

Standardized Noise Annoyance Modifiers in Korean According to the ICBEN Method

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Abstract

Recently a number of social surveys on community response to environmental noises have been conducted to summarize response relationship obtained from different areas. Some problems have been pointed out in comparing the result of surveys using verbal scales with different number of categories. ICBEN (International Commission on Biological Environment of Noise) Team 6 planned a international joint study and constructed comparable standardized noise annoyance scales using the same method. In Korea the survey was conducted in four areas such as Seoul, Taejon, Taegu, Kwangju. About 100 subjects participated in each area approximately. Finally five verbal annoyance were constructed as follows; 1 (Jeonhyu), 2 (Jokm), 3 (Bikyojerk), 4 (Ajoo), 5 (Umcheongnaje).

Keywords: ICBEN Team 6, Community response to noise, Standardized annoyance modifiers, The net preference score, Intensity score

I. Introduction

A considerable number of social surveys on resident's reaction to community noises have been carried out to try to compare response-relationships from different surveys. In order to compare such results, it is important to determine how to transfer annoyance response measured by different scales into a unified response such as % highly annoyed.

ICBEN (International Commission on Biological Effects of Noise) Team 6 (Community Response to Noise) planned an international joint study and constructed comparable standardized noise annoyance scales using the same method, and suggested a survey form which has two major part. First is to construct 5- or 4-point verbal annoyance

scales from the minimum to maximum from the 21 English modifiers. Second, subjects evaluated the intensity of the 21 English modifiers by placing a mark on 10 cm line[1-4].

As a part of international joint study, experiments were performed in Korea to determine the modifiers for four-point and five-point verbal scales with the ICBEN's proposed method. Survey was conducted with people from a wide range of ages and locations. According to the result of this survey we will suggested a new noise-evaluation scales and standard survey form by using the modifiers suggested in result of survey.

II. Outline of the Survey

First of all, we selected 115 modifiers form Korean

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Figure 1. Scale for suitability test.

Table 1. The codes and words for the standard noise annoyance modifiers.

Jeonhyu..anta (JH)	Byullo..anta (BR)	Gruke ..anta (GR)
gdaji ..anta (GD)	Yakgan (YG)	Jogm (JG)
Jom (Jom)	Daso (DS)	Jebeop (JB)
Bigyojerk (BG)	Yunanhi (YN)	Tukhi (TH)
Koi (KO)	Maewoo (MW)	Neomoo (MW)
Mopsi (MS)	Ajoo (AJ)	Jeongmal (JM)
Daedanhi (DD)	Kengianghi (GJ)	Umcheongnage (UC)

Table 2. distribution of subjects by age and area.

age	Seoul	Taejon	Taegu	Kwangju	Total
20s	20	20	20	24	84
30s	20	20	18	22	80
40s	21	20	18	22	81
50s	18	20	20	24	82
60s	18	20	18	18	74
Total	97	100	94	110	391

dictionary. And suitability test was conducted as shown figure 1.

In suitability test, 38 graduate students, 10 graduated subjects participated. The criterion of selection is (a) be frequently used when people talk about noise annoyance. 50 modifiers were selected (over 4.5 point) at first, and 22 graduate students conducted noise intensity test about this 30 modifiers to select 21 final modifiers. Table 1 shows the final selected 21 modifiers.

In order to minimize the effect of difference from region and age this survey was conducted from four areas (Seoul, Kyonggi, Taejon, Taegu, Kwangju), and almost 100 subjects were participated in each area. Table 2 shows the distribution of the subjects by generation and area. In total, 391 questionnaires were collected.

The subjects completed the questionnaire by performing next three tasks to evaluate 21 modifiers.

(a) **Intensity grouping:** classification of 21 modifiers into nine or fewer groups based on rating of intensity scores of annoyance.

(b) **Intensity scoring:** Evaluating the intensities of 21 modifiers by marking on 10-cm line (Modifiers were presented in random order). And there is no numeric indication on line.

(c) **preference question:** Selecting one word for each of the scale points by choosing a word which is most likely to use for expressing greatest amount of annoyance and then select other point's best suitable word with the same method.

III. Analysis

ICBEN Team 6 made a following principle about the modifiers for standard noise annoyance scale; (a) be equally spaced between the lowest and the highest annoyance, (b) be frequently used when people talk about noise annoyance and (c) have a small deviation in intensity.

Table 3 show the steps for eliminating candidate modifiers proposed by ICBEN Team 6. The selection of modifiers was based on the following criteria; (a) the average of intensity scores, (b) the standard deviation of intensity scores and (c) the net preference score.

The result of this analysis was a series of five ratings for each word that could in turn be used to apply the ICBEN protocol for selecting one word for each scale point. The five ratings are the following.

Intensity score average: the average of the positions in which subjects marked the word on the 10-cm scale when the marks are scored in millimeters (0-100).

Intensity score standard deviation: the root mean square of the intensity scores.

Scale point candidacy: the single scale point (#1, #2, #3, #4, #5) for which the word is a candidate.

Net preference score: percent of subjects preferring the word for that word's "candidate" position decreased by the percent preferring the word for other positions. The net preference score may be negative if a word is chosen for more than two positions.

Difference from scale point intensity criterion: the

difference between the word's intensity score and the intensity criterion for that word's candidate scale point. The intensity criteria for the 5-point scale are 0,25, 50,75,100 for points #1 - #5 respectively.

In Table 3, limit of entrance criteria is higher according to the step. In other words, if a modifier satisfy step 5, for example, a modifier must have already satisfied the criteria for step 1 through step 4. Intensity score is more important than the net preference scores in selecting the

candidate words. The step proceeded until all modifiers but one had been eliminated. That remaining modifier was chosen as the modifier for the particular scale point and the process to select modifiers is shown in Table 4.

IV. Result

The modifiers selected finally through Table 4 are

Table 3. Steps for eliminating candidate noise-reaction.

Pool	Step	Criteria
BASE POOL	1	Borderline or higher investigator classification (i.e. IJC > 1)
	2	P% > 4% (Net preference score must be at least 5%)
LOW ACCEPTANCE POOL	3	I-C Delta < 15 (Intensity score within 15 points of intensity criterion)
	4	P% Delta < 20 (preference score within 20% points of most popular remaining modifier's score)
	5	StD Delta < 15 (Standard deviation within 15 points of smallest remaining modifier's StD)
MIDDLE ACCEPTANCE POOL (10% pool)	6	I-C Delta < 10
	7	P% Delta < 15
	8	StD Delta < 10
HIGH ACCEPTANCE POOL (5% pool)	9	I-C Delta < 5
	10	P% Delta < 10
	11	StD Delta < 5
SINGLE RANKING POOL	12	Lowest IC-Delta Score
	13	Highest P% Score
	14	Lowest StD
FINAL JUDGEMENT	15	Judge > Borderline (i.e. IJC=3)

Table 4. Result for 391 Korean subjects.

step	Entrance criteria	BR	GD	GR	JG	YG	BG	JB	AJ	MS	MW	GJ	UC
	P%	15.20	5.58	9.07	12.50	9.80	7.84	12.25	6.86	8.09	8.09	6.86	66.91
	I-C Delta	11.00	13.20	8.6	2.4	11.2	1.5	5.9	3.6	7.7	7	8.9	7.3
	StD	9.6	9.40	12.6	16.4	18.3	16.2	15.5	12	12.2	11.1	10.3	10.3
1	IJC2-3	3	3	3	3	3	3	3	3	3	3	3	3
2	P% > 4%	15.20	5.58	9.07	12.50	9.80	7.84	12.25	6.86	8.09	8.09	6.86	66.91
3	I-C Delta < 15	11.00	13.20	8.6	2.4	11.2	1.5	5.9	3.6	7.7	7	8.9	7.3
4	P% Delta < 20	0.00	6.62	6.13	2.70	5.39	4.41	0.00	1.23	0.00	0.00	60.75	0.00
5	StD Delta < 15	0.20	0.00	3.20	7.00	8.90	0.00	0.70	0.90	1.10	0.00		0.00
6	I-C Delta < 10	11.00	13.20	8.6	2.4	11.2	1.5	5.9	3.6	7.7	7		
7	P% Delta < 15			6.13	2.70		4.41	0.00	1.23	7.7	0.00		
8	StD Delta < 10			3.20	7.00		0.00	0.70	0.90	1.10	0.00		
9	I-C Delta < 5			8.60	2.40		1.50	5.59	3.6	0	0		
10	P% Delta < 10				0.00		0.00						
11	StD Delta < 5												
12	Lowest I-C Delta												
13	Highest P%												

'Jeonhyu.anta' (JH), 'Jokm' (Jo), 'Bigyojerk' (BG), 'Ajoon' (AJ), 'Umcheongnage' (UC) and regional verbal scales are listed in Table 5.

Result was almost same except Taejon, Kwangju and the subject of Seoul, Taegu selected same verbal scales with total Korean result.

Figure 2, 3 compare the four areas with respect to the average intensity scores and the standard deviations.

The words are listed in order by the average of all subjects' ratings on the line-marking exercise. The ratings of modifiers are similar for each region but Kwangju has the highest average intensity score as you can see in Table

Table 5. Scales constructed from regional data.

Scales	Seoul	Taejon	Taegu	Kwangju	Total
1	JH	JH	JH	JH	JH
2	JG	JG	JG	JG	JG
3	BG	JB	BG	BG	BG
4	AJ	JM	AJ	YN	AJ
5	UC	UC	UC	UC	UC

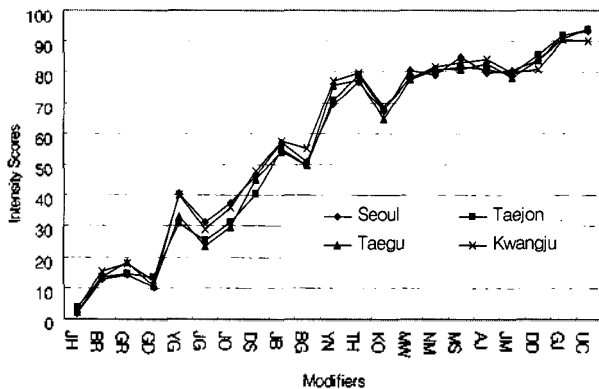


Figure 2. Regional comparison: Intensity scores.

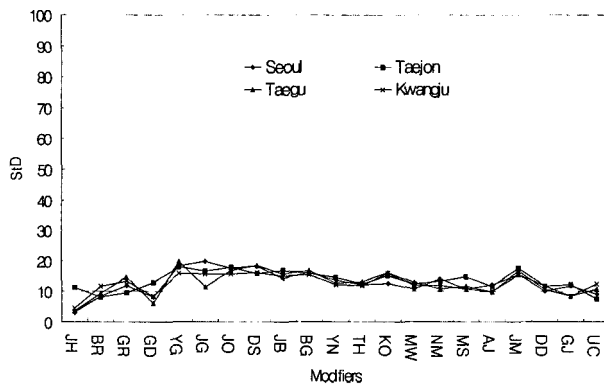


Figure 3. Regional comparison: Stand deviation of Intensity scores.

6. The standard deviation of Taejon is higher than other region by 0.08 points.

Fig. 4, 5, 6, 7, show regional P% (Net Preference Score). Each region selected similar modifier as the first choice for each 5-point scale except Taejon, Kwangju. The lowest point was predetermined as 'JH'. Many subjects

Table 6. The regional average Intensity scores.

Region	Seoul	Taejon	Taegu	Kwangju
Average	56.70	55.60	55.60	57.54

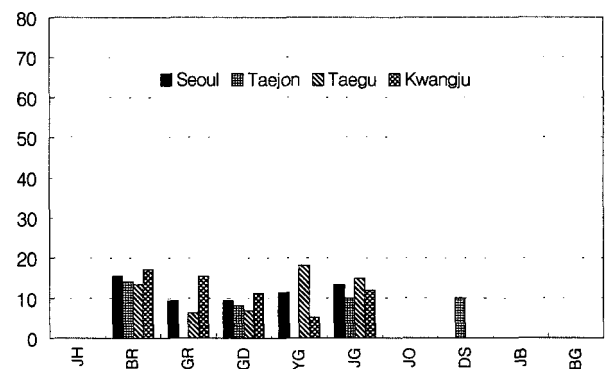


Figure 4. Regional comparison at #2 point.

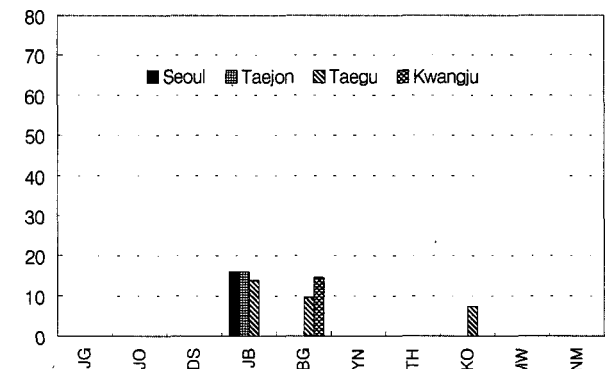


Figure 5. Regional comparison at #3 point.

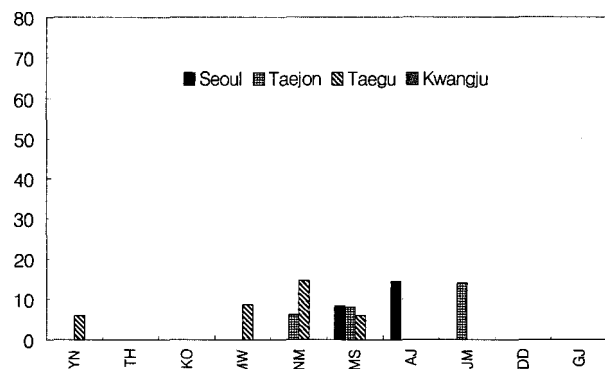


Figure 6. Regional comparison at #4 point.

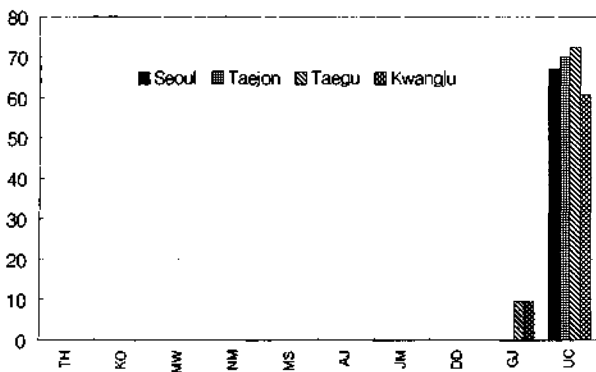


Figure 7. Regional comparison at #5 point.

Table 7. Scales constructed from generational data.

Point	20s	30s	40s	50s	60s
1	JH	JH	JH	JH	JH
2	JG	BR	BR	JG	JO
3	BG	JB	BG	KO	JB
4	AJ	JN	KO	AJ	NM
5	UC	UC	UC	UC	UC

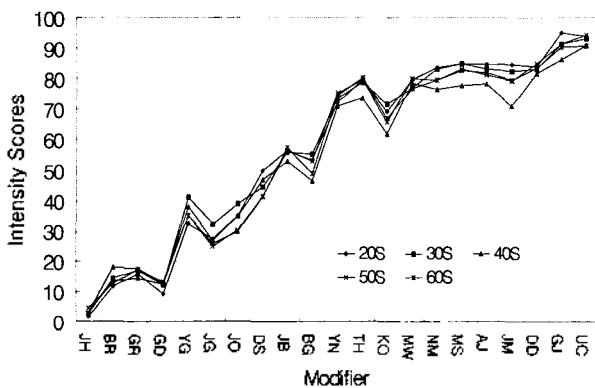


Figure 8. Intensity Scores from generational data.

selected 'BR', 'JO' at 2-point, 'JB' at 3-point but at Kwangju 'YN' is the highest P% modifier. At 4-point, subject of Seoul, Taegu selected 'AJ' mostly, but 'NM', 'JM' has a high P% in Kwangju, Taejon respectively. And at 5-point 'UC' has the highest P% in all area.

Table 7 shows the scale selected for each generation using the modifier selection. Most subjects selected 'UC' at 5-point, and various modifiers were selected as other scales points.

Fig. 8 compares the generational difference about the average intensities from the result of a line-marking exercise with 21 modifiers. The relative ratings are similar

Table 8. Scale comparison between gender.

Point	1	2	3	4	5
Men	JH	JG	BG	MW	UC
Women	JH	JG	JB	MW	UC

for each generation. However young generations (20s, 30s) have a tendency to express higher ratings than older people.

The difference according to gender is shown in Table 8. Men selected 'BG' at 3-point, but women selected 'JB' as their 3-point. Generally, men likely to use more scientific words than women and this result is in accord with common sense.

V. Application

ICBEN's Community Response to Noise Team (Team 6) recommends that each survey use two questions to measure annoyance reactions for the purpose of making comparisons between social surveys. This section presents the English version of the two questions (including their accompanying answer scale) and the instructions for administering the questions.

The recommended measurement procedure consists of one verbal scale question (Q.V) and one numeric answer scale question (Q.N). In English, the questions are the following[1].

Q.V "Thinking about the last (..12 months or so..), when you are here at home, how much does noise from (..noise source..) bother, disturb, or annoy you; Extremely, Very, Moderately, Slightly or Not at all?"

Q.N "Next is a zero to ten opinion scale for how much (..source..) noise bothers, disturbs or annoys you when you are here at home. If you are not at all annoyed choose zero, if you are extremely annoyed choose ten, if you are somewhere in between choose a number between zero to ten. Thinking about the last (..12months or so..), what number from zero to ten best shows how much you are bothered, disturbed, or annoyed by (..source..) noise?"

When make Korean questionnaire, English result of

5-point verbal scales is replaced as Korean result. We are going to translate English version into Korean version with the help of expert of English and it will be possible to develop a comparable noise-reaction question.

VI. Conclusion

After conducting this experiment it is investigated that the selection of noise-evaluation modifiers is affected by the generational and regional differences because the intensity scores and net preference scores are different from region and age. Younger subjects' intensity scores are higher than other generations and With respect to intensity scores, Kwangju is the highest area and other regions are almost same. But, If we avoid some modifiers which has large difference in intensity scores and net preference scores, it is possible to suggest a standard 5 verbal annoyance scale in Korea as following 'Jeonhyu..anta' (JH), 'Jogm' (JG), 'Bigyojerk' (BG), 'Ajoon' (AJ), 'Umcheongnage' (UC).

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[Profile]

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