SEMANTIC INFLUENCES ON CATEGORY SCALE RESPONSES

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INTRODUCTION

Rating scale has been used for a long time without any fundamental studies of the rating process as a simple method to gather data on human behavior. One of the main reasons may be caused by psychologists' overestimation of their own knowledge of language.

The main purposes of this studies were as follows;

A. To measure the strength of Japanese adverbs which express the degree of things. Examples of Japanese adverbs are;
Hijooni(very), kanari(rather), yaya (somewhat), tokidoki(sometimes),tamani (occasionally), etc.

B. To study the semantic influences of Japanese degree adverbs on category scale responses.

Studies on category scaling were introduced in this report and this report was written on the base of Oda's doctorial thesis(1980).

OUTLINE OF THIS REPORT

We usually ask subjects many questions. For example: "Do you like apples?" Then we will get following two kinds of answers.

Study on quantitative adverbs

The first one is a free response type answer with various quantitative adverbs, such as "like very much", "like a little", "don't like at all", "dislike, if anything ", "dislike greatly" and so on.

These various adverbs are different from each other in strength of semantic meaning. Do you have enough knowledge to make unambiguous interpretations of these quantitative adverbs? In Japan, our answer is no. Then if we want to use these adverbs in our research or in our reports, it is very important to learn much more about the specific meaning of Japanese or English quantitative adverbs.

Study on semantic influences

The second type of answer is that subjects respond to a given question using a scale. One psychologist may use one type of category scale for a question and another one may use another type of category scale for the same question. Then we have a new problem: "Do these category scales measure the same quality with equal meaning?" Our understanding of this question is also very poor.

TABLE 1 Percentage matrix of Japanese degree adverbs by the method of paired comparison and scale values (strength of semantic meaning) caluculated through Guilford's composite-standard method (327 Japanese students)

(Oda, 1976b,p231)

Degree Adverb, j \ Degree Adverb, k	1. very big	2. rather big	3. big	4. not little at all	5. somewhat big	6. big, if anything	7. not little	8. not too little	9. neither big nor little	10. not too big	11. somewhat little	12. little, if anything	13. not big	14. little	15. not big at all	16. rather little	17. very little	Scale value
1. very big 非常に大きい	50	89	99	94	99	98	100	100	100	100	100	100	100	100	100	100	100	1.76
2. rather big かなり大きい	11	50	87	88	99	99	99	99	99	100	100	100	100	100	100	100	100	1.29
3. big 大きい	1	13	50	70	87	91	95	96	99	98	99	100	100	100	100	100	100	0.92
4. not little at all全然小さくない	6	12	30	50	59	56	80	84	83	80	91	91	88	96	93	99	99	0.53
5. somewhat big やや大きい	1	1	13	41	50	75	65	82	94	92	90	93	99	100	100	100	100	0.53
6. big, if anythingどちらかといえば	1	1	9	44	25	50	60	79	97	88	90	98	99	100	100	100	100	0.44
7. not little 小さくない	2	1	5	20	35	40	50	59	81	71	90	91	88	99	94	99	99	0.25
8. not too little あまり小さくない	0	1	4	16	18	21	41	50	66	60	80	83	86	98	91	99	99	0.10
9. neither big nor little 中間	0	1	1	17	6	3	19	34	50	55	86	95	89	99	95	99	99	0.00
10.not too big あまり大きくない	0	0	2	20	8	12	29	40	45	50	60	77	85	96	97	100	100	-0.05
11.somewhat little やや小さい	0	0	1	9	10	10	10	20	14	40	50	34	72	92	86	100	100	-0.31
12.little, if anythingどちらかといえば	0	0	3	9	7	2	9	17	5	23	66	50	58	92	82	98	100	-0.33
13.not big 大きくない	0	0	0	12	1	1	12	14	11	15	28	42	50	87	97	96	98	-0.44
14.little 小さい	0	0	0	4	0	0	1	2	1	4	8	8	13	50	54	96	99	-0.84
15.not big at all全然大きくない	0	0	0	7	0	0	6	9	5	3	14	18	3	46	50	59	92	-0.92
16.rather little かなり小さい	0	0	0	1	0	0	1	1	1	0	0	2	4	4	41	50	77	-1.23
17.very little 非常に小さい	0	0	0	1	0	0	1	1	1	0	0	0	2	1	8	23	50	-1.65

* Numeral in the matrix shows percentage of subjects who judged that the degree adverb j meant bigger than the degree adverb k.

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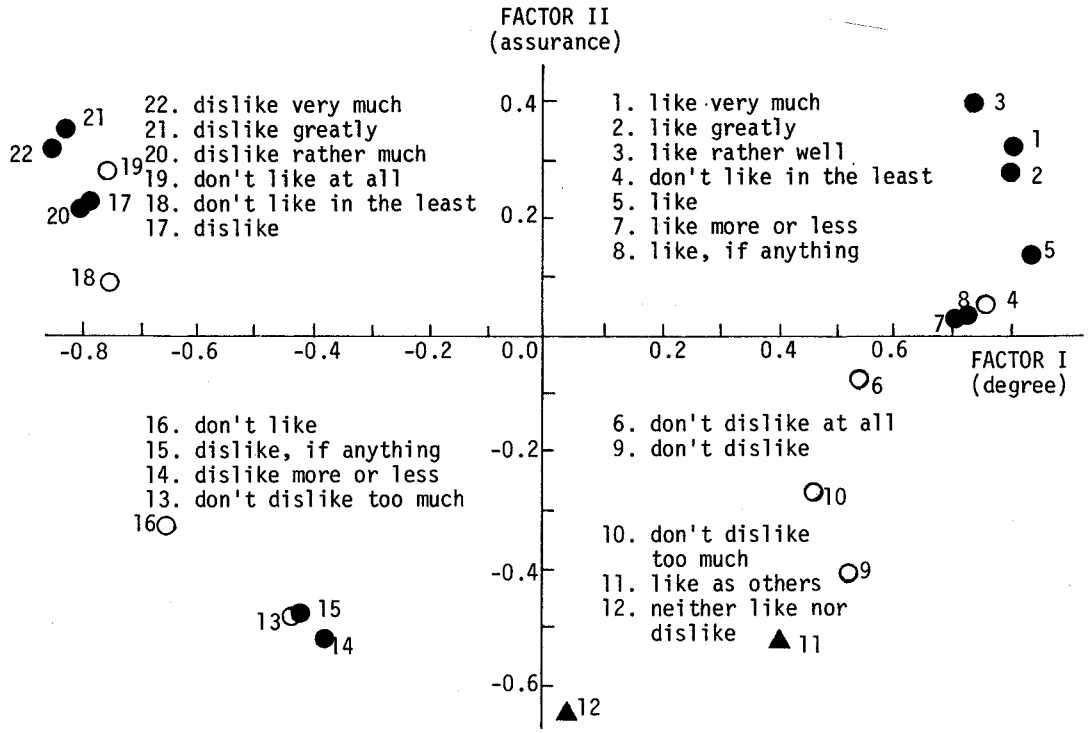


FIG. 1 Factor structure of twenty-two Japanese degree adverbs (Oda, 1977b).

STUDY ON QUANTITATIVE ADVERBS

Measurement of strength of semantic meaning of Japanese adverbs

The strength of semantic meaning of Japanese adverbs were measured by the method of paired comparisons(Oda, 1967, 1970, 1976b, 1977b). One of the results is shown in Table 1.

Results

The main results were as follows;

A. Some of the Japanese degree adverbs were distinguished very sharply from each other and some were not distinguished.

B. Japanese students and students of Michigan State University could distinguish more sharply the difference in strength of semantic meaning between the two affirmative sentences with degree adverbs than between an affirmative sentence and a negative sentence.

C. The strongest negative expression "not little at all" meant more little than "big". The same result was observed in the data of Michigan State University students.

D. Degree adverbs had two factors(Fig. 1). The first factor was related to the degree of things and the second one was related to the level of assurance of subject's judgment.

Conclusion

We must use quantitative adverbs as categorical words, which are distinguished from each other in strength of semantic meaning by researchers and also by subjects. Table 1 may be very useful when we construct and use a category scale.

STUDY ON SEMSNTIC INFLUENCES ON CATEGORY SCALE RESPONSES IN PERSEPTUAL-JUDGMENT EXPERIMENT

Purpose

From the studies of Japanese quantitative adverbs, the following new problems were occured.

a. Is the assumption of the equal-appearing intervals on category scales valid?

b. What functions do the categorical words of a category scale have?

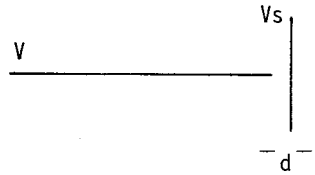
c. Does the position of the neutral category in a category scale affect our judgment process?

d. Do the Type A scales(A-B, ex. long-short), Type B scales(A-non A, ex. long-not long), Type C scales(non B-B, ex. not short-short) and Type D scales(non B-non A) measure the same psychological dimention?

To study these semantic meaning influence, the relationship between the i-th category of a 5-point category scale and the mean value of stimulus judged with the i-th category was studied by means of the experiment of perceptual-judgment(Oda,1975a, 1975b, 1976a, 1977a).

Method

As the categorical words of 5-point category scales, fifteen Japanese degree



V: variable stimulus (V=1,2,3,...,14 unit(s) of length)
Vs:standard stimulus (Vs= 7 units of length)
d: fixed distance (d= 0.5 unit of length)

FIG. 2 Example of stimulus of white line on black ground

Category \ Test No.	1	2	3	4	. . . .	28
5 very long	X					
4 long			X			
3 neither long nor short		X				
2 not too long						X
1 not long at all				X		

FIG. 3 Check example and response form of No.31 category scale. Category number 1, 2, .. , 5 are for expranation to readers only.

adverbs were chosen, which were the most frequently used for the categorical words of category scales in Japan. Forty-one kinds of 5-point category scales with the neutral category (neither long nor short) at i-th (i=1,2,...,5) category were created with the fifteenth categorical words, and they were clustered into five groups according to the intra-scale position(i-th category) of the neutral category.

Twenty-eight slides were made as stimuli(Fig. 2), which were composed of one standard line(7 units of length) and a variable line(V=1, 2,...,14 units of length) and were judged with one of the forty-one kinds of 5-point category scales by Japanese students(Fig. 3).

Conclusion

From the experiments, we arrived at the following conclusions;

A. The order of categorical words of a category scale should fulfill the following conditions.

a) Validity of strength of semantic meaning; Categorical words of a category scale should be differentiated from each other in strength of semantic meaning.

b) Validity of order of categorical words: Categorical words of a category scale should be arranged in the order of the strength of semantic meaning.

c) Validity of expressive consistency; Categorical words of a category scale should possess expressive consistency as follows;

(a) Examples of scales with the validity.

- very big (1.76, affirmative)
- big (0.92, affirmative)
- somewhat big(0.53, affirmative)
- not too big(-0.05, negative)
- not big (-0.44, negative)

- big (0.92, affirmative)
- somewhat big(0.53, affirmative)
- neither big nor little(0.0, neutral)
- somewhat little(-0.31, negative)
- little (-0.84, negative)

The categorical words of these scales are arranged from affirmative- to negative-expression or affirmative- to affirmative-expression, and are arranged from "high score to low score in strength of semantic meaning" shown in Table 1.

(b) An example of scales without the validity.

- very big (1.76, affirmative)
- big (0.92, affirmative)
- not too big(-0.05, negative)
- somewhat little(-0.31, affirmative)
- not big at all(-0.92, negative)

The categorical words are arranged from high score to low score in strength of semantic meaning but they are not arranged neither from affirmative- to affirmative-expression nor from affirmative- to negative-expression. In this case we should not use "somewhat little" as a categorical words.

TABLE 2 Cross-table of responses for ten attitude questions judged with Category scale A and Category scale B by 119 students (Oda, 1978, p144).

Category Scale, A \ Category Scale, B	1 very disagreeable	2 rather disagreeable	3 somewhat disagreeable	4 neither agreeable nor disagreeable	5 agreeable	Total	
5 very agreeable	0	1	0	8	175	184	
4 rather agreeable	1	9	1	21	108	140	474
3 somewhat agreeable	0	7	23	76	44	150	
2 neither agreeable nor disagreeable	9	24	79	174	18		304
1 disagreeable	203	111	64	16	13		407
Total	213	152	167				
		532		295	358		1,185

* Total judgments were 1,190 times (5 nonresponses).
** Category j (j=1,2,...,5)is only for reader.

Judgments made with a category scale which does not fulfill these three validities might be confusing to interpret.

B. Subjects had a strong tendency to use a given category scale as a category scale of equal appearing intervals.

C. The categorical words of a category scale had the following two functions;

a) Function A: Categorical words fix the order of the categories by their strength of semantic meaning. Example;

very big > big > somewhat big > little

b) Function B: Categorical words fix the positions of their categories on the psychological continuum by their strength of semantic meaning. This relation is shown as follows;

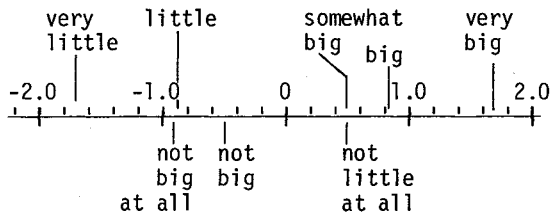


TABLE 3 Cross-table of responses for ten attitude questions judged with two different category scales with same categorical words, "agreeable" and "disagreeable" by 111 students (Oda, 1978, p145)

Category Scale, C \ Category Scale, D	1 disagreeable (-0.8)	2 if anything disagreeable, (-0.3)	3 neither agreeable nor disagree. (0.0)	4 agreeable, if anything (0.4)	5 agreeable (0.9)	Total
5 very agreeable (1.8)	3	0	4	4	87 */∨	93
4 agreeable (0.9)	4	8	58	141 >	116	327
3 neither agreeable nor disagreeable (0)	18	54	268	57	15	408
2 disagreeable (-0.8)	75 */∧ <	93	29	6	6	209
1 very disagreeable (-1.7)	50	5	5	2	1	63
Total	150	160	360	210	225	1105

* Total judgments are 1,110 times and 5 N.R..

** In Table 3, 4 and 5, numeral in parentheses shows scale value of Japanese degree adverb shown in Table 1.

*** In Table 3, 4 and 5, " >" shows expected relation from the experiment of perceptual-judgment (Oda, 1976a, 1977a) and " * " shows the result of Chi-square test (* $p \leq 0.05$, ** $p \leq 0.01$).

**** Category j (j=1,2,...,5) is only for readers.

Function A worked more strongly than Function B in the experiments of perceptual-judgment carried out for the purpose of this study.

STUDY ON SEMANTIC INFLUENCES ON CATEGORY SCALE RESPONSES IN QUESTIONNAIRES

Purpose

The purpose of this study was to investigate the adaptability of the results of the experiments of perceptual-judgment to the judgment process on questionnaires(Oda, 1978), which were found in the previous experiments of perceptual-judgment.

Method

The questionnaires were composed of ten attitude questions. Subjects were 1,024 Japanese students in total.

Results

The main results were as follows;

A. Effects of the position of neutral category(neither long nor short): Table 2 shows us that (1) subjects who judged the question with the neutral category(2nd category) of Category Scale A had a tendency to judge the same question with the neutral category(4-th category) of Category Scale B, and (2) the total frequency of "agreeable" judgment at Category Scale A (which has three agreeable categories) was larger than that at Category Scale B (which has one agreeable category), and the reversed relation was

TABLE 4 Cross-table of responses for ten attitude questions judged with two different category scales in which the order of two categorical words, "somewhat agreeable(0.5)" and "agreeable, if anything(0.4) is different by 184 students (Oda, 1978,p146)

Category Scale, E \ Category Scale, F	1 not agreeable (-0.4)	2 not too agreeable (-0.1)	3 agreeable, if anything (0.4)	4 somewhat agreeable (0.5)	5 agreeable (0.9)	Total
5 agreeable (0.9)	15	18	29	41	299	402
4 agreeable, if anything (0.4)	5	35	85 < ** /∧	93 ∨ */**	35	253
3 somewhat agreeable (0.5)	12	80	180 > **	67	20	359
2 not too agreeable (-0.1)	63	339	57	26	11	496
1 not agreeable (-0.4)	217	74	11	18	1	321
Total	312	546	362	245	366	1831

*Total judgments are 1,840 times and 9 N.R..

TABLE 5 Cross-table of responses for ten attitude questions judged with two different category scales in which the order of two categorical words, "somewhat agreeable" and "rather agreeable" is different by 159 students (Oda, 1978, p147).

Category Scale, G \ Category Scale, H	1 disagreeable (-.8)	2 neither agreeable nor disagree (0.0)	3 somewhat agreeable (0.5)	4 rather agreeable (1.3)	5 very agreeable (1.8)	Total
5 very agreeable (1.8)	2	4	12	46	179	243
4 somewhat agreeable (0.5)	6	36	87	45	5	179
3 rather agreeable (1.3)	4	25	40	85	25	179
2 neither agreeable nor disagree. (0.0)	51	371	56	16	3	497
1 disagreeable (-0.8)	432	48	3	5	3	491
Total	495	484	198	197	215	1589

* Total judgments are 1590 times and 1 N.R..

TABLE 6 Cross-table of responses for ten attitude questions judged with two different category scales with same categorical words, "neither agreeable nor disagreeable" and "not too agreeable", whose order is different (161 students, Oda, 1978, p147)

Category Scale, I \ Category Scale, J	1 not agreeable (-0.4)	2 neither agreeable nor disagree. (0.0)	3 not too agreeable (-0.1)	4 agreeable, if anything (0.4)	5 agreeable (0.9)	Total
5 agreeable (0.9)	14	11	3	42	273	343
4 agreeable, if anything (0.4)	5	34	30	162	45	276
3 neither agreeable nor disagree. (0.0)	19	245	92	54	11	421
2 not too agreeable (-0.1)	65	60	165	16	6	312
1 not agreeable (-0.4)	212	11	23	3	6	255
Total	315	361	313	277	341	1607

* Total judgments are 1,610 times and 3 N.R..

observed in total frequency of "disagreeable" judgment.

These results suggested to us that the intra-scale position of the neutral category had a strong effect on our judgment in questionnaires.

B. Strength of two functions of categorical words: From the experiments of perceptual judgment, we found that the categorical words of a category scale had two functions, and that Function A was a stronger infuluence on our response than Function B.

The results of the Chi-square test (Table 3) suggested to us that in questionnaires categorical words worked to fix the intervals of categories (Function B), as well as to fix the order of categories of a category scale (Function A).

C. Effects of strength of semantic meaning: Table 4 showed to us that within a category scale whose categorical words were similar in strength of semantic meaning, the subjects had a strong tendency to accept the order of the categorical words of the given category scale.

D. Effects of the order of categorical words: Table 5 showed to us that when a category scale was given, (1) whose categorical words were different from each other in strength and (2) whose order of categorical words was not identical with the order understood by subjects, subjects rearranged the order of the categorical words according to their own understanding.

E. Effects of expression of categorical words: Table 6 showed to us that when a category scale was given, (1) whose categorical words were similar in strength and (2) whose order of categorical words lacked expressive validity, the subjects rearranged the order of the categorical words with high expressive validity.

F. Effects of type of category scales: Table 7 showed to us that there were relatively high correlation coefficients between (1) Type A scales (A-B, ex. strong -weak) and Type B scales (A-non A, ex. strong- not strong) and (2) Type A scales and Type C scales (non B-B, ex. not weak-weak). There were low correlaton coefficients between Type B scales and Type C scales.

These results suggested to us that Type B scales and Type C scales measured somewhat different aspects from each other.

CONCLUSION

The following conclusions were derived from the experiments on 5-point category scales.

A. The three kinds of validity are very important to make and use category scales.

a) Validity of strength of semantic meaning: We must use a category scale whose categorical words are clearly differentiated from one another in strength of semantic meaning by subjects. Table 1 is very useful when we make and use category scales.

TABLE 7 Correlation-coefficients between three types of category scales (Oda, 1977b, p39)

Ten SD scales of Type A scales (A-B)	r between Type A & Type B	r between Type A & Type C	r between Type B & Type C
1. good-------bad	0.57	0.53	0.50
2. fast-------slow	0.68	0.67	0.64
3. big--------small	0.68	0.51	0.47
4. strong-----weak	0.67	0.58	0.42
5. difficult--easy	0.54	0.42	0.13
6. hot--------cold	0.60	0.41	0.21
7. compound---simple	0.56	0.62	0.22
8. light------heavy	0.50	0.51	0.42
9. glad-------sad	0.71	0.62	0.39
10. wide-------narrow	0.59	0.61	0.56

* " r " means correlation coefficient.
** Subjects were 101 Japanese Students.
*** Type A scale: A-B, ex. good-bad, Type B scale: A-non A, ex. good- not good, and Type C scale: non B-B, ex. not bad-bad.

b) Validity of order of categorical words: The categorical words of a category scale must be arranged in order of strength of semantic meaning.

c) Validity of expressive consistency: The categorical words of a category scale must be arranged from (1) affirmative to affirmative expression or (2) affirmative to negative expression.

B. The position of the neutral category in a category scale had a strong effect on our judgment. We should use a category scale which has the neutral category or the neutral point at the center of the category scale.

C. In questionnaires, categorical words worked not only as a factor which fixed the order of the categorical words, but also as a factor which fixed the positions of categories on a given psychological continuum.

D. Subjects showed a strong tendency to respond to a given category scale as if it was an equal interval scale. Then the categorical words of first and last category should be shosen very carefully.

E. Type A scales(A-B, ex. strong-weak), Type B scale(A-non A, ex. strong-not strong) and Type C scale(non B-B, ex. not weak-weak) measured somewhat different aspects. The Type A scales are the most directly interpretable and we should use a category scale of Type A scales.

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