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Standardized noise annoyance scales in Chinese, Korean and Vietnamese

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Abstract

Internationally standardized annoyance scales are required in order to compare community responses to environmental noises measured in various linguistic regions. ICBEN Team 6 organized an international joint study to establish standardized noise annoyance scales and has developed scales and questions in nine linguistic regions. With the exception of Japan, all of these regions were Euro-American. Thus, it has been necessary to augment the original ICBEN study by utilizing the ICBEN method to construct noise annoyance scales for use in other Asian countries, because noise pollution is becoming an increasingly important environmental issue in these countries. Also, Asian data should be compared internationally with Euro-American data. The present study reports on the use of the ICBEN method to construct annoyance scales in Chinese, Korean and Vietnamese.
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1. Introduction

Internationally standardized annoyance scales are required in order to compare community responses to environmental noises measured in various linguistic regions. Such comparative data are important, because they may form the basis for understanding the cultural differences

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influencing responses to noise. This is of importance for the establishment of international noise criteria and for the regulation of the various means of transportation that cross national borders. ICBEN Team 6 organized an international joint study to construct standardized noise annoyance scales in 1997 and has developed scales and questions in nine linguistic regions [1]. With the exception of Japan, all of these regions were Euro-American. Thus, it has been necessary to augment the original ICBEN study by utilizing the ICBEN method to construct noise annoyance scales for use in other Asian countries, where there is growing recognition of the importance of environmental noise pollution. ICBEN Team 6 suggested a 5-point verbal scale, as this was a little more superior in equidistant intensity and preference than a 4-point scale, meaning that people could classify noise annoyance more precisely. The present study reports on the use of the ICBEN method to construct annoyance scales in Chinese, Korean and Vietnamese.

2. Material and Methods

2.1. Experiment design

The experiment was designed to construct 5-and 4-point scales based on the preferred scale point and the intensity score of 21 modifiers describing various degrees of annoyance from the minimum to the maximum in each language. The modifiers were selected from pools of modifiers collected from the literature and dictionaries by the authors in careful consultation with noise annoyance researchers in the linguistic regions and researchers familiar with Japanese and one of the other languages. Table 1 shows the 21 English modifiers used in the ICBEN study and the pools of modifiers in the three languages that were selected for use in this study.

2.2. Procedure

The ICBEN method consists of the following four procedures: (1) classification of the 21 modifiers into a maximum of nine categories; (2) construction of a 5-point scale by selecting suitable modifiers from the 21 modifiers; (3) construction of a 4-point scale by selecting suitable modifiers from the 21 modifiers; and (4) intensity evaluation of the 21 modifiers through a line-marking exercise on a 10 cm line segment. These contents were included in a questionnaire and each subject conducted the experiment task following the questionnaire.

The first step helped subjects to select the modifier of maximum degree from the separate cards on which the 21 modifiers were printed. In steps 2 and 3, the equivalents of "not at all" were internationally defined as the minimum. The same maximum modifier which was selected from the modifiers classified into the highest category at the first step was used for the top category of both the 5-and 4-point scales. Subjects selected modifiers for the scale points equidistant between the minimum and the maximum. In the last step, 10 cm line segments with the modifiers were presented on the separate pages in random order and the intensities were evaluated by measuring the distance from the left end to the marks made by the subjects.

2.3. Subjects

The subjects were recruited in five cities of China, four of Korea and two of Vietnam with an even age distribution from 20 s to 60s + as shown in Tables 2–4. The numbers of male and female subjects were almost even in all the countries. Since areas, age brackets and gender may affect the impressions of modifiers, the arrangement of subjects was well-balanced within them. The total numbers of Chinese, Korean and Vietnamese subjects were 474, 408 and 200, respectively. They were university students, their neighbours, friends, relatives and factory employees.

Table 1
The 21 modifiers in Chinese, Korean and Vietnamese

No.	English	Chinese	Korean	Vietnamese
1	Not at all (NA)	Yi dian ye bu (YB)	Junhyia (JH)	Hoan toan khong on (HT)
2	Insignificantly (IF)	Bu (BU)	Gudaji (GD)	On mot chut (MC)
3	Barely (BA)	Ji hu bu (JB)	Byialro (BR)	On chut it (OI)
4	Hardly (HA)	You yi dian dian (YY)	Gurokke (GR)	Tuong doi khong on (TK)
5	A little (AL)	Bu zen me (BM)	Jogum (JG)	It on (IO)
6	Slightly (SL)	Shao wei you dian (SW)	Jom (JO)	On chut xiu (OX)
7	Partially (PA)	Hao xiang you dian (HD)	Yakkan (YG)	On mot phan nao (PN)
8	Somewhat (SW)	Bu hen (BH)	Daso (DS)	Khong den noi on (KN)
9	Fairly (FY)	You dian (YD)	Bigyojiac (BG)	On phan nao (OP)
10	Moderately (MO)	You xie (YX)	Jebupp (JB)	Khong on lam (KL)
11	Rather (RA)	Bi jiao (BJ)	Kkue (KO)	On it nhieu (IN)
12	Importantly (IM)	Shi zai you dian (SD)	Yunanhi (YN)	Hoi on (HO)
13	Considerably (CN)	Man (MN)	Tukki (TH)	Khong qua on (KQ)
14	Substantially (SU)	Hao (HO)	Meu (MW)	Kha on (KO)
15	Significantly (SI)	Xiang dang (XD)	Jungmal (JM)	Tuong doi on (TO)
16	Very (VY)	Hen (HN)	Noumu (NM)	Hoi qua on (HQ)
17	Highly (HY)	Shi fen (SF)	Aju (AJ)	On nhieu (ON)
18	Strongly (SY)	Shi zai hen (SH)	Moppsi (MS)	Qua on (QO)
19	Severely (SE)	Tai (TI)	Dedanhi (DD)	Rat on (RO)
20	Tremendously (TR)	Fei chang (FC)	Gyuengjanghi (GJ)	On lam (OL)
21	Extremely (EX)	Te bie (TB)	Umchungnage (UC)	Cuc on (CO)

Table 2
Chinese subjects

	20s	30s	40s	50s	60s +	Total
Taibei	18	18	18	18	18	90
Tainan	15	19	16	16	18	84
Tianjin	20	20	21	20	19	100
Nanjing	20	20	20	20	20	100
Shanghai	20	20	18	22	20	100
Total	93	97	93	96	95	474

Table 3
Korean subjects

	20s	30s	40s	50s	60s+	Total
Seoul	20	20	21	18	18	97
Daejon	20	20	20	20	20	100
Daegu	20	18	18	20	18	94
Kwangju	31	22	23	23	18	117
Total	91	80	82	81	74	408

Table 4
Vietnamese subjects

	20s	30s	40s	50s	60s+	Total
Hanoi	20	20	19	21	20	100
Ho chi minh	21	21	22	22	14	100
Total	41	41	41	43	34	200

3. Results

3.1. Construction of the standardized noise annoyance scales

There are three criteria for the scale construction. The first concerns Equidistant intensity where the modifiers for the scale points should be close to the intensity scores of 0, 25, 50, 75 and 100 on a scale of 100. The index was intensity difference score (I-C Delta), i.e., the difference between the modifier's mean and the scale point's ideal intensity score (0, 25, 50, 75 or 100).

The second criterion is Preference. The modifiers should be selected at a particular scale point and not at the other points. The net preference score (P%) was used as the index. The P% is the net number of selections of the modifier for a particular scale point (the number of selections for the scale point minus the number of selections for the other scale points) divided by the total number of subjects.

The third criterion is Agreement. The standard deviation of the intensity score of a modifier should be low.

In practice, all modifiers were screened through 15 steps of the above three criteria and finally only one modifier remained at each scale point. Fig. 1 shows the mean intensity scores of the 21 modifiers on the line-marking exercises in Chinese, Korean and Vietnamese. The modifiers in Table 5 were selected for use in the 5-point scales in each of the languages.

3.2. Comparison of intensities between age brackets, areas and genders

Three-factor analysis of variance was applied to each modifier in Chinese, Korean and Vietnamese to test the significant difference in intensity between age brackets, areas and genders.

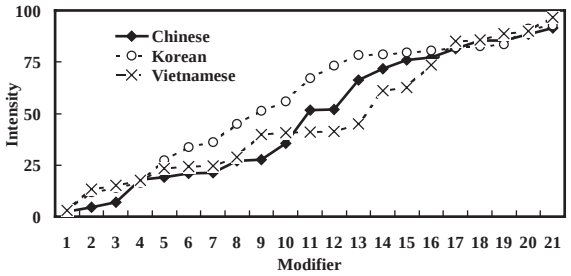

Fig. 1. Intensities of 21 modifiers in Chinese, Korean and Vietnamese.

Table 5
Standardized noise annoyance scales in Chinese, Korean and Vietnamese

No.	English	Chinese	Korean	Vietnamese
1	Not at all (NA)	Yi dian ye bu (YB)	Junhyia (JH)	Hoan toan khong on (HT)
2	Slightly (SL)	Hao xiang you dian (HD)	Jogum (JG)	On mot phan nao (PN)
3	Moderately (MO)	Bi jiao (BJ)	Jebupp (JB)	Khong qua on (KQ)
4	Very (VY)	Xiang dang (XD)	Meu (MW)	On nhieu (ON)
5	Extremely (EX)	Te bie (TB)	Umchungnage (UC)	Cuc on (CO)

Significance of main effect was found at 5% for three modifiers and at 1% for one between age brackets, at 5% for four and at 1% for nine between areas and at 5% for four between genders in Chinese. It was found at 5% for five modifiers and at 1% for 10 between age brackets, at 5% for three and at 1% for seven between areas and at 5% for three between genders in Korean. It was found at 5% for six modifiers and at 1% for one between age brackets, at 5% for two and 1% for seven between areas and at 5% for two between genders in Vietnamese. In each language, the main effect of gender was small and the significant main effect of area was found in nine to 13 modifiers. However, the main effect of age bracket was less in Chinese than Korean and Vietnamese.

The linear regression analysis was also conducted between age and intensity for every modifier in Chinese, Korean and Vietnamese. Though the regression coefficient was significant at 5% for one modifier and at 1% for one in Chinese, it was significant at 5% for three and 1% for four in Korean and at 5% for two and 1% for six in Vietnamese. Also, it was significant at 5% for three modifiers and at 1% for eight in Japanese [3]. The effect of age on modifier intensity in Chinese seems to be less than the other languages.

Comments

Noise annoyance scales in three Asian countries were constructed using the ICBEN method and a sufficient number of subjects. The researchers in the linguistic regions also made the

standardized noise annoyance questions. The detailed results are or will be published in local journals [2–6]. Noise pollution will be an important and serious environmental problem in Asian countries and a frame has now been established to conduct social surveys on community responses to environmental noises and to offer internationally comparable data from East Asia.

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