free". However, the evaluators concluded that the literal translation would give a very radical idea about the absence of crime, which should be made explicit in this case. Thus, another sentence that transmitted the meaning more properly in the Brazilian context was chosen. The other item was initially literally translated, including the word NOT. The evaluators' opinion concerning difficulties with negative expressions was confirmed in surveys and pretests. Thus, it was decided to change the expression into an affirmative one since there was a further reason for doubts among the interviewees in this case, since they would give contradictory responses to these two items, which were presented one after the other. Thus, for example, they *agreed* that their neighborhood *was* safe in relation to crimes, and at the same time *disagreed* that violence was *not* a problem in the same neighborhood.

The average age of the respondents in the test-retest reliability study was 52.5 years (standard deviation 8.7); 49.4% (129) were women, and 50.6% (132) were men. The mean length of time living in the neighborhood was 18.1 years (standard deviation 15.1).

Descriptive statistics on the stage of equivalence of measurements on the scales are presented in Table 2. Cronbach's alpha ranged from 0.64 (social cohesion) to 0.84 (availability of healthy foods, after exclusion of item 4, as shown in Table 1, due to the poor performance presented by this item).

The reproducibility of the overall scores ranged from good to very good. The scales with the highest stability values were environment suitable for physical activity and availability of healthy foods, followed by perceived violence, safety and social cohesion (Table 3). In the stratified analyses, the intraclass correlation coefficients were above 0.78 for all strata of sex, age, and educational level. No important variations or consistent patterns could be identified according to the strata of these characteristics. The question about victimization presented an overall kappa index (κ) of 0.66, with notable variation among the strata, with the lowest performance in the stratum of elementary educational level ($\kappa = 0.36$). After adjustment according to prevalence, the general index of this question presented the greatest temporal stability (overall

κa = 0.71) with reduction of the difference among the strata of educational level (elementary κa = 0.56; high school κa = 0.70; higher education κa = 0.73).

The weighted kappa statistics (κp) for individual evaluation of the items ranged from 0.30 to 0.42 for sentences with statements with negative expressions (not), and from 0.54 to 0.74 for the other sentences.

DISCUSSION

According to the scheme proposed by Herdman et al,[16] the evaluation of the five types of equivalence (conceptual, among items, semantic, operational and measurement) suggested that there is functional equivalence between the scales in English and in Portuguese.

The internal consistency estimates on the scales evaluated presented values that were similar to those of reference studies such as the one carried out by Echeverría et al,[14] in which Cronbach's alpha ranged

from 0.77 to 0.94, and the MESA study, with a range from 0.73 to 0.89,[20] considering all scales.

Like in the MESA study,[20] the item about fast food was excluded from the scale of availability of healthy foods, which improved its internal consistency. Thus, all future analyses of this domain will be based on scores obtained through summing its first three items.

Considering the cutoff points for the stability levels for responses suggested by Byrt et al,[5] the victimization scale presented good stability (0.66), and the social cohesion, safety and perceived violence scales, followed by the availability of healthy foods and environment suitable for physical activity scales presented very good stability (ICC 0.83 to 0.90).

These results are similar to those of American studies, in which high reproducibility was estimated for all scales. In the pilot study developed by Echeverría et al[14] among 48 volunteers living in New York, the ICC ranged from 0.78 to 0.91 (all scales). In the case of the investigation

Table 2. Means and standard deviations of the scores from measurement scale dimensions of self-reported neighborhood characteristics in the test and retest. ELSA-Brasil, 2010.

Dimension	Number of items on the scale	Range of the score	Mean for test (with sd)	Cronbach's alpha (test)	Mean for retest (with sd)	Cronbach's alpha (retest)
Social cohesion	5	5-25	12.8 (3.5)	0.60	12.4 (3.6)	0.70
Environment suitable for physical activity	9	9-45	21.1 (6.9)	0.72	21.3 (7.2)	0.79
Availability of healthy foods	3	3-15	5.6 (3.3)	0.84	5.6(3.1)	0.84
Safety	3	3-12	8.4 (3.2)	0.67	8.0 (3.1)	0.70
Perceived violence	5	5-20	16.6 (2.9)	0.71	16.8 (2.8)	0.75

Table 3. Intraclass correlation coefficient and 95% confidence intervals of the measurement scale dimensions of self-reported neighborhood characteristics: general values and according to sex, age and educational level. ELSA-Brasil, 2010.

Domínio	General 95%CI	Sex		Age		Educational level		
		Male	Female	35 to 54	55 to 74	Elementary	High school	Higher education
Social cohesion	0.83 0.78;0.87	0.84 0.77;0.89	0.80 0.72;0.86	0.87 0.82;0.90	0.77 0.66;0.84	0.90 0.79;0.95	0.79 0.68;0.86	0.79 0.68;0.86
Environment suitable for physical activity	0.90 0.87;0.92	0.89 0.85;0.93	0.90 0.86;0.93	0.91 0.88;0.94	0.88 0.82;0.92	0.90 0.78;0.96	0.81 0.71;0.87	0.93 0.90;0.95
Availability of healthy foods	0.89 0.86;091	0.88 0.83;0.92	0.90 0.83;0.96	0.88 0.83;0.91	0.91 0.87;0.94	0.95 0.90;0.98	0.81 0.71;0.88	0.93 0.91;0.95
Safety	0.86 0.82;0.89	0.85 0.79;0.89	0.87 0.82;0.91	0.90 0.86;0.92	0.80 0.70 0.86	0.78 0.52;0.90	0.84 0.75;0.90	0.89 0.84;0.92
Perceived violence	0.87 0.84;0.90	0.87 0.81;0.91	0.88 0.83;0.91	0.85 0.79;0.89	0.90 0.85;0.93	0.78 0.53;0.90	0.89 0.83;0.93	0.87 0.82;0.91
Victimization (One question)	0.66[a] 0.55;0.75	0.61[a] 0.44;0.75	0.69[a] 0.55;0.81	0.71[a] 0.58;0.82	0.59[a] 0.42;0.74	0.36[a] -0.12;0.74	0.61[a] 0.41;0.78	0.72[a] 0.59;0.83
Duration of residence (years)	0.94 0.91;0.97	0.98 0.97;0.98	0.96 0.95;0.97	0.96 0.94;0.97	0.98 0.97;0.99	0.99 0.98;0.99	0.98 0.97;0.99	0.96 0.94;0.97

[a] Kappa index

conducted by Mujahid et al[20] (MESA), the scales used presented slightly lower coefficients, ranging from 0.60 to 0.88, and were applied by telephone to a sample of 120 individuals.

It should be noted that the subsample of study participants was distributed similarly to the whole population of ELSA-Brasil, with regard to sex, age group and educational level. Thus, it was similar to the population for which the instrument was targeted. This, combined with the results from the stages of semantic, item and operational equivalence, indicates that the equivalence of measurements that was the aim was obtained, and that the estimates of the statistical analyses represented the real reliability of the instruments.

We consider that the favorable results found in the present study, i.e. indicating that self-reported measurements of neighborhood characteristics are reproducible in Brazil, are fundamental for enabling analysis on mechanisms that can explain how the characteristics of neighborhoods can affect health.

The next step in using self-reported measurement scales on neighborhood characteristics is to study correlations between the participants who live in the same neighborhood, by means of ecometric techniques.[20,23] This approach will provide estimates of the consistency between the items on each scale, among participants of the same neighborhood, and between various neighborhoods simultaneous

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