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Forty eight undergraduates were assigned to two groups of 24 subjects each. The high association (HA) group was given booklets that contained a series of nouns associatively related according to free association norms, one pair to a page; the low association (LA) group was given booklets containing pairs of associatively unrelated nouns. The syntactic features of the nouns of the HA and LA pairs were identical. The task was to make up a sentence using each of the noun pairs, with no restrictions placed on the content or syntactic structure of the sentence productions. Since HA and LA pairs of the type used here differ in semantic and contextual featural overlap, it was anticipated that they would also differ in the syntactic relationships within which their members would appear in the sentence productions. The results supported the hypothesis. (Author/DO)

SEMANTIC CONSTRAINTS UPON THE SYNTACTIC STRUCTURE OF SENTENCE PRODUCTIONS[1]

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48 undergraduates were assigned to 2 groups of 24 Ss each. The high association (HA) group was given booklets that contained a series of nouns associatively related according to free association norms, one pair to a page; low association (LA) group was given booklets containing pairs of associatively unrelated nouns. The syntactic features of the nouns of the HA and LA pairs were identical. The task was to make up a sentence using each of the noun pairs, with no restrictions placed on the content or syntactic structure of the sentence productions. Since HA and LA pairs of the type used here differ in semantic and contextual featural overlap, it was anticipated that they would also differ in the syntactic relationships within which their members would appear in the sentence productions. The results supported the hypothesis.

It has been observed in studies too numerous to mention that in a free word-association task the high frequency responses of an adult population tend to be words of the same grammatical class (i.e., words that share the same syntactic features) as the stimulus words. This appears to be particularly the case when the stimuli are nouns and common adjectives. In addition to the overlap in syntactic features (e.g., noun, animate, count, plural), it is clear (Deese, 1965) that associatively related words tend to share semantic features (e.g., living, human, adult, strong) as well. There is even a growing tendency to attempt to account for syntactic featural overlap in terms of the semantic features that words share (Clifton, 1967; McNeill, in press).

In addition to the syntactic and semantic featural overlap between associatively related words, research on the origin of associations within the same grammatical class (McNeill, 1963; 196) suggests that associatively related words should also share contextual features, i.e., they should tend to occur in similar semantic contexts. Some evidence to support this hypothesis comes from norms of sequential associative dependencies in active declarative sentences (Rosenberg & Koen, 1968). In that study, Ss were

given a series of sentence frames containing a subject noun (e.g., The man _____ the _____). Their task was to associate a verb (past tense) and an object noun to the subject noun in each frame. In these norms, the verb responses for each subject noun are arranged in order of frequency from highest to lowest, and beside each verb is printed the frequency distribution of the object nouns that accompanied it. For each of the subject nouns, then these norms generate predicate phrases varying in associative frequency.

An examination of the stimulus materials used in producing the norms revealed 13 pairs of nouns where the members of the pairs elicit each other as response primaries in free association or where one word elicits the other as a response primary in free association. To determine contextual featural overlap, the three most frequent predicate phrases given for the subject nouns in each free association pair were examined. Table 1 contains the associative pairs in question followed by their overlapping contextual features. It can be seen that in all but one case there was some contextual featural overlap.

Insert Table 1 About Here

For purposes of control, the nouns in the associative pairs of Table 1 were paired at random to produce pairs with weaker semantic featural overlap. Table 2 contains these pairs together with their contextual featural overlap. As was anticipated, this table reveals only a few instances of contextual featural overlap.

Insert Table 2 About Here

The discussion so far leads us to expect a relationship between semantic input and syntactic structure in sentence production, the relation being mediated by semantic and contextual featural overlap. Specifically, it can be hypothesized that in a task in which Ss are required to construct sentences using pairs of nouns with identical syntactic features but different free association strengths, there will be a greater tendency for the nouns in the high association (HA) pairs than those in the low association (LA) pairs to share the same underlying P-Marker in the sentences produced. In other words, an HA pair is more likely to be used as a compound subject or compound object,

for example, than an LA pair. Conversely, it was anticipated that the LA nouns would appear more often than HA nouns in different underlying sentences. The present study was an attempt to verify these hypotheses.

Method

Subjects: The Ss were 48 paid undergraduate volunteers who were assigned in alternation to two groups of 24 each as they appeared at the experiment. The data were collected in three sessions of group testing. The N's for the sessions were, respectively, 16, 18, and 14. Half the Ss in each session were assigned to the HA condition and half to the LA condition.

Materials: The materials consisted of a booklet and a sheet of instructions. Each page of a booklet contained a pair of nouns printed at the top, below which were four lines for writing. The HA booklets contained 12 pairs of associatively related (bidirectionally) nouns while the LA booklets contained 12 pairs of associatively unrelated (bidirectionally) nouns. The mean relative frequency of elicitation in free association (forward and reverse combined) for the HA pairs was 41.83% while for the LA nouns it was virtually zero. The nouns within and between each associative level were matched as closely as possible on Thorndike-Lorge (1944) frequency (mostly AA and A words). Half the pairs in each list contained animate nouns and half contained inanimate ones. The nouns in each pair, HA and LA, were matched for syntactic features. Local free association norms and the Minnesota norms (Palermo & Jenkins, 1964) were used to select the items. For half the Ss in each condition the nouns in each pair were printed in one order, and for the other half they were printed in the reverse order. The order of pairs within the booklets was varied from S to S. Table 3 contains the stimulus materials of the present study. It will be noted that one member of each HA pair occurred in its LA counterpart.

Insert Table 3 About Here

Procedure: The data were collected in a classroom. After being seated, each S was given a booklet and a copy of the printed instructions. The E then read the instructions aloud while the Ss followed in their copies of the text. The Ss' task is described in the instructions reproduced below.

Rosenberg

Sentence Production Study

Instructions

This is a study of sentence production. Each of you has been given a booklet that contains 12 pairs of nouns, one pair to a page. Below each pair of nouns you will find some blank lines on which you are to write during the sentence-production task. Your task, for each page of the booklet, is to make up a sentence that contains the nouns printed at the top of the page. Please follow these instructions in performing your task:

1. The nouns must be used as nouns and not as any other part of speech.
2. Each noun on a given page must be used only once in the sentence that you make up.
3. Where the two nouns appear in a given sentence and in what order they appear is entirely up to you. For example, whether they appear together or at different places in a sentence is for you to decide.
4. The content, length and grammatical complexity of your sentences is entirely up to you.

You may refer back to these instructions at any time. Work as rapidly as you can, but please write neatly. Please keep your eyes on your own booklet and do not do anything that might disturb those around you. As soon as you finish all 12 pages, check to see that you've left no pages blank, turn your booklet over, and remain seated until the others have finished.

Scoring. The sentence productions were scored by a graduate student[2] familiar with transformational grammar. The types of syntactic relationships within which the nouns in each pair occurred were categorized as follows:

Type I. Each noun serves the same grammatical function in the same underlying sentence (e.g., compound subject, compound object, objects of the same preposition).

Type II. Each noun occurs in a different underlying sentence (e.g., $noun_1$ is the subject of one underlying sentence while $noun_2$ is the direct object in another underlying sentence).

Type III. The two nouns occur in the same underlying sentence but with different grammatical functions (e.g., subject-direct object, subject-predicate noun).

Results

There was one sentence production in each of the experimental conditions which could not be scored, owing to semantic anomaly. The means for the

number of pairs that fell into each of the three scoring types were, for Group HA, 4.83, 3.71, and 3.42 respectively. The corresponding values for Group LA were 1.63, 5.25, and 5.08. Thus, as anticipated, Group HA produced more Type I relationships than Group LA, while Group LA produced more Type II relationships than Group HA. Group LA also appeared to have produced more Type III relations than Group HA. The difference for Type I relationships is highly significant, t (23) = 6.15 p = < .001, one-tailed. Because of heterogeneity of variance, the df were reduced by half for this comparison. For the Type II difference t (46) = 2.66 p < .01, one-tailed, while for the Type III difference t (46) = 2.89, p < .01, two-tailed.

Discussion

Transformational grammar has made us aware of the critical relationship that exists between the syntactic features of words and their semantic interpretations, and between the underlying syntactic structures of sentences and their semantic interpretations. However, our knowledge of semantic constraints upon the syntax of utterances is still very limited. This study was an attempt to investigate one small aspect of this problem, namely, the relationship between the semantic phenomena underlying word associations and the syntactic structure of sentence productions. This analysis, of course, is limited to the case of nouns with identical syntactic features.

Clearly, words with a high degree of overlap in semantic and contextual features appear to be used in a different syntactic fashion than words with a limited amount of such overlap. Nouns of the latter type appear more frequently than nouns of the former type in different underlying sentences, while nouns of the former type tend to serve the same grammatical function in the same underlying sentence to a greater extent than nouns of the latter type. In addition, nouns with limited semantic and contextual featural overlap are used more frequently with differing grammatical functions in the same underlying sentence than are minimally contrasting nouns. This last finding was not anticipated, and the reasons for it are not clear.

Finally, it is worth mentioning that since the HA and LA noun pairs used here were matched for syntactic features, the results of the study do not favor a grammatical explanation of the syntactic features of word associations; they tend rather to favor the semantic explanation proposed by McNeill (in press).

Footnotes

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[2]The contribution of Mr. Roger Gehlbach to this analysis is gratefully acknowledged.

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Table 1

Contextual Featural Overlap for Pairs of Associatively Related Nouns

Associative Pair	Contextual Featural Overlap
Man - Woman	drove the car
Dog - Cat	ate; chased
Aunt - Uncle	loved
Boy - Girl	loved
Candidate - Mayor	won the election
Baby - Child	ate
Enemy - Friend	----------
Father - Mother	spanked the child
Husband - Wife	loved
King - Queen	ruled; married
Lion - Tiger	attacked the hunter
Doctor - Nurse	helped the patient
Student - Teacher	test

Table 2

Contextual Featural Overlap for Control Pairs

Control Pair	Contextual Featural Overlap
Father - Lion	----------
Doctor - Husband	----------
Tiger - Aunt	----------
Baby - Dog	ate the food
King - Teacher	gave
Nurse - Boy	----------
Uncle - Queen	loved; married
Cat - Wife	----------
Candidate - Friend	----------
Girl - Mayor	----------
Woman - Student	----------
Enemy - Child	----------
Man - Mother	----------

Table 3

HA and LA Noun Pairs

HA		LA	
student	teacher	student	farmer
doctor	nurse	judge	nurse
queen	king	queen	clerk
lion	tiger	wolf	tiger
uncle	aunt	uncle	maid
dog	cat	dog	goat
bread	butter	candy	butter
chair	table	door	table
city	town	city	lake
nail	hammer	pipe	hammer
health	sickness	peace	sickness
street	road	street	field