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Concurrent and face validity of the MacArthur scale for assessing subjective social status: Brazilian Longitudinal Study of Adult Health (ELSA-Brasil)

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Abstract *This work assessed the concurrent and face validity of the MacArthur scale, which attempts to capture subjective social status in society, neighborhood and work contexts. The study population comprised a convenience sample made up of 159 adult participants of the ELSA-Brasil cohort study conducted in Minas Gerais between 2012 and 2014. The analysis was conducted drawing on Conceptual Metaphor Theory and using corpus linguistic methods. Concurrent validity was shown to be moderate for the society ladder (Kappaw = 0.55) and good for the neighborhood (Kappaw = 0.60) and work (Kappaw = 0,67) ladders. Face validity indicated that the MacArthur scale really captures subjective social status across indicators of socioeconomic position, thus confirming that it is a valuable tool for the study of social inequalities in health Brazil.*

Key words *Social class, Linguistics, Metaphor, Validity*

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Introduction

Objective social status (OSS), a commonly used indicator in studies addressing social inequalities in health, can be defined as the prestige associated with an individual's position in the social hierarchy, which determines access to goods, services, and knowledge[1]. In addition to prestige, social status also encompasses the power and honor attributed to a social position in the existing class hierarchy[2]. Subjective social status (SSS) on the other hand can be defined as an individual's common sense perception of his/her social standing[3,4]. It comprises a sense of belonging and identity in relation to the values, interests and habits of a particular social class[5]. It is believed that social inequalities in health are determined by both objective social status and subjective psychosocial perceptions[6-9]. Despite the importance of SSS, objective indicators such as income and schooling have received more research attention, possibly because they are easier to measure[10].

The MacArthur scale is one of the most widely used measures of SSS in epidemiological studies. It was developed to capture the common sense of social status across socioeconomic indicators such as income, education and occupation[3]. The scale comprises two 10-step ladders: one that attempts to capture broader social status and one that assesses standing in the local environment (community). Low SSS has been associated with a higher prevalence of arterial hypertension[11], type 2 diabetes[4] and respiratory infections[12], and with poor health rated health[13], even after adjustment for objective socioeconomic indicators. A comparative study of the predictive power of objective and subjective status showed that although both were predictors of poor health status, only subjective status was independently associated with health outcomes[14]. The authors suggested the following three hypotheses to explain these results: 1) SSS represents a cognitive average of objective socioeconomic indicators; 2) OSS is absolute, while SSS is relative; and 3) the association between SSS and health and disease is spurious, being affected by response bias or confused by other variables.

The MacArthur scale was recently translated and adapted for use in Brazil as part of the Longitudinal Study of Adult Health in Brazil (*Estudo Longitudinal de Saúde do Adulto – ELSA, Brasil)*. Although the Brazilian version has been shown to have good reliability[15], an analysis of the scale's instructions conducted within a cognitive linguistics framework[16,17] raises questions as to whether it actually provides a direct assessment of status, given that the instructions fail to explicitly mention the word "status", referring only to "income", "education", "work", and "standard of living". In view of Brazil's rich sociocultural diversity[18] and recent political changes[19], it is likely that not everyone will grasp the meaning of "status" in the instructions. Semantically speaking, saying that someone "has a high income, but does not have status" is not contradiction *per se*. This statement would be contradictory only if the idealized cognitive model (ICM) of social status was shared across the entire scope of Brazilian culture. ICMs are stable, organized and idealized theories and representations of the world and act as structures of sociocultural expectations[20,21]. They are intimately related to prototypes, which are abstract "representations" involved in categorization processes, which bring together attributes and meanings that better designate a category[20,21].

The theories referred to above stem from the fact that cognitive linguists generally work with the weak version of the principle of linguistic relativity[16], which considers different world views (*Weltanschauung*)[22]. This version suggests that language only partially influences cognition (thought, perception, memory, etc.) and culture. Within this context, the perceived linguistic variations among individuals belonging to different social classes and age groups reflect different world views and, possibly, "status". Within the weak version, these varying world views are not completely isolated and exclusive, but rather have zones of experiential intersection. In short, it can be said that individuals have different world views depending on their gender, class and level of schooling, with ICMs that result in different prototypes of social categorization.

It is also important to remember that, although "status" may include prestige and renown, the Brazilian Portuguese dictionary definition does not always encompass the socioeconomic aspects of the term[23,24] commonly found in English[25,26] and sociology[27] dictionaries. We therefore hypothesize that the instructions of the MacArthur scale do not fully capture the common sense of "status" in Brazilian Portuguese, given that different social strata are likely to have different conceptions of the term. In light of the above, we elaborated a status scale to test the concurrent validity of the MacArthur scale and determine whether validity varies according to sociodemographic characteristics. Furthermore, we assessed the face validity of the MacArthur scale using corpus linguistic methods[28,29].

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Method

Study Population

The ELSA-Brasil is a multicentric cohort study developed in higher education and research institutions in six different Brazilian states. The baseline of the study, conducted between 2008 and 2010, included 15,105 active and retired workers from the participating institutions. The main aims of the study are to investigate the incidence and progression of diabetes and cardiovascular diseases and the biological, behavioral, environmental, occupational, psychological and social factors associated with these diseases and their complications[30,31]. The ELSA-Brasil was conducted in accordance with the norms and standards for research involving human subjects and approved by the relevant state ethics committees and by the National Research Ethics Committee of the Ministry of Health.

The present study used a convenience sample made up of 159 ELSA-Brasil participants from the Minas Gerais Research Center (*Centro de Investigação de Minas Gerais - CI-MG)*, who took part in the second visit of examinations and interviews conducted between November 2012 and February 2014. The participants were randomly invited to participate in the study, ensuring that the sample size was appropriately distributed across gender, age group and occupation. Each participant was interviewed in the CI-MG by a qualified researcher (WAF). Interviews were conducted in a setting that guaranteed participant privacy and confidentiality of information and recorded for subsequent qualitative analysis.

Data collection

A semi-structured interview was conducted using a questionnaire that was pretested and piloted via the following stages: 1) application of the status scale; 2) application of the MacArthur scale; and 3) open-ended interviews about the chosen options. After answering the closed-ended questions contained in the status and MacArthur scales, participants were asked to answer the following three questions about the MacArthur scale: 1) "What type of people are at the top of the ladder?"; 2) "What kind of people are at the bottom of the ladder?"; 3) "What kind of people are in the middle of the ladder?". Face validity was tested using the answers to these open-ended questions related to the MacArthur´s scale.

Status scale

The status scale, used as a criterion test to measure the concurrent validity of the MacArthur scale, was elaborated from the original MacArthur scale drawing on Conceptual Metaphor Theory (CMT)[32-37], replacing the semantic equivalence used for the instructions with the word "status". The original passages were maintained, seeking to create more referential instructions and allocating prepositional phrases (for example, "in society", "in your neighborhood" and "at your work") to activate the respective conceptual domains. This methodology was developed to trigger the priming effect: a preceding stimulus that activates a node in the cognitive network triggering the propagated activation of other nodes[38], in such a way that the ladder domain is used in the metaphorization of the status domain. This idea is based on the conceptual metaphor "high status is up" [37] and the primary metaphors "inequalities are distances", "up is good", and "down is bad"[36].

Society:

This ladder represents status in society. People who have a high social status are at the top of the ladder. People who have a low social status are at the bottom of the ladder. The higher you consider yourself on this ladder, the closer you will be to the people who are at the top of the ladder and the lower, the closer to people who find themselves at the bottom. Where would you place yourself on this ladder?

Neighborhood:

Now, following the same logic as the previous question, this ladder represents status within your neighborhood. People define their neighborhood in various ways. Please use the definition that makes most sense to you. People who have a high status within your neighborhood are at the top of the ladder. People who have a low status within your neighborhood are at the bottom of the ladder. Considering the status of the people within your neighborhood, where would you place yourself on this ladder?

Work:

Finally, following the same logic, this ladder represents status at work. People define their work in various ways. Please use the definition that makes most sense to you. People who have a high status at your work are at the top of the ladder. People who have a low status at your work are at the bottom of the ladder. Considering your work, where would you place yourself on this ladder?

MacArthur scale

The original versions of the MacArthur scale were applied in the same way as they were used in the baseline of the ELSA- Brasil (between 2008 and 2010)[15]:

Society:

Consider that the ladder I am showing you represents the place that people occupy in society. People with more money, a higher level of education and better jobs are at the top of the ladder. People with less money, a lower level of education and worse jobs (jobs with less recognition) or who are unemployed are at the bottom of the ladder. The higher you consider yourself on this ladder, the closer you will be to the people who are at the top of the ladder and the lower, the closer to people who find themselves at the bottom. Where would you place yourself on this ladder?

Neighborhood:

Following the same logic as the previous question, this ladder represents the place people occupy within the neighborhood where you live. People define their neighborhood in various ways. Please use the definition that makes most sense to you. The people in your neighborhood who have a higher standard of living are at the top of the ladder. The people in your neighborhood who have a lower standard of living are at the bottom of the ladder. Considering the standard of living of the people in your neighborhood, where would you place yourself on this ladder?

Work:

Finally, following the same logic, this ladder represents the place people occupy at your work. People define their work in various ways. Please use the definition that makes most sense to you. People in the upper echelons, like directors or the president for example, are at the top of the ladder. People who do the less valued jobs are at the bottom of the ladder. Considering your work, where would you place yourself on this ladder?

The status scale was used as a criterion test to measure the concurrent validity because the explicit introduction of the word "status" is an objective, referential and direct form of measuring subjective social status (SSS). From the point of view of pragmatics[39], by applying the status scale the interviewer says exactly what he/she intends to communicate to the participant (for example: "People who have a high social status are at the top of the ladder"): SSS is assessed directly. On the other hand, by applying the MacArthur scale, the interviewer says something (for example: "People with more money, a higher level of education and better jobs are at the top of the ladder") while he intended to communicate something else (for example: "Actually, by these socioeconomic indicators I mean that the people at the top have a higher social status"): SSS is assessed indirectly. In the status scale, SSS must be deduced, semantically, directly and referentially, based upon the verticality of the ladder (for example: top, higher status; bottom, lower status; middle, average status), while in the MacArthur scale, SSS must be inferred, pragmatically and indirectly, based on classic socioeconomic indicators (for example: "'x' has a high level of education, average income and an average job, so probably has a status that is slightly above average").

Study variables

To investigate the sociodemographic characteristics associated with differences in step selection on the respective ladders of the status and MacArthur scales, we created three response variables (one for each context). These were based on the absolute differences between the chosen steps and categorized as follows: 1) no difference; 2) difference of one step; and 3) difference of two or more steps. The sociodemographic variables used were gender (male; female), age categorized according to the 50th percentile (39-52 years; 53-76 years), higher education (yes; no), net family income (1-4; 5-8; 9-10 minimum salaries), social class (low; middle; upper), and occupation (active; retired). The variables higher education, net family income and social class were taken from the baseline of the ELSA-Brasil, while occupation and age were obtained at the time of the interview in the second phase.

Quantitative analysis

The analysis assumes that if the MacArthur scale purportedly assesses SSS in society, the neighborhood, and at work, participants will choose identical steps in the respective ladders of the status scale. Agreement between the responses to the MacArthur and status scales was determined using weighted kappa with a 95% confidence interval. The kappa coefficient was calculated using quadratic weight, because it computes the intraclass correlation coefficient[40]. Furthermore, the weighted kappa coefficients were stratified according to the study variables (CI 95%). To measure agreement, Kappa values

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were classified according to Altman's criteria[41]: poor: -1 to 0.2; fair: 0.2 to 0.4; moderate: 0.4 to 0.6; good: 0.6 to 0.8; very good: 0.8 to 1.0.

Weighted Kappa was used to test concurrent validity because it represents the magnitude of overlapping between the semantic areas of the constructs of the status and MacArthur scales, given that the instructions of the status scale were constructed, *a priori*, to safeguard synonymy in relation to the MacArthur scale. Thus, a weighted Kappa value of 1.0 means that the areas of the constructs of the status and MacArthur scales are semantically equivalent (content synonymy) or, in other words, "congruent" and comparable, which are essential elements of valid tools[42]. It is important to highlight that similar methodological procedures using Kappa are conducted in the field of *corpus linguistics*[43].

Ordinal logistic regression was then performed to determine which sociodemographic characteristics were associated with the absolute differences in step selection between the respective ladders of the status and MacArthur scales. Odds ratios (OR) and respective 95% confidence intervals were calculated to measure the magnitude of association using the logit function. A univariate analysis was conducted followed by multivariate analysis with explanatory variables that obtained a value of $p < 0.20$ adopting a 5% significance level. The maximum likelihood test was used to test the proportional odds assumption.

Qualitative analysis

The face validity of the MacArthur scale was tested using empirically-based computational methods of corpus linguistics designed to carefully collect and analyze linguistic data (also called corpora)[28,29]. The analysis was conducted using AntConc (3.4.3w), a freeware concordance software program[44].

First, the participants' answers were transcribed in accordance with the norms of the *Projeto da Norma Urbana Oral Culta do Rio de Janeiro (NURC)*[45]. Since 62% of the participants had completed higher education, interviews were randomly selected so as to not create discrepancies between the number of interviews of individuals who had not completed higher education. The selection process also considered distribution by gender, given that there was a statistically significant association between these two variables and absolute differences in the MacArthur and status scales. This balance in the size of the corpus is important to allow comparisons between subgroups[28].

The transcriptions were organized into nine corpora: A) society (1. top, 2. middle, 3. bottom); B) neighborhood (idem); and C) work (idem). The AntConc keyword list tool was used to extract 100 keywords central to each *corpora,* resulting in a total of 900 keywords. The analysis only considered nouns. Semantically redundant or empty words, such as "*gente*" (us or people) and "*coisa*" (thing), were ignored. This is because the semantic network is organized around concepts (or nodes) that structure knowledge[38]. The extraction of keywords requires a reference corpus[28,29]. For this study we used the *Projeto Corpus Brasileiro (GELC)*[46], which attempts to represent contemporary Brazilian Portuguese and currently comprises almost one billion (989,012,584) words from different textual genres[47]. The keyword tool basically conducts a statistical comparison (log-likelihood) between the word lists of the study corpus and the distribution of the reference corpus.

Each of the keywords are then qualitatively analyzed in the co-text using the program's N-grams and concordance tools. The co-text is the textual setting in which the target word is found. The first tool lists the words that appear directly on the right (D) or left (E) of the nucleus, for example "*poder*", "*poder* aquisitivo", "*poder* aquisitivo maior" (*power*, purchasing *power*, greater purchasing *power*) or "Eu tenho *poder*", "tenho *poder*", "*poder*" (I have power, have *power*, *power*), while the second lists the keyword in the co-text, for example "(...) as pessoas com *poder* aquisitivo maior (...)" (people with greater purchasing *power*). These strategies were used to capture the nuances of meaning (for example "doesn't *have* access to education" is different to "didn't *have* access to education"). These semantic frames were used to better describe the semantic fields in which they are found linked to keywords[48].

Care was taken to preserve the synonymy between language and cognition: 1) each keyword was described, when possible, using the verbs *ter* (have), *ser* and *estar* (which both mean to be), for example "*Tem* mais dinheiro" (*has* more money); "*são* empresários" (*are* businessmen); 2) we opted to maintain expressions as close as possible to the answers, for example "não tem/teve oportunidade" (doesn't/didn't have opportunity); 3) special attention was given to 3.1) quantifica-

tions, for example "*mais/menos* rico" (*more/less* rich), and 3.2) categorizations, for example "casa *própria/alugada*"(*own/rented* house). This methodology is justified by the fact that grammatical structure reflects, at least partially, conceptualization processes[49]. Finally, the keywords belonging to the same semantic field were grouped, for example, *mais escolaridade*: "*instrução*", "*educação*" (higher level of schooling: "training", "education").

Results

Quantitative analysis

Over half of the 159 participants (54%) were men; 51% were aged between 39 and 52 years and 49% between 53 and 76 years; 62% had completed higher education; 33% had a family income of between nine and 10 minimum salaries, 29% between five and eight minimum salaries, and 36% between one and four; 45% were upper class, 33% middle class, and 16% lower class; and 46% were retired.

With respect to the selected step, for the society ladder the mode for the MacArthur and status scale was 6 (25%) and 7 (24%), respectively, while the median was 6 for both scales. With respect to neighborhood, the mode was 8 for both scales (MacArthur scale, 26%; Status Scale, 27%), and the median was 6 and 5, respectively. Finally, for work the mode was 8 for both scales (MacArthur scale, 24%; status scale, 26%), and the median was 6 and 6.5, respectively.

Based on the Kappa values, general agreement was shown to be moderate for the society ladder (0.55) and good for the neighborhood (0.60) and work (0.67) ladders (Table 1). No statistically significant differences between kappa statistics for sociodemographic characteristics were observed across all ladders. However, in the society and neighborhood ladders agreement was weak for individuals who had not completed higher education (0.27) and who were retired (0.22), respectively.

The results of the multivariate analysis showed that there was an association between a difference of one or two steps and education on the society ladder and gender on the neighborhood ladder. No association was found between a difference of one or two steps and sociodemographic variables on the work ladder. The results of the maximum likelihood test show that none of the variables broke the proportional odds assumption (Table 2).

Qualitative analysis

Chart 1 shows the prototypes obtained for the society ladder of the MacArthur Scale. Prototypical examples at the top of the ladder were businessmen and politicians, compared to street dwellers, illiterate and unemployed individuals at the bottom. Prototypical examples in the middle of the ladder were salaried workers, public servants and middle-class workers. With respect to indicators of status, "power" ("political", "purchasing", "economic" and of "persuasion") and "prestige" emerged as keywords, while "honor" was not mentioned at any moment during the interviews.

Chart 2 shows the prototypes obtained for the neighborhood ladder. The prototypical examples that remained were businessmen at the top of the ladder and street dwellers, the unemployed and individuals living in *favelas* (slums) at the bottom. In the middle of the ladder, the prototypes were workers and middle-class workers and former residents of the neighborhood or building. With respect to indicators of status, only "power" ("purchasing", "economic" and "financial") emerged as a keyword.

Chart 3 shows the prototypes obtained for the MacArthur work ladder. Prototypical examples at the top of the ladder were principals, heads of department, unit directors, businessmen and others, while examples at the bottom were cleaners, porters, servants, gardeners and outsourced workers. In the middle of the ladder, prototypes included technical-administrative workers, new teachers, heads of division, and civil servants.

Discussion

The results of this study show that general agreement between the MacArthur and Status scales was moderate for the society ladder and good for the neighborhood and work ladders. It was also shown that agreement does not vary according to the sociodemographic characteristics studied. However, ordinal logistic regression showed nonrandom differences in step selection in the society and neighborhood ladders. The likelihood of a difference of one or two steps was greater among participants who had not completed higher education in the society ladder and among wom-

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Table 1. Agreement between the MacArthur and status scales by sociodemographic characteristics, ELSA-Brasil.

	Society Kw (CI: 95%)	Neighborhood Kw (CI: 95%)	Work Kw (CI: 95%)
General	0.55 (0.44;0.66)	0.60 (0.47;0.73)	0.67 (0.52; 0.83)
Gender			
Male	0.58 (0.41;0.75)	0.58 (0.38;0.79)	0.67 (0.49;0.86)
Female	0.52 (0.40;0.64)	0.61 (0.46;0.76)	0.66 (0.41;0.92)
Age			
39-52	0.56 (0.42;0.69)	0.70 (0.59;0.81)	0.63 (0.40; 0.86)
53-76	0.55 (0.37;0.72)	0.52 (0.31;0.72)	0.71 (0.51; 0.92)
Higher education			
Yes	0.61 (0.50;0.72)	0.58 (0.45;0.71)	0.66 (0.42;0.90)
No	0.27 (0.01;0.53)	0.54 (0.27;0.81)	0.59 (0.35;0.84)
Net family income (Nº of minimum salaries)			
1-4	0.42 (0.18;0.66)	0.43 (0.14;0.71)	0.63 (0.41; 0.85)
5-8	0.40 (0.21;0.58)	0.60 (0.41; 0.79)	0.44 (0.01; 0.86)
9-10	0.35 (0.20;0.51)	0.61 (0.44; 0.77)	0.60 (0.44; 0.77)
Social class			
Lower	0.45 (0.14;0.76)	0.82 (0.74;0.91)	0.64 (0.33;0.95)
Middle	0.42 (0.17;0.67)	0.57 (0.38;0.75)	0.61 (0.25;0.97)
Upper	0.50 (0.37;0.63)	0.56 (0.39;0.72)	0.66 (0.52;0.81)
Occupation			
Active	0.52 (0.40;0.64)	0.66 (0.56;0.76)	0.67(0.51;0.84)
Retired	0.74 (0.54;0.95)	0.22 (-0.36; 0.80)	0.67 (0.24;1.11)

Note. K_w: Weighted Kappa; w = [1- (i^2)/(k-1)^2].

Table 2. Association between sociodemographic characteristics and absolute differences between selected steps in the MacArthur and status scales, ELSA-Brasil.

	Univariate analysis			Multivariate analysis	
	Society	Neighborhood	Work	Society*	Neighborhood**
	OR (CI: 95%)	OR (CI: 95%)	OR (CI: 95%)	OR (CI: 95%)	OR (CI: 95%)
Gender					
Male	1.0	1.0	1.0	-	1.0
Female	1.56 (0.87;2.83)	**1.91 (1.05;3.47)**	1.01 (0.55;1.86)	-	**1.89 (1.03-3.45)**
Ager					
53-76	1.0	1.0	1.0	-	-
39-52	1,41 (0,78;2,53)	0,81(0,45;1,46)	0,96 (0,52;1,75)	-	-
Higher education					
Yes	1.0	1.0	1.0	1.0	-
No	**3.70 (1.97;6.95)**	1,29 (0,70;2,38)	1,36 (0,73;2,55)	**3,45 (1,21;9,82)**	-
Net family income (Nº of minimum salaries)					
9-10	1.0	1.0	1.0	-	-
5-8	0.99 (0.46;2.5)	2.16 (1.00;4.68)	1.79 (0.82;3.90)	-	-
1-4	**2.76 (1.35;5.66)**	**2.27 (1.09;4.74)**	1.70 (0.81;3.56)	-	-
Social class					
Upper	1.0	1.0	1.0	-	-
Middle	**2.26 (1.13;4.50)**	1.65 (0.83;3.26)	0.97 (0.48;1.95)	-	-
Lower	**4.43 (1.85;10.65)**	1.49 (0.63;3.52)	0.78 (0.32;1.92)	-	-
Occupation					
Retired	1.0	1.0	1.0	-	-
Active	1.33 (0.53;3.35)	1.11 (0.45;2.76)	1.03 (0.40;2.67)	-	-

Note. *Adjusted for net family income and social class. Likelihood: 0.3342. ** Adjusted for net family income 1-4 versus 5-10 salaries. Likelihood: 0.4447.

Chart 1. Prototypes for the MacArthur society (general) ladder, ELSA-Brasil.

Bottom	Middle	Top
WORSE JOBS: have jobs: worse, without stability, without security; have *informal underpaid job*; or without job; less job offers;	AVERAGE JOBS: have jobs: average, reasonable, satisfactory, better and formal; or have access to and search for jobs; are *employees*: average public or perhaps high-level;	BETTER JOBS: have jobs: better, stable and important; more jobs (offers); are big *businessmen*: businessmen who have schooling, many or some of them; are big *politicians*;
LOWER LEVEL OF SCHOOLING: have less/little/or do not have *education/schooling*; fundamental level of schooling; do not have/ did not have *education* or *access* to education; have less/lower level of *training*;	AVERAGE LEVEL OF SCHOOLING: have secondary *education*; or better access to education today; have *schooling*; a little schooling; completed only normal schooling;	HIGHER LEVEL OF SCHOOLING: have more/better *training*; privileged training; have *PhD*; have/did *degree/post-graduate degree*; have much/higher level of *study*; although practically the majority did not study; have much/ higher level of *schooling;* but also some do not have much schooling; have a lot of *knowledge;* also some have little knowledge;
LOWER INCOME: have worse/ lower *salaries*; less than one or two minimum salaries; low salary; or no salary; have very little /do not have *money*; have low *income*; or do not have income;	AVERAGE INCOME: have/earn *salaries*: medium; "get by" with little salary;	HIGH INCOME: have/earn a lot of/ more *money*; have higher *salaries*;
WORSE LIVING CONDITIONS: have poor/lost their *health*; do not have private health; do not have health to earn his/her own living; have/had less/few *opportunities*; do not have *food security* or have no job; without *housing*; do not have their own home; are *street dwellers*; or live on the street; do not have/did not have *access* to things.	AVERAGE LIVING CONDITIONS: are from the middle *class:* formerly middle, lower or middle class; reach better *positions* and climbed to better positions; have average purchasing and political *power*; may reach "the top"; achieved a certain *status*; are from the *in-crowd:* average and from the judiciary; have *life*: moderate, dignified, stable and improvable; have *leisure* conditions.	BETTER LIVING CONDITIONS: have a lot of/more *power*: political, purchasing, economic and of persuasion; are from high *society*, have important ("central") jobs; have a lot of/more *prestige;* social prestige; some because they *deserve* it/other not.

Note. Keywords in italic from the contemporary Portuguese language

en in the neighborhood ladder. Although these results support our hypothesis that given that individuals from different social classes are likely to have different conceptions of the term "status", they should be treated with caution. Differences of one step may just express preferences without any major connotation of socioeconomic position. It is also important to highlight that weighted Kappa showed that education and gender did not have an influence in the society and neighborhood ladders, respectively.

The differences in step selection on the society ladder between the status and MacArthur scales may be explained by two hypotheses, one of which is based on cognitive linguistics and the other sociocultural. From a cognitive linguistics point of view, it is assumed that individuals who have not completed higher education have greater difficulty in understanding the instructions of the MacArthur scale for the society ladder. The instructions of the MacArthur scale are more complex linguistically speaking since they have

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Chart 2. Prototypes for the MacArthur neighborhood (general) ladder, ELSA-Brasil.

Bottom	Middle	Top
LOWER STANDARD OF LIVING: have lower/low *standard of living*; do not manage to maintain a moderate standard of living;	AVERAGE STANDARD OF LIVING have a moderate *standard of living;* better and more average; are middle *class*: middle, lower-middle or poor; have *salaries*; survive on them; around five salaries;	HIGH STANDARD OF LIVING: have a higher/high *standard of living*, much better, really higher; have greater purchasing, economic and financial power (much above); power "in their hands"; have a lot of and spend a lot of/more *money;* to show they have money; have better/ good *salaries*; salaries much better than mine;
WORSE HOUSING: have *houses*: simple, rented, without maintenance; or do not have houses; can't afford their own house; have *housing* in subhuman conditions; housing incompatible with what they deserve, or no housing; are in/live in *favelas;* live close to *favelas*; have to pay *rent*;	AVERAG HOUSING: have *houses*: own, average size, reasonable and good; have *housing*: good, comfortable; do not own the house; are older *buildings*; former residents of the building; do not have to pay *rent*; or pay/live in rented accommodation;	BETTER HOUSING: have *houses:* own, better, very good, luxurious, with security guards; buy things for the house; have more *cars*; very good cars, in the garage; two, three cars; change cars;
WORSE LIVING CONDITIONS: have worse, unstable lives; precarious conditions; are in the *neighborhood*; work in the neighborhood; or are from neighboring areas; are some *neighbors;* from neighboring areas;	AVERAGE LIVING CONDITIONS: have stable, average, normal, but simple, more average *lives*; managed to improve and "be someone in life";	BETTER LIVING CONDITIONS: have professional, defined, more stable, comfortable *lives*; lucky in life;
WORSE JOBS: have jobs: more simple, badly paid, disadvantaged, or do not have;	AVERAGE JOBS: have jobs: fixed, good and average;	BETTER JOBS: have good/better *employment*; got good jobs; are *businessmen*; big businessmen;
EXCLUDED: are from/in the *neighborhood*; do not have any *place* to live; each day in a different place; are street dwellers, are there or clean the street;	INCLUDED: are/stay in the *neighborhood* (former residents); have ascended socially (with the consequent social ascension of the neighborhood); have intermediate status in my *neighborhood*;	INCLUDED/IMPORTANT: are people within the *neighborhood* ("central"); there are few *neighbors*; or all the neighbors in the neighborhood
FEW OPPORTUNITIES: do not have/ did not have *opportunities* to enter the job market, society or to be someone;	SAÚDE: do not have private *health* plan and depend on health center	
LESS SCHOOLING: have less/little/ no *schooling*; did not have education for ascend socially.		

Note. Keywords in italic from the contemporary Portuguese language.

long periods and subordinate constructions, thus requiring substantially greater cognitive skills. The short-term memory is limited and holds around seven (CI: 5-9) chunks of information[38] and various linguistic constituents can overload it (for example: "more money", "greater schooling", etc.). This hypothesis based on cognitive linguistics is tied with the fact that the performance of individuals with lower levels of education in cognitive tests, including ELSA-Brasil, is generally worse[50,51]. From a sociocultural point of view, it can be assumed that within the world view of individuals

Chart 3. Prototypes for the MacArthur work (general) ladder, ELSA-Brasil.

Bottom	Middle	Top
SUPPORT WORKERS: are from *cleaning*: servers, helpers, menial workers or employees; are from *cleaning/cleaners*; are servants: construction or cleaning; are *gardeners;* are *porters*; are from the *support* level, medium support; work in *maintenance*; are *outsourced* workers;	TECHNICAL-ADMINISTRATIVE WORKERS: are *technicians*: administrative, graduate; the majority are technical assistants; are heads of *divisions*;	IMPORTANT POSITIONS: are *principals*/*deans*; are *directors*: of units, schools, sectors, hospitals, institutions, etc.; are from the *management*: general or superintendent; are *managers*; are in the *institution*: bosses, directors, who decide the "direction" of the institution;
LABORERS: have *services*: menial, domestic, support, simple, general and less valued; have *work*: more heavy work, less work time, influenced by the environment;	NEW TEACHERS: are *teachers*: that have just started, assistants, give more classes; or do not progress;	PROFESSORS WITH PHD: are *professors*: university professors, heads, highly qualified, PhD;
UNDERVALUED: have *positions*: lower and less privileged; have/ earn lower/worse *salaries*; depend on minimum salary; or don't have salary;	SALARIED WORKERS: have a *salary*: average, good, better and bigger; know how to control their salary;	CENTRAL/IMPORTANT: are within my *work* ("central"), in the environment; or do not have anyone above them; are "*parts*" that cannot be "discarded", indispensable.
LESS SCHOOLING: have lower level of/less *schooling*; or do not need it;	AVERAGELY PRESTIGIOUS: receive some form of recognition for the *service* they provide; are of secondary school level in my work; have a defined *profession*; are from *maintenance*;	EXECUTIVE POSTS: are *heads*: of department, institutions, services, hospitals; are *coordinators*; are from the *management* of the *sector*; are *engineers*; are some work *colleagues*;
COMMERCIAL EMPLOYEES: are employed in *commerce;* or commercial services;	CIVIL SERVANTS: are public *employees*; some are very successful; some are of secondary school level.	BUSINESSMEN: are *businessmen;* senior businessmen;
UNQUALIFIED: are people who do/carry out their *profession badly;* are *employees*: poorly qualified, more simple, not satisfied.		POLITICIANS: are involved in *politics*; in university politics.

Note. Keywords in italic from the contemporary Portuguese language.

who have not completed higher education the conception of status is not exactly the same as that proposed by the MacArthur scale. This hypothesis, which is less likely to be true, is tied to the fact that Brazil is made up of various cultural matrices[18]. Despite these considerations, our findings show that the society ladder of the MacArthur scale can be used as an indicator of subjective social status, principally because it represents a cognitive average of the indicators of socioeconomic position throughout life and captures aspects that go beyond objective indicators[14].

Although cognitive linguistics may be a possible explanation for the differences in step selection in the society ladder of the status and MacArthur scales, the same cannot be said in relation to the difference observed among women in the neighborhood ladder. First of all, men and women do not differ in relation to general intelligence (the g Factor). Furthermore, wom-

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en generally have better verbal skills, perceptual speed and short-term memory[52]. Therefore, the difference is unlikely to be due to differences in cognitive levels and linguistic abilities. It should be noted that the strength of association between gender and differences in step selection was weak and, moreover, we did not note any major difference between the prototypes selected by men and women in the open-ended interviews for the neighborhood ladder of the MacArthur scale. Therefore, our results suggest that this ladder can be used as an indicator of subjective social status, principally because it captures the nuanced perceptions of poorer individuals[3].

With respect to the MacArthur scale, the work ladder was shown to have the best concurrent validity of the three ladders and can also be used as an indicator of subjective social status, principally because it relativizes perceptions within occupational hierarchies. The three ladders of the MacArthur scale obtained good results for face validity, showing that they really capture status. The main indicator of status for the society ladder was power (political, economic or of persuasion), followed by prestige. The main prototypes of high status in society were big businessmen, politicians and individuals with a PhD. Prestige was not mentioned in the neighborhood ladder of the MacArthur scale, with power (economic, purchasing and financial) being the only indicator of status and businessmen and owners (housing, vehicles, etc.) as the prototypes of high status. Finally, although the indicators of status did not appear explicitly in the work ladder, they may be semantically deduced (for example the higher the level of education and income, the greater the tendency towards higher status). The prototypes of high status were principals, deans, directors and heads of department, together with businessmen. It is worth mentioning that "honor" was not mentioned during the interviews and was the indicator that least characterizes status among the study population.

The results regarding face validity are in line with those found in the literature, which is to be expected given that the aim of the MacArthur scale is to capture the common sense of social status across indicators of socioeconomic position[3]. According to Adler and Stew[3], the most common indicator of status in the society ladder was material wealth (90%), followed by occupation (72%), and education (62%). It is interesting to note that ethical, spiritual and altruistic aspects were also reported (~25%) as being important elements in the characterization of status. Our findings are consistent with those of Adler and Stew[3], since the responses regarding the society ladder of the MacArthur scale encompassed "merit", "opportunity", and "access" in addition to wealth, education and occupation. With respect to the neighborhood ladder, Adler and Stew showed that wealth (25%), occupation (22%) and education (7%) were less important than aspects such as helping others (87%) (volunteers, donators, good citizens, etc.) and being well-seen or respected (52%). In contrast, our results show that the prototypes for neighborhood give priority to aspects related to material wealth, such as purchasing power, money, and having a luxurious house, and that the only ethical, spiritual or altruistic aspect mentioned in the neighborhood ladder was the keyword "opportunity".

It is worth highlighting that the Status Scale was used as the criterion test to measure the concurrent validity of the MacArthur scale due to the lack of other validated scales in the literature. From the point of view of pragmatics[39], given the fact that the word "status" is explicit in the instructions, the status scale has greater validity for capturing SSS since it requires cognitive and semantic processing and deductive reasoning, while the instructions of the MacArthur scale (where only indicators such as "money", "schooling" and "work" are explicit) require cognitive and pragmatic processing and inferential reasoning, which, to be effective and correct, depend not solely on linguistic instructions, but also on the context of use and world knowledge[39]. Thus, we believe that the instructions of the status scale are more objective, referential and direct than those of the MacArthur scale when it comes to measuring SSS, given that the content of the test is not judged only by its title or by what it says it is measuring[53].

One of the main limitations of this study is the small number of participants, which resulted in a limited statistical power for the stratified analyses of education and gender. Furthermore, the ordinal nature of the ladder may have reduced the accuracy of the responses and induced a preference for the middle (on or around step 5). This response centralization bias is a common phenomenon in studies and tests that require choices to be made based on numeric scales or figures such as a ladder or slide rule[54]. Finally, it is important to note that the combination of quantitative and qualitative methodologies enabled us to measure the concurrent and face validity of the MacArthur Scale in a comprehensive and innovative manner.

Collaborations

WA Ferreira, SM Barreto, L Giatti and RC Figueiredo outlined the study, conducted the analysis and prepared the final version of the manuscript. WA Ferreira performed the data collection. HR Mello contributed in the analysis, discussion and final version of the manuscript (expert in linguistics and corpus). The paper is part of the doctoral thesis of WA Ferreira (public health, epidemiology area).

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