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# Slovenian Standardised Noise Reaction Questions for Community Noise Surveys

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## Summary

Two standardized annoyance reaction questions for community noise surveys and a corresponding verbal response scale has been translated into the Slovenian language according to ICBEN protocol. The modifiers for the verbal scale were selected through a web-based questionnaire. It is recommended that these questions and the corresponding response scales are included in all future social surveys on noise annoyance in Slovenia, so that new survey results can be readily compared with similar studies conducted elsewhere on the international scene.

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## 1 Introduction

18 Data on community reaction to environmental  
19 noise are scarce in Slovenia. The national  
20 survey 'Health-related lifestyle' that has been  
21 conducted every four years since 2004 includes  
22 one question on noise in the environment: "How  
23 noisy do you find the environment where you  
24 live?" The answer offers four response options:  
25 very noisy moderately noisy a little noisy and  
26 not at all. The percentage of people that find  
27 their environment very noisy increased from  
28 13.1 % in 2004 to 18.9 % in 2016 [1].

29 Another series of surveys that has been  
30 conducted since 1968 is the Slovenian Public  
31 Opinion Survey [2]. This study includes a  
32 question on noise disturbance: "How do the

33 situations mentioned below harm or disturb  
34 you, or are they absent in your living or working  
35 environment. Noise is one of the situations that  
36 is listed. This survey has a 6-point response  
37 scale. The last survey from 2016 shows that  
38 0.9 % believe that noise in their environment  
39 can be life threatening and 6.8 % believe it  
40 harms and disturbs them very much [2].

41 The questions used in these two studies do not  
42 follow the recommendations from ICBEN, and  
43 the results can therefore not be readily  
44 compared with surveys conducted elsewhere.

### 45 1.1 ICBEN recommendation

46 A number of different questions and response  
47 scales have been used for social surveys on  
48 noise annoyance, and the variety of options has

49 made inter-survey comparisons very  
 50 complicated. In 2001 The International  
 51 Commission on Biological Effects of Noise  
 52 (ICBEN), recommended that two standardized  
 53 questions with standardized response scales  
 54 should be included in future surveys [3]. This  
 55 would facilitate comparisons across surveys and  
 56 across language borders. This recommendation  
 57 has subsequently been translated into a number  
 58 of different languages following a strict  
 59 common protocol [4-7]. The recommendation  
 60 has also been adopted by the International  
 61 Standardization Organization, ISO/TS  
 62 15666[8].

63 Our research team decided to develop a  
 64 Slovenian version of the ICBEN scale and  
 65 standardized questions according to the  
 66 specified protocol. It may not be feasible to  
 67 change the questions in ongoing studies in  
 68 Slovenia but we plan future epidemiological  
 69 studies to better evaluate community annoyance  
 70 caused by different environment noise sources.  
 71 For that purpose, standardized questions that  
 72 will allow for international comparisons will be  
 73 used.

## 74 **2 Method for construction of 5-** 75 **point verbal scale**

### 76 **2.1 Forming a pool of test words**

77 A list of 21 adverbs (modifiers) was selected to  
 78 describe various degrees of annoyance in  
 79 Slovenian language. Care was taken to cover the  
 80 entire range from not annoyed at all to the most  
 81 extreme annoyance. This was done by

82 translating the list of 21 candidate response  
 83 modifiers for English language used by Fields  
 84 et al. (2001) in their original study.

### 85 **2.2 Collecting data**

86 An invitation for participation in the survey was  
 87 sent in November 2017 to 217 employees (33  
 88 male, 184 female) from 9 regional units of the  
 89 National Institute of Public Health.  
 90 Participation in this survey did not demand any  
 91 particular skill or previous noise experience.  
 92 The only requirement was a general knowledge  
 93 of the Slovenian language. For convenience  
 94 sake we therefore recruited the participants  
 95 among our colleagues at the National Institute  
 96 of Public Health.

97 A large geographical spread of subjects was  
 98 important in order to include all 7 main regional  
 99 dialect groups in the country. This would  
 100 compensate for possible regional dialect  
 101 differences.

102 The survey was designed as a web-based  
 103 questionnaire following the ICBEN protocol  
 104 [3].

105 The subjects completed the questionnaire by  
 106 performing the following tasks to evaluate the  
 107 21 modifiers.

#### 108 *Task 1: Intensity scoring.*

109 The subjects were asked to assign "an intensity  
 110 score" to each modifier by putting a mark on a  
 111 line representing the full range of annoyance.  
 112 Each word was presented on a separate screen.  
 113 These marks were subsequently transformed  
 114 into a number in the range 0 – 100.

115 *Task 2: Preferred modifier for a 5-point verbal*  
116 *scale*

117 The zero-end point, "not at all" was pre-selected  
118 and the subjects were asked to choose a word  
119 representing the other end point (100 %) from  
120 the remaining 20 modifiers. Then the word  
121 representing the mid-point of the scale (50 %)  
122 was chosen, and finally the two words preferred  
123 for representing the 25 % and the 75 %  
124 positions of the scale.

125 At the end of the questionnaire questions on  
126 gender, age, native language, dialect group and  
127 education were presented.

### 128 **2.3 Data analysis**

129 In the data analysis only subjects' responses  
130 fulfilling the following criteria were included:

- 131 – Missing response to a maximum of  
132 three questions in the whole  
133 questionnaire, or
- 134 – fully completed Task 1 (Intensity  
135 scoring) of the questionnaire, or
- 136 – fully completed Task 2 (Preferred  
137 modifier for a 5-point verbal scale) of  
138 the questionnaire.

139 Subjects' responses were excluded if they have  
140 failed to follow the instructions of the  
141 questionnaire, or if they have completed the  
142 questionnaires in an obviously inconsistent  
143 manner.

144 From the approved responses, the following  
145 parameters were calculated according to the  
146 ICBEN protocol (3):

- 147 - Intensity score average ( $x$ ): the average  
148 value of the positions in which the subjects

149 marked each of the 21 Slovenian modifiers on  
150 the 0-100 scale. From no annoyance at 0, to the  
151 most annoyance you can imagine at 100.

- 152 - Intensity score standard deviation ( $\sigma$ ):  
153 the root mean square of the intensity scores.  
154 Large standard deviation indicates a lack of  
155 agreement between subjects of word's position.

- 156 - Difference from scale point intensity  
157 criterion for 5-point scale ( $\Delta$ ): the difference  
158 between the word's intensity score and the  
159 intensity criterion for that word's candidate  
160 scale point. For 5-point scale intensity criteria  
161 are 0 (point # 1), 25 (point # 2), 50 (point # 3),  
162 75 (point # 4) and 100 (point # 5).

- 163 - Scale point candidacy for 5-point scale  
164 (CAT #): The single scale point for which the  
165 word is candidate. Indicating the percent of the  
166 subjects who preferred this particular word to  
167 identify the category.

- 168 - Net preference score (NP %): Percent  
169 of subjects preferring the word for the word's  
170 candidate position decreased by the percentage  
171 preferring the word for other positions (CAT #).  
172 It may be negative if a word has been chosen for  
173 more than two positions.

### 174 **2.4 Selection of modifiers**

175 The best candidate word for each scale point on  
176 5-point scale was chosen based on the net  
177 preference score, difference from scale point  
178 intensity and intensity score standard deviation.  
179 The lowest point was pre-determined. The  
180 selection proceeded in accordance to ICBEN  
181 Protocol [3], with gradual elimination of scale

182 point candidate words, following 13 successive  
183 steps:

184 Step 1: Net preference (NP) score  $\geq 5$  %.

185 Step 2: Unsigned difference from scale  
186 intensity  $|\Delta| \leq 15$ .

187 Step 3: Net Preference score within 20 points  
188 of most popular remaining candidate word for  
189 the scale point.

190 Step 4: Standard deviation within 15 points of  
191 smallest remaining modifiers' standard  
192 deviation.

193 Step 5: Unsigned difference from scale  
194 intensity  $|\Delta| \leq 10$ .

195 Step 6: Net preference score within 15 points  
196 of most popular remaining candidate word.

197 Step 7: Standard deviation within 10 points of  
198 smallest remaining modifiers' standard  
199 deviation.

200 Step 8: Unsigned difference from scale  
201 intensity  $|\Delta| \leq 5$ .

202 Step 9: Net preference score within 10 points  
203 of most popular remaining candidate word.

204 Step 10: Standard deviation within 5 points of  
205 smallest remaining modifiers' standard  
206 deviation.

207 Step 11: Select the remaining word closest to  
208 the intensity criterion.

209 Step 12: Select highest remaining preference  
210 score.

211 Step 13: Select lowest remaining standard  
212 deviation score.

### 213 **3 Method for construction of** 214 **two standardized annoyance** 215 **reaction questions**

216 The two standardized questions, one using a 5-  
217 point verbal scale and one using an 11-point  
218 numerical scale, specified by ICBEN protocol  
219 [3] and ISO/TS 15666 [8] were translated from  
220 original English version to Slovenian language  
221 by a professional translator and two researchers;  
222 one researcher from the field of environmental  
223 noise and one researcher from the public  
224 relation domain. Back translation into original  
225 language was performed by translator with no  
226 prior knowledge of the original content in order  
227 to assure the conceptual equivalent of questions.

### 228 **4 Results**

229 The list of 21 candidate response modifiers in  
230 Slovenian language with corresponding English  
231 modifiers from Fields et al. (2001) is presented  
232 in Table 1.

233 Among the 217 invited subjects, 97 completed  
234 the questionnaire, giving a response rate of  
235 44.7 %. For the data analysis 79 subjects'  
236 responses were included.

237 The subjects were mainly women (76 %), aged  
238 between 24 and 67 years. All except 2 (Croatian  
239 and Italian) are native Slovenian speakers. All  
240 seven Slovenian regional dialect groups were  
241 represented in the study panel, with the highest  
242 response in the Upper Carniolan (22.8 %) and  
243 Styrian (22.8 %) dialect groups.

#### 244 **4.1 Intensity score**

245 Graphical display of the word intensity scoring  
246 results is given in Figure 1. The figure shows  
247 average intensity score and standard deviation.  
248 The modifiers are evenly spread out across the  
249 full range from minimum to maximum  
250 intensity. Numerical results of intensity scoring  
251 are presented in Table 2 and Table 3.

#### 252 **4.2 Slovenian modifiers**

253 Following the procedure specified in the  
254 methods, the preferred modifier for category #2  
255 was “nekoliko” (selected after step 8), for  
256 category #3 the preferred modifier was  
257 “srednje” (selected after step 1), for category #4  
258 the preferred modifier was “močno” (selected  
259 after step 3) and for category #5 the preferred  
260 modifier was “ekstremno” (selected after step  
261 3).

#### 262 **4.3 Standardized annoyance reaction** 263 **questions**

264 The original English text for the question with a  
265 5-point verbal response scale is as follows:

266 Thinking about the last (12 months or so), when  
267 you are here at home, how much does noise  
268 from (noise source) bother, disturb or annoy  
269 you?

270 - Not at all? - Slightly? -Moderately? - Very? –  
271 Extremely?

272 The time frame, *12 months or so*, is meant to  
273 indicate a general response and are not referring  
274 to the exact 365 days preceding the survey.

275 The location for the assessment, *at home*, is not  
276 confined to inside the residence, but includes

277 the residence and the immediate surroundings,  
278 for instance on a balcony or porch, in your own  
279 garden or on the street just outside your  
280 residence.

281 The impact of the noise, *bother, disturb or*  
282 *annoy*, is intended to include most negative  
283 reactions or feelings regarding that specific  
284 noise source.

285 We feel that these considerations are fully  
286 reflected in the following recommended  
287 Slovenian version of this question:

288 Če pomislite na zadnjih (12 mesecev ali  
289 podobno), ko ste doma, v kolikšni meri vas hrup  
290 (vir hrupa) jezi, moti ali vznemirja?

291 - Sploh ne? - Nekoliko? - Srednje? - Močno? -  
292 Ekstremno?

293 A backwards translation from Slovenian to  
294 English, using the service offered by Google,  
295 gives an almost identical result as the original  
296 question.

297 The English text for the question with a  
298 numerical rating scale is as follows:

299 Introduction: This question uses a 0-to-10  
300 opinion scale for how much (source) noise  
301 bothers, disturbs or annoys you when you are  
302 here at home. If you are not at all annoyed  
303 choose 0; if you are extremely annoyed choose  
304 10; if you are somewhere in between, choose a  
305 number between 0 and 10.

306 Question: Thinking about the last (12 months or  
307 so), what number from 0 to 10 best shows how  
308 much you are bothered, disturbed or annoyed by  
309 (source) noise?

310

311 The recommended Slovenian version of this  
312 question is as follows:

313 Uvod: Sledi deset-stopenjska lestvica, s katero  
314 ocenite v kolikšni meri vas hrup (vir hrupa) jezi,  
315 moti, ali vznemirja, ko ste doma. Če vas sploh  
316 ne vznemirja, označite nič, če vas ekstremno  
317 vznemirja, pa označite deset. Če pa vas  
318 vznemirja nekje vmes, izberite številko med nič  
319 in deset.

320 Vprašanje: Če pomislite na zadnjih (12 mesecev  
321 ali podobno), katera številka med nič in deset  
322 najboljše odraža v kolikšni meri vas hrup (vir  
323 hrupa) jezi, moti ali vznemirja.

324 This translation reflects the same considerations  
325 as discussed for the previous question.

## 326 5 Conclusion

327 Standard annoyance reaction questions for  
328 community noise surveys and 21 modifiers  
329 were translated from English into Slovenian  
330 language following the ICBEN protocol [3].  
331 Modifiers for verbal scale were selected  
332 through a web-based questionnaire. Among 217  
333 subjects that were invited to participate in the  
334 study, 79 fulfilled questionnaires that fitted our  
335 inclusion criteria and were used for data  
336 analysis. The selected modifiers suggested to be  
337 used in survey studies are: “sploh ne” (not at  
338 all), “nekoliko” (somewhat), “srednje”  
339 (moderately), “močno” (strongly), and  
340 “ekstremno” (extremely).

341 It is recommended that the two questions on  
342 noise annoyance and the corresponding  
343 response scales are included in all future noise

344 annoyance surveys in Slovenia. This will allow  
345 Slovenia to contribute to the international pool  
346 of noise annoyance survey results, and will  
347 facilitate the comparison of Slovenian results  
348 with those from other parts of the world.

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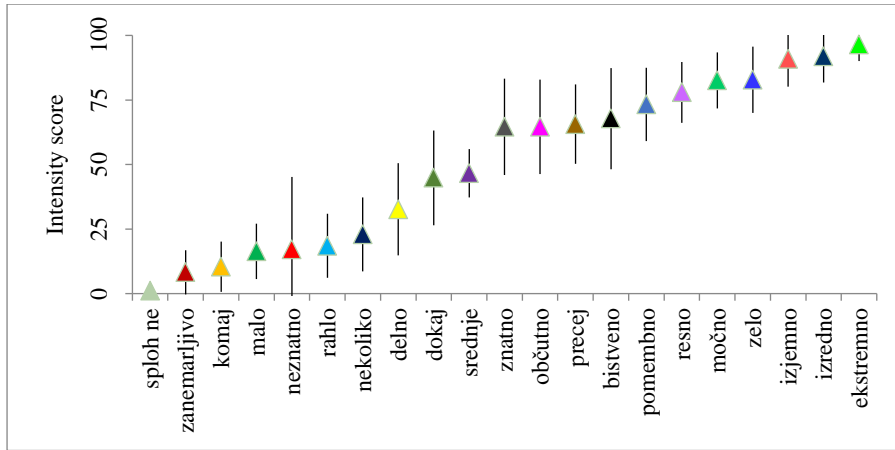


Figure 1. (Colour online) Intensity score for Slovenian modifiers (average and standard deviation).

Table 1: A list of 21 candidate response modifiers for original English version and corresponding translation of candidate response modifiers in Slovenian language. Underlined words are the preferred modifiers for the original English version of the 5-point verbal scale.

	English candidate response modifiers	Slovenian candidate response modifiers
1	<b>not at all</b>	sploh ne
2	insignificantly	neznatno
3	barely	komaj
4	hardly	zanemarljivo
5	a little	malo
6	<b>slightly</b>	rahlo
7	partially	delno
8	somewhat	nekoliko
9	fairly	dokaj
10	<b>moderately</b>	srednje
11	rather	precej
12	importantly	pomembno
13	considerably	občutno
14	substantially	znatno
15	significantly	bistveno
16	<b>very</b>	zelo
17	highly	izredno
18	strongly	močno
19	severely	resno
20	tremendously	izjemno
21	<b>extremely</b>	ekstremno

Table 3: Scale point candidacy. CAT - the single scale point for which the word is candidate. Underlined words are the preferred modifiers for the Slovenian version of the 5-point verbal scale.

	CAT 2	CAT 3	CAT 4	CAT 5
<b>sploh ne</b>	1.35			
zanemarljivo				
komaj				
malo	18.92			
neznatno			1.35	1.32
rahlo	22.97			
<b>nekoliko</b>	21.62	2.70	5.41	
delno	13.51	4.05		
dokaj	14.86	4.05	2.70	
<b>srednje</b>	1.35	66.22		
znatno	1.35	1.35	4.05	
občutno		6.76	5.41	
precej	2.70	5.41	18.92	1.32
bistveno		4.05	5.41	
pomembno	1.35	2.70	2.70	
resno		1.35	1.35	5.26
<b>močno</b>			37.84	3.95
zelo			9.46	6.58
izjemno		1.35	4.05	1.32
izredno			1.35	25.00
<b>ekstremno</b>				52.63

Table 2: Data for choice of modifiers. n – number of responses;  $\bar{x}$  – intensity score average;  $\sigma$  – intensity score standard deviation;  $\Delta$  – difference from scale point intensity criterion for 5-point scale; NP # - Net preference score.

	n	$\bar{x}$	$\sigma$	$\Delta$ #2	$\Delta$ #3	$\Delta$ #4	$\Delta$ #5	NP #2	NP #3	NP #4	NP #5
<u>sploh ne</u>	77	1.21	1.21	-23.79	-48.79	-73.79	-98.79	9.46	-9.46	-17.57	-17.57
zanemarljivo	78	8.26	8.57	-16.74	-41.74	-66.74	-91.74	-9.46	-1.35	1.35	-9.46
komaj	76	10.39	9.71	-14.61	-39.61	-64.61	-89.61	-22.94	-17.53	9.50	-25.71
malo	78	16.35	10.72	-8.65	-33.65	-58.65	-83.65	-16.04	-16.04	2.88	-2.88
neznatno	78	17.13	28.08	-7.87	-32.87	-57.87	-82.87	-4.05	-1.35	-1.35	-6.76
rahlo	77	18.48	12.40	-6.52	-31.52	-56.52	-81.52	-12.16	1.35	-1.35	-12.16
<u>nekoliko</u>	78	22.90	14.31	-2.10	-27.10	-52.10	-77.10	22.97	-22.97	-22.97	-22.97
delno	74	32.65	17.84	7.65	-17.35	-42.35	-67.35	8.11	-13.51	-16.22	-21.62
dokaj	75	44.83	18.35	19.83	-5.17	-30.17	-55.17	0.00	0.00	0.00	0.00
<u>srednje</u>	41	46.59	9.36	21.59	-3.41	-28.41	-53.41	1.35	-1.35	-1.35	-1.35
znatno	75	64.55	18.67	39.55	14.55	-10.45	-35.45	-6.72	-4.02	1.39	-4.09
občutno	75	64.63	18.27	39.63	14.63	-10.37	-35.37	-2.67	-2.67	0.04	-0.04
precej	76	65.62	15.40	40.62	15.62	-9.38	-34.38	0.00	0.00	0.00	0.00
bistveno	78	67.77	19.61	42.77	17.77	-7.23	-32.23	-52.63	-52.63	-52.63	52.63
pomembno	73	73.22	14.20	48.22	23.22	-1.78	-26.78	13.51	-24.32	-18.92	-29.73
resno	77	77.97	11.78	52.97	27.97	2.97	-22.03	-41.79	-41.79	33.89	-33.89
<u>močno</u>	78	82.55	10.82	57.55	32.55	7.55	-17.45	18.92	-18.92	-18.92	-18.92
zelo	78	82.85	12.81	57.85	32.85	7.85	-17.15	-64.86	64.86	-67.57	-67.57
izjemno	78	90.85	10.64	65.85	40.85	15.85	-9.15	-4.05	-4.05	1.35	-6.76
izredno	76	91.92	10.11	66.92	41.92	16.92	-8.08	-7.97	-5.26	-5.26	2.56
ekstremno	78	96.50	6.46	71.50	46.50	21.50	-3.50	-26.35	-26.35	-23.65	23.65