Available online at www.sciencedirect.com
ScienceDirect
Journal of Sound and Vibration 308 (2007) 343–347
JOURNAL OF SOUND AND VIBRATION
www.elsevier.com/locate/jsvi

Short Communication

Note on the development of a Brazilian version of a noise annoyance scale ☆

Hartmut Günther*, Fabio Iglesias, Juliana Moraes de Sousa

Environmental Psychology Research Group, Department of Social and Work Psychology, Institute of Psychology, University of Brasília, 70910-100 Brasilia, DF, Brazil

Received 1 February 2006; received in revised form 3 September 2006; accepted 27 June 2007
Available online 31 August 2007

Abstract

In order to compare community responses to environmental noise across cultures and languages, international standardized annoyance scales are necessary. ICBEN Team 6 has organized the development of scales for eight European languages and for Japanese. More recently, scales for three other Asian languages were added. The present study reports on the use of the ICBEN method to construct an annoyance scale for Brazilian Portuguese.

1. Introduction

Beginning in 1997, ICBEN Team 6 began the development of internationally standardized noise annoyance scales [1]. In 2001, first results were reported for nine languages: English, Dutch (Flemish), French, German, Hungarian, Japanese, Norwegian, Spanish, and Turkish [2]. Yano and Ma [3] reported results for Chinese, Korean, and Vietnamese versions of the scale in 2004. In the following, the development of a Brazilian Portuguese version is reported.

2. Method

2.1. Participants

Some 286 individuals were recruited in six major cities in all geographical regions of Brazil: From Belém do Pará (North region) some 40 participants, João Pessoa (North East) with 47 participants, Rio de Janeiro (South East) with 49 respondents, Porto Alegre (South) with 48 participants, Goiânia (Central West) with 49 respondents, and from the capital Brasília 53 respondents. The participants were second- and third-year psychology undergraduate students, who responded to the instrument as part of class activities in social psychology, methods and measurement or general psychology. The mean age was 23 years and 2

☆ Part of this paper was presented at the 6th Biennial Conference on Environmental Psychology, Ruhr Universität Bochum, Germany, September 2005.

*Corresponding author. Tel./fax: +55 61 3347 7043.
E-mail address: hartmut@unb.br (H. Günther).

0022-460X/$ - see front matter © 2007 Elsevier Ltd. All rights reserved.
doi:10.1016/j.jsv.2007.06.072

months, with a standard deviation of 6.75, minimum 16 years, and maximum 56 years. Some 238 (83.2%) were female.

2.2. Instrument

While Brazilian Portuguese is spoken by virtually all inhabitants of Brazil, there are some regional differences in accent, grammar, and word use. Thus, initially, native speakers from five different locals of the country were contacted and asked to provide adverbs indicating intensity of feeling. After eliminating items from these lists that represented superlatives, consisted of two words or appeared on only one or two lists, a single list of 15 could be constructed, as presented in Table 1.

In order to enlist the cooperation of colleagues around the country more easily, a questionnaire version was constructed from the protocol suggested by Fields et al. [2]. The first page of the questionnaire consisted of an introduction and asked for demographic information. On the top of the second page, five spaces were given, with the first, left most, fixed with the term *nada* (none at all). The list of 14 adverbs was presented in random order in column form on the right side of the page, with instructions on the left.

The overall instruction for this page read "You are asked to select four expressions for a noise annoyance scale. A first category we already been defined as 'no annoyance'. Follow the instructions below in the order that they appear and, please, do not pass over any of the steps![1]"The following instructions read thus:

1. Note carefully the expressions in the right-hand column. Read each one with attention.
2. Among the expressions, select the one that to you represent the maximum level of noise annoyance possible. Write it in the **field 5** above and strike it from the column on the right.
3. Now select the expression that you think should be exactly between the expressions 'no annoyance' and the expression you just selected for field 5. Write it in **field 3** and strike it from the column on the right.
4. Now select the expression that you think should be between 'no annoyance' and the expression you wrote in field 3. Write the expression in **field 2** and strike it from the column on the right.
5. Finally, you should select the expression that fits between the expressions in field 3 and in field 5. Write it in **field 4**.
6. Please go to the next page.

On the following page of the questionnaire this exercise was repeated, except that only four positions were given on the top of the page. The overall instruction read "Once again you are to select expressions to be placed on a noise annoyance scale. However, the following scale has only four categories, from 'no annoyance' to maximum annoyance. Just follow the instructions below." The remainder of the instructions read thus:

1. To begin, write in **field 4** the expression that you chose for field 5 on the previous page. Strike it from the column on the right.
2. Now, considering the two extremes of the scale, select an expression for **field 2** and one for **field 3**. You should do this such that there is the same distance between field 1 and field 2, between field 2 and field 3, and field 3 and field 4.
3. Now that you chose the two expressions, write them in the respective fields.
4. Go to the next page.

The fourth page consisted of instructions for the final task—presented on the fifth, sixth and seventh page. The 14 adverbs and the anchor term 'none at all' were distributed randomly over these three pages. The respondents had to mark the position of each adverb on a 100 mm graphic scale with the end points "least level of annoyance" and "highest level of annoyance".

[1]Underlines and bold in the original text.

Table 1
List of 15 adverbs used to develop the Brazilian Portuguese scale with respective means and standard deviations

Adverb[i]	100 mm scale		Assuming a five-point scale		Assuming a four-point scale	
	Mean	Standard deviation	Difference from ideal[a]	Frequency in %	Difference from ideal[a]	Frequency in %
Nada *Nothing, not at all*	0.61	0.75	0.61	100%	0.61	100%
Levemente *Slightly*	10.07	6.02		36.0%[d]		26.6%[g]
Pouco *A little*	13.63	6.19		30.1%[d]		26.2%[g]
Ligeiramente *Slightly, just a bit*	16.97	12.05		17.5%[d]		
Algo *Somewhat*	22.99	16.41	−2.01	7.3%[d]		
Razoavelmente *Reasonably*	35.93	15.01			2.60	14.7%[g]
Moderadamente *Moderately*	42.00	10.79		26.6%[c]		
Medianamente *Middling*	48.02	5.88	−1.98	25.9%[c]		
Muito *Much*	74.35	8.77	−0.65	33.9%[e]	7.68	31.5[h]
Bastante *A lot*	78.72	9.73				
Demasiadamente *Too much*	81.30	16.61				
Fortemente *Strongly*	82.14	7.51				
Altamente *Highly*	89.67	6.46				
Intensamente *Intensely*	89.77	6.00				
Extremamente *Extremely*	98.50	1.85	−1.05	67.5%[b]	−1.05	67.1%[f]

[a]Difference between the empirical values and the respective ideal scale values for a five-point scale (0, 25, 50, 75, and 100) and for a four-point scale (0, 33.33, 66.67, and 100).
[b]Percentage mention as the most extreme value on a five-point scale.
[c]Percentage mention as the middle point on a five-point scale.
[d]Percentage mention as the middle point between nothing and the middle point on a five-point scale.
[e]Percentage mention as the middle point between most extreme and the middle point on a five-point sale.
[f]Percentage mention as the most extreme value on a four-point scale.
[g]Percentage mention, on a four-point scale, such that it is closer to nothing.
[h]Percentage mention, on a four-point scale, such that it is closer to the most extreme value.
[i]All translations are approximations. Hence, *razoavelmente* is given as 'reasonable', in Portuguese it stands for 'acceptable'; *demasiadamente* is given as 'too much', since, indeed, it means exceeding limits.

2.3. Procedure

Questionnaires were administered individually and in group sessions, varying in size between 20 and 40 persons.

3. Results

As presented in previous studies, there are three criteria for scale construction. A first criterion concerns equidistance intensity between the adverbs to be used on a scale. Assuming a five-point scale, the absence

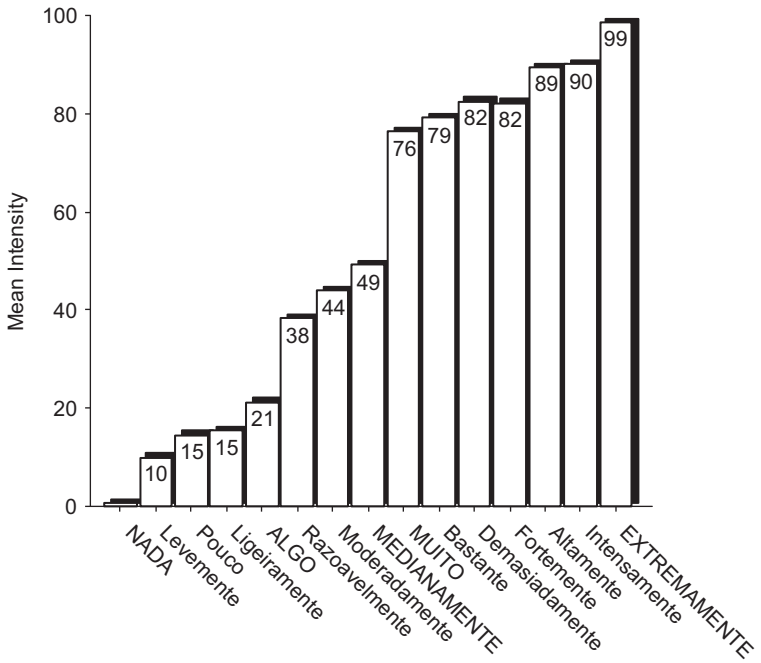

Fig. 1. Intensity of 15 adverbs characterizing levels of annoyance (recommended terms are capitalized).

annoyance would be represented by an ideal intensity score of 0, followed by ideal values of 25, 50, 75, and 100 on a scale of 0–100. Assuming a four-point scale, the respective ideal values would be 0, 33.33, 66.67, and 100. In Table 1, empirical mean values obtained from graphic 100 mm scales are presented for each of the 15 adverbs. Fig. 1 presents a graphic representation of the mean intensity values for the 15 adverbs.

As may be noted in Table 1, there are slight differences between the ideal values of a five-point scale and the empirical means for corresponding terms. On the other hand, for the case of a four-point scale, a larger discrepancy was found for one of the items, *muito* (much).

A second criterion is consistency as expressed in variability of the intensity ratings for each annoyance, as presented in the second column of Table 1.

A third criterion is the preference of a given adverb for a position. Table 1 also presents the relative frequency with which different adverbs were selected to represent different positions on five- and four-point scales.

Given the size of the country and possible variability among regions, two-factor analyses of covariance were computed for each of the 15 adverbs, comparing region and gender and using age as a covariant. Considering the adverbs for a five- or four-point scale, one significant correlation was found between the covariant age and *muito* (much), the point between the midpoint of the five-point scale and the most extreme value. However, no regional differences were encountered between the terms.

Especially notable is the fact that four terms were selected as indicating the point between no annoyance and the middle position: *levemente*, *pouco*, *ligeiramente*, and *algo*. While the first of these terms was mentioned most frequently, its mean value is furthest from the ideal. Given the similarity in meaning, an empirical validation of the scale-combining objective measures of ambient noise and subjective evaluation should shed further light on this matter.

In conclusion, our recommendation is to use the terms *nada*, *algo*, *medianamente*, *muito*, and *extremamente* for a five-point scale and the terms *nada*, *razoavelmente*, *muito*, and *extremamente* for a four-point scale.

4. Future work

After the development of the scale, we will proceed with empirical validations in natural environments of the instrument.

Acknowledgments

The study was supported by the National Council of Research and Technology (CNPq) in the form of a faculty stipend, a doctoral award, and an undergraduate research participation grant, respectively.

The authors gratefully acknowledge the collaboration of Hilma Khoury, Valdiney G. Gouveia, Pedro Humberto Faria, Gisele Dias e Maria Lúcia T. Nunes, who distributed the questionnaire in Belém, João Pessoa, Goiânia, Rio de Janeiro, and Porto Alegre, respectively.

References

[1] J.M. Fields, R.G. de Jong, A.L. Brown, I.H. Flindell, T. Gjestland, R.F.S. Job, S. Kurra, P. Lercher, A. Schuemer-Kohrs, M. Vallet, T. Yano, Guidelines for reporting core information from community noise reaction surveys, *Journal of Sound and Vibration* 206 (1997) 685–695.

[2] J.M. Fields, R.G. de Jong, T. Gjestland, I.H. Flindell, R.F.S. Job., S. Kurra, P. Lercher, M. Vallet, T. Yano, R. Guski, U. Felscher-Suhr, R. Schumer, Standardized general-purpose noise reaction questions for community noise surveys: research and a recommendation, *Journal of Sound and Vibration* 242 (2001) 641–679.

[3] T. Yano, H. Ma, Standardized noise annoyance scales in Chinese, *Korean and Vietnamese. Journal of Sound and Vibration* 277 (2004) 583–588.