Testing the Regression Hypothesis Using Dimensional and Spatio-Temporal Pairs

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Introduction

The study of the acquisition of language and the analogies between acquisition of language in the child and the dissolution of language in the adult aphasic person, as suggested by Jakobson's (1971) regression hypothesis, have been looked at by many investigators in the hope of gaining a better understanding of aphasia; e.g., Goodglass, Gleason and Hyde (1970), Caramazza and Zurif (1978), and Goodglass (1978). Clark (1972) and Brown (1973) suggest from their studies of children's acquisition of the meaning of words that children learn the general meaning of a word first and then, over time, learn its specific meaning. With regard to dimensional adjective pairs, Donaldson and Balfour (1968) and Clark (1972) found that the pattern of learning is the same for all the dimensional adjective pairs tested. Thus, they found that one member of the pair is learned first and that its meaning is overextended to apply to the other. Consistent with "marking theory" (Katz and Fodor, 1963; and Greenberg, 1977) the first word of a pair learned is always the unmarked member. Moreover, positive terms are acquired before negative ones.

When Clark (1972) performed her investigation of a child's acquisition of antonyms, her results showed a distinct order of acquisition among the pairs, allowing her to rank them according to their relative complexity of meaning. The present study asks whether or not there is any order in the dissolution of the antonym pairs in aphasic adults.

In the present investigation the responses of two groups of aphasics, fluent and nonfluent, were compared in order to assess their comprehension and oral production of dimensional and spatio-temporal antonyms. The stimuli were drawings representing the antonym pairs.

Other experiments of similar kind have recently been reported. Friederici (1981) performed a set of experiments on comprehension and production of prepositions, without emphasizing opposites. Seron and Deloche (1981) assessed the comprehension of selected prepositions by means of a motor task, in the manner of Clark (1974) whose subjects were children. Mack (1981) employed auditory instructions patterned after the Token Test, using three different tasks involving motor responses. Results of these other experiments are compared with those of the present study after the procedure and results have been described.

Subjects and Procedure

Twenty aphasic subjects, all with a confirmed diagnosis of left-hemisphere cerebrovascular accident (CVA), were selected to form two groups of ten: Group 1 comprised nonfluent aphasic subjects and Group 2 fluent aphasic subjects, as judged on the conversational and expository sample of the Boston Diagnostic Aphasia Examination (Goodglass and Kaplan, 1972). The diagnosis of CVA with aphasia was determined by the attending neurologist and a speech pathologist. The Porch Index of Communicative Ability (PICA) confirmed the diagnosis of aphasia.

The two groups were approximately matched for age, race, and overall communicative ability as assessed by the PICA. Subjects ranged in age from 43 to 69 years with a mean age of 58 years. The PICA overall scores for Groups 1 and 2 ranged from the 30th to the 74th percentile and from the 22nd to the 87th percentile, respectively.

Design, Procedure and Materials

The study was divided into two subtests. Subtest 1 required a gestural response to an auditory stimulus, and Subtest 2 a verbal response to an auditory question. Both subtests included visual stimuli from 35mm slides that showed pairs of antonyms side by side. They were presented to the subject by means of a Singer Caramatic 3300 projector.

The slides for Subtest 1 consisted of 19 pairs of opposites (three pairs for preliminary training and 16 pairs for the experiment. Eight were dimensional pairs and eight were spatio-temporal). In one presentation of a pair the image on the left side was marked, and in the other presentation it was unmarked.

The slides for Subtest 2 also consisted of the 19 pairs of opposites each presented two ways. In every case, both members of an opposite pair were shown next to each other on the top half of the screen while one member of the pair was shown in the center of the bottom half of the screen. In one presentation of the pair, the marked member was shown on the bottom half of the screen and in the other presentation the unmarked member was shown on the bottom half of the screen.

The order of presentation of the stimulus slides for Subtests 1 and 2 was randomized. Each subject was presented with the slides in a different order, but this order was the same for Subtests 1 and 2. The order of presentation of Subtests 1 and 2 was also randomized.

Results

The research design represented groups (1 or 2) x stimulus type (marked or unmarked) x test mode (gestural or verbal) x (dimensional + spatio-temporal pairs). The data on the dimensional pairs were analyzed separately from the data on the spatio-temporal pairs; analysis of variance (ANOVA) was employed for all the individual variables and their interactions.

The aphasic patients' performance in either subtest (as determined by one-way ANOVAs) was independent of age, sex, months post-onset, and overall PICA scores. As determined by overall ANOVAs, no significant differences were found between groups or between marked and unmarked members of the dimensional or spatio-temporal pairs. However, significant differences were found between Subtest 1 and Subtest 2 for the dimensional pairs ($F = 30.02$, $p < 0.01$); and for spatio-temporal pairs ($F = 42.83$, $p < 0.01$).

Figure 1 depicts the results of Subtests 1 and 2 for the dimensional stimulus word pairs. The word pairs are listed in the left column of the figure. Each bar represents the mean fraction correct of the total number of responses in groups 1 and 2 for each stimulus word. The open and shaded bars refer to Subtests 1 and 2, respectively.

For the dimensional stimuli, it became apparent during testing that the pair "large-small" caused subjects some confusion as a consequence of a lack of clarity in the pictures. This confusion shows up in Figure 1 as an aberration from the general trends in the seven remaining pairs. The pair tall-short also caused some lesser confusion during the testing and this, too, is evident in the last pair in Figure 1. Figure 2 depicts the results for the spatio-temporal pairs. For the spatio-temporal pairs, no confusion due to lack of clarity occurred.

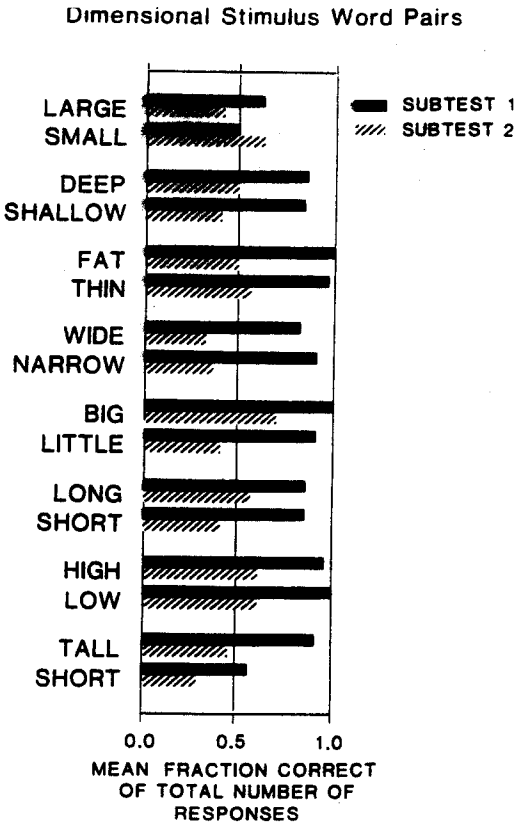

Figure 1. Results of Subtests 1 and 2 for Dimensional Stimuli.

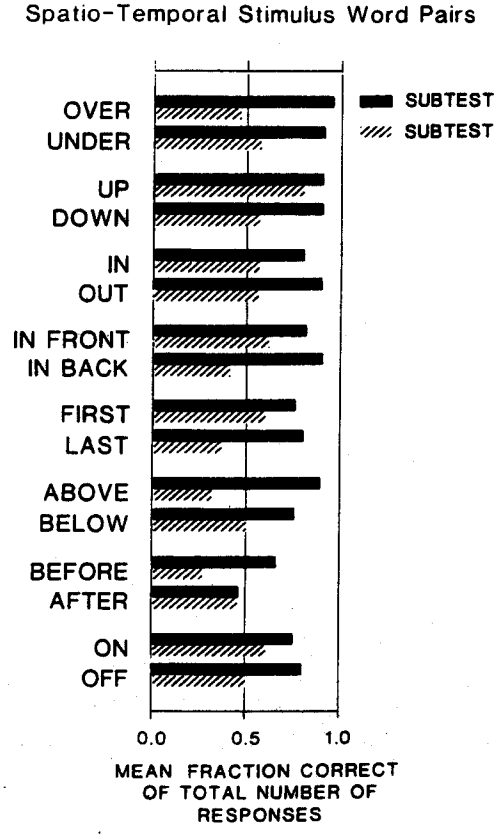

Figure 2. Results of Subtests 1 1 and 2 for Spatio-temporal Stimuli.

Although no overall difference between groups was found, a statistically significant difference between groups was found for spatio-temporal pairs when subtest and stimulus were taken into account ($F = 2.84$, $p < 0.01$). As is evident in Table 1 nonfluent aphasic subjects performed better on both subtests than fluent aphasic subjects.

Table 1. Mean percent correct responses for spatio-temporal pairs.

	Nonfluent	Fluent
Subtest 1	85.6	55
Subtest 2	75.6	45

Further, there is some statistical evidence with regard to spatio-temporal pairs that markedness also plays a role, but the results are inconclusive.

The most significant finding is in regard to the hierarchical order of both sets of antonyms ranked on the basis of the grand mean number of correct responses in percent. The definition of the grand mean number of correct responses is the mean for all responses without distinguishing group, subtest, or markedness.

For the dimensional antonyms, the two stimulus pairs that caused confusion (large-small, tall-short) were disregarded and the grand means for the remaining pairs were calculated. The order of rank of the grand mean number of correct responses in percent from greatest to least is shown in Table 2. Clark's (1972) responses designated adult correct (AC) are included along with the grand means for Subtest 2.

Table 2. Grand mean percent correct responses for dimensional pairs.

Dimensional Pairs Used in Study	Clark (AC)	Subtest 2 (Oral Response)	Grand Means
big-small (Clark)	97		
high-low	82	60	79
fat-thin		55	75
thick-thin (Clark)	82		
big-little		55	70
long-short	85	48	66
deep-shallow	37	50	66
wide-narrow	27	33	59

Clark (1972) predicted the order of acquisition for dimensional pairs to be:

big-small	before	tall-short high-low long-short
long-short	before	wide-narrow thick-thin deep-shallow

It is difficult to compare the hierarchical order of correctness for the dimensional pairs with the order of acquisition suggested by Clark because of some differences in pairs used and questionable results for large-small and tall-short. However, the outcome does suggest that "wide-narrow" and "deep-shallow" were more difficult than the other stimulus pairs. This finding is in agreement with the results of Clark's study.

The grand means of correct responses for spatio-temporal pairs are ranked in Table 3. The comparison of the present results with the Clark (1972) findings is remarkably parallel, as shown explicitly in Table 4, which is derived from the data in Tables 2 and 3.

Table 3. Grand mean percent correct responses for spatio-temporal pairs.

Spatio-Temporal Pairs Used in Study	Clark (AC)	Subtest 2 (Oral Responses)	Grand Means
up-down	97	68	79
over-under	85	50	71
in-out	82	55	70
on-off	82	55	66
in front-in back	77	50	63
first-last	47	48	63
above-below	27	45	61
before-after	37	35	45

Table 4. Comparison of order of dissolution and acquisisition of spatio-temporal pairs.

Present Study		Clark (1972)	
This pair comes	before this pair	This pair comes	before this pair
in-out	above-below	in-out	above-below
on-off		on-off	above-below
up-down	over-under	up-down	above-below
	above-below		
in front-in back	first-last*	in front-in back	ahead-behind
			first-last
in front-in back	before-after	in front in back	early-late
			before-after

*The mean number of correct responses was equal in this case.

In our view, this hierarchical order of dissolution, which is consistent with Clark's (1972) hierarchical order of acquisition of antonym pairs, is the major finding of the present study. The two left-hand columns represent the results of the present investigation and the last two columns represent Clark's findings. "Over-under" was studied in this investigation but not in Clark's; while "ahead-behind" and "early-late" were studied by Clark but not in the present investigation.

Discussion and Conclusions

The results of this study support the notion that auditory comprehension is superior to verbal production with regard to dimensional and spatio-temporal antonym pairs. Also, the results of this investigation do not strongly support differences in performance within comprehension and production tasks for different aphasic types, i.e., nonfluent and fluent. As was shown, no overall differences were found between nonfluent and fluent subjects in their performance of comprehension and production tasks. This result is consistent with Seron and Deloche's (1981) findings for comprehension performance. However, significant differences were found between nonfluent and fluent subjects for the spatio-temporal antonyms. Mack (1981) found that Broca's aphsic subjects were significantly superior to Wernicke's aphasic subjects in comprehension performance. Finally, Friederici's (1981) data suggest that nonfluent and fluent aphasic subjects perform equally well in auditory comprehension and that nonfluent aphasic subjects perform significantly more poorly than fluent subjects in oral production. These differences in outcome may result from differences in the design and stimulus materials used in the different studies. Mack (1981) writes with respect to his research that "the present results indicate that one must be attentive to the means of presentation of a task...before drawing general conclusions regarding the relationship between aphasic subtypes and specific comprehension deficits."

The major finding of the present investigation demonstrates some evidence in support of Jacobson's regression hypothesis. The importance of this finding with regard to treatment planning is that it suggests to the clinician that selection of materials for treatment of adult aphasic patients might well be based on hierarchical language acquisition patterns of children. Future research in training aphasic patients with regard to their use of antonyms could further determine whether there is indeed an advantage in following the hierarchical order.

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