

Free associations to conceptually structured word triads

EUGENE A. LOVELACE, L. STARLING REID, and LINDA C. HUNT
University of Virginia, Charlottesville, Virginia 22901

A set of word triads are presented that, as stimulus materials for free association, permit the assessment of the relative salience of two varieties of feature enhancement. There are 10 triads of each of four types that differ with respect to how the words of each triad are related. In the first type, the three words share inherent features that determine their membership in a common natural category, words of a second type are from different categories but share a sensory characteristic, the third type share both membership in a natural category and a sensory feature, and the fourth type are unrelated. The distributions of responses to these triad types are presented for a college sample as a baseline for a population of high linguistic ability. Changes in such distributions from 1st to 5th grade are then explored, and differences are shown in the associations produced by 10th- and 11th-grade high school students of high, medium, and low reading levels.

In an excellent article concerned with developmental changes in free association responses, Nelson (1977) called for a more structured approach to the study of verbal associations. She observed that, if one is to learn about the relations that are salient in semantic memory, "stimulus words as well as response words should be classified according to their conceptual relationships" (Nelson, 1977, p. 112); lists must be carefully constructed, she said, so that different sorts of relationships may be assessed. Shortly before Nelson's (1977) article appeared, the late L. Starling Reid had developed a set of stimulus materials for use in verbal free association that permits a systematic exploration of the salience of certain types of conceptual relations. In Reid's materials, each stimulus is a set of three concrete nouns. These triads differ systematically in the relations that hold among the three stimulus words. In a detailed theoretical discussion of ways in which language stimuli are understood and structured, from the surface level to the deepest conceptual levels, Reid (1974) discussed two major types of relations based on what Strawson (1959) called "sortal and characterizing ties." According to Reid, "sortal ties serve to group individual participants into categories definable on the basis of inherent features of their members. Characterizing ties serve to group qualities, states, and actions that are common to many different participants" (1974, p. 327). Sortally related sets of words (and the underlying concepts) are typically

realized most directly in a natural language as concrete, count nouns of a natural category. Characterizing ties among words (and concepts) are related to abstract conceptual complexes that are most often realized in surface structure as adjectives, verbs, and adverbs. Such abstract characterizing complexes collect properties, or relations among properties, that are often common to members of a large number of different sortal sets or natural categories.

The present studies involve free association to stimulus compounds in which, for each triad, the words were selected so as to bear certain relationships to each other. For some triads the three words were sortally related in that they were members of a natural category, whereas for others the words shared a characterizing relation, a sensory feature, but belonged to different natural categories. In addition, some triads were related by both sortal and characterizing ties; that is, they possessed the two properties of belonging to a natural category and sharing a sensory feature that is not inherent in that category membership.

The source of these materials, their general characteristics, and the specific words and their relations are detailed below. The distribution of responses of various types in single-word free association to these triads is presented for a sample of college students in order to establish some adult norms for these triads. Elementary school children's responses for samples of first-, third-, and fifth-graders are then examined, as well as responses of samples high school students from English classes of high, medium, and low reading levels.

METHOD

Materials

A sensory feature that is shared by members of different natural categories can provide a basis for a characterizing tie. Underwood and Richardson's (1956) norms of sense-impression

The research reported here was initiated and guided by L. Starling Reid until his death in April 1978. Eunice Powell assisted him with the study involving high school students; the study of elementary school children was conducted by the third author in partial fulfillment of the requirements of the MA degree. The first author regrets that this paper could not benefit from the very considerable scholarship and editing skills of Professor Reid. Thanks are due M. J. Homzie for valuable comments on an earlier draft.

associations for a pool of 213 concrete nouns were used to construct the 10 "characterizing" triads of Table 1. To the right of each triad is the dominant shared sensory response. The mean dominance level in those norms for occurrence of the indicated sensory responses to words of these triads was 54.4.

Sortal triads were created by drawing items from categories or the Battig-Montague (1969) norms. These 10 "sortal" triads appear in Table 1, along with the superordinate category name. The mean rank of the individual words as instances in the category norms was 11.8.

To the extent possible, the words of triads in which both sortal and characterizing ties (S + C triads) exist should have characterizing relations that are equivalent to those present in triads with only characterizing ties and have sortal relations that are equivalent to those in triads with sortal relations only. The Underwood-Richardson (1956) dominance level of words in these S + C triads, which appear in Table 1, has a mean of 58.9, compared with 54.4 for the characterizing triads. The overlap of items in the Battig-Montague and Underwood-Richardson norms allowed selection of words for only six pairs of the S + C triads to be chosen from the Battig-Montague category norms. For these six triads, the mean rank of these instances in the category norms was 11.4, compared with a mean rank of 11.8 for words of the sortal triads. Items of the remaining four S + C triads, the last four in Table 1, were selected by Reid; although no normative data are available, the performance levels on these two subsets of the S + C triads were very similar, which suggests that the materials have similar characteristics.

Words for an "unrelated" set of triads (see Table 1) were chosen from the sense-impression norms such that the three words of a given triad did not share any compelling sensory association; further, they were judged by the researchers not to belong to any obvious natural category.

Subjects

Forty-four college students enrolled at the University of Virginia were tested to provide responses from a highly verbal, adult population. Eighty-eight elementary school children in the public schools of Albemarle County, Virginia, also participated, 28 from the first grade and 30 from the third and fifth grades. Selection of students "of at least average intelligence" in each grade was by discretion of their teachers. Data were also gathered from 60 10th- and 11th-grade students, 20 from each of three different high school English classes at Harrisonburg High School, Harrisonburg, Virginia. The three classes had been constituted to achieve three levels of reading ability, largely on the basis of teacher recommendations and reference to standardized test scores, when available.

Procedure

For each subject, the 40 triads were listed on a computer printout in successive blocks of 4, such that each block consisted of 1 triad of each of the four categories of relationships: sortal, characterizing, S + C, and unrelated. Order of triads and words within triads were randomly determined for each subject.

The college and high school students were tested in groups and wrote their answers on lines that appeared on the computer printout following each of the triads. The elementary school children were tested individually, with the experimenter reading the three words of each triad aloud to the children and recording their responses. All subjects were instructed to read or listen carefully to the three nouns of each triad and to respond with the first word brought to mind by the three words as a whole; the instructions reminded them that they were not to respond to just one word of the triad. The elementary school children were also told that there were no "right" or "wrong" answers and that the appropriate response was the first thing that came to mind; for these children, the sample triad PLAYPEN-DIAPER-RATTLE was given and the word "baby" was suggested as a possible response.

High school and college students proceeded through the 40

Table 1
Words in Each Stimulus Triad and Relationship
Among the Three Words

			Super- ordinate	Adjec- tival
Sortal Triads				
grape	peach	pineapple	fruit	
socks	jacket	belt	clothes	
pistol	sword	arrow	weapons	
desk	lamp	footstool	furniture	
daffodil	gardenia	daisy	flower	
tennis	soccer	baseball	sports	
pigeon	owl	wren	birds	
cabin	cottage	mansion	home	
onion	carrot	spinach	vegetable	
bike	jeep	canoe	vehicle	
Characterizing Triads				
olive	grass	cabbage		green
butter	straw	moon		yellow
honey	paste	tar		sticky
garbage	skunk	zoo		smelly
mouse	thimble	capsule		small
balloon	pill	button		round
beet	lips	brick		red
stone	knuckle	helmet		hard
tack	pin	beak		sharp
snow	teeth	pearl		white
S + C Triads				
flannel	silk	velvet	cloth	soft
cherry	apple	cranberry	fruit	red
ant	flea	gnat	insect	small
cucumber	asparagus	beans	vegetable	green
spear	knife	dagger	weapon	sharp
kitten	pony	puppy	animal	small
banana	lemon	pear	fruit	yellow
milk	bread	rice	food	white
pail	barrel	pot	containers	round
elephant	gorilla	whale	animal	large
Unrelated				
spool	gasoline	diaper		
lawn	freckle	anchor		
wheel	buckle	grapefruit		
ivy	coal	oyster		
telephone	bracelet	rod		
cave	knob	napkin		
boulder	cork	tweezer		
dime	moccasin	salt		
tomato	city	pillow		
platter	dandelion	hatchet		

triads in a self-paced fashion. For elementary school children, the three nouns were read so as to be spaced about 1 sec apart; if after 10 sec no response had been made, the child was urged to say the word he was thinking of at the moment.

RESULTS

Given a reasonably well structured conceptual memory, the shared features of the concepts encoded by the nouns of the sortal triads would be expected to lead predominantly to the production of superordinate responses. For characterizing triads that are encoded in terms of concepts that share certain sensory features, the

predominant responses expected would be adjectives describing the shared sensory features. For all subjects, the free association responses to triads were coded into one of five categories: (1) superordinate, in which the response was the name of a category for which all words of the triad were members, (2) coordinate, in which the response was another noun belonging to the same category or sharing the same characteristics as the words in the triad, (3) adjective, in which the response was an adjective that named a shared, characterizing feature, (4) function, in which the response was a verb related to a common use or function of all words in the triad, and (5) miscellaneous. Examples of responses of each of the five types to the S+C triad CUCUMBER-BEAN-ASPARAGUS might be "vegetable," "spinach," "green," "eat," and "healthy," respectively.

The distributions of the five response types to triads in each category for the college sample are shown in Table 2. As expected, the sortal triads elicited predominantly superordinate responses, whereas adjective responses predominated for characterizing triads. In S+C triads, both sorts of responses occurred, but the sortal ties among words appear more salient than characterizing ties, since these triads produced more than twice as many superordinate responses as adjective responses.

The distribution of responses for the elementary school children are given in Table 3. There is clear evidence of developmental emergence of the sophisticated types of response, superordinate responses to sortal triads increased from 46% in the first grade to 74% in the fifth grade, and adjective responses to characterizing triads increased from 40% to 68%. Similar changes, albeit of smaller magnitudes, can be seen for both superordinate and adjective responses to S+C triads. All of these developmental trends were statistically significant ($p < .05$), except for the increase in adjectives with age in the S+C triads; for the latter, the change was of marginal reliability ($p = .053$).

Table 4 provides the proportions of responses in the high school sample that belong in each response category for students of the English classes at three reading levels. For sortal triads, the distribution of response types was nearly identical for the three reading levels. For characterizing triads, however, adjective responses for students at the high reading level dramatically exceeded those of students at a low reading level (65% vs. 35%); on the other hand, miscellaneous responses were notably fewer for those at high than for those at low reading levels, whereas other categories remained fairly stable. For S+C triads, there appeared to be only small effects of reading level.

In Table 4, the only very notable aspect is the low level of adjective responses to characterizing triads in the classes of medium and low reading levels. Since this result is substantial in magnitude and consistent with earlier pilot data, it is unlikely that it represents a Type I error. These English classes surely differed in general verbal aptitude of individuals as well as reading

Table 2
Proportions of Responses to Each Type of Triad That Fell in Each Response Category for the College Sample

Triad Type	Super-ordinate	Coordinate	Adjective	Function	Miscellaneous
S	.66	.16	.01	.15	.03
C	.00	.03	.66	.04	.27
S + C	.47	.15	.21	.14	.02

Note— $N = 44$. *S* = sortal; *C* = characterizing. For 23 of these subjects, a few of the individual words composing the triads differed from those in Table 1, but the relations among the words conform to those shown there, and performances were similar.

Table 3
Proportions of Elementary School Children's Responses That Were of Each Response Type at Each Grade Level

Grade Level	Super-ordinate	Coordinate	Adjective	Function	Miscellaneous
Sortal Triads					
1	.46	.13	.00	.26	.15
3	.64	.04	.00	.20	.12
5	.74	.01	.00	.15	.10
Characterizing Triads					
1	.00	.03	.40	.05	.52
3	.00	.03	.56	.03	.38
5	.00	.01	.68	.02	.29
S + C Triads					
1	.41	.12	.10	.22	.15
3	.47	.05	.17	.18	.13
5	.60	.01	.16	.10	.13

Note— $N = 28, 30, \text{ and } 30$ for Grades 1, 3, and 5, respectively.

Table 4
Proportion of High School Students' Responses That Were of Each Response Type for Each of Three Reading Levels

Reading Level	Super-ordinate	Coordinate	Adjective	Function	Miscellaneous
Sortal Triads					
Low	.57	.12	.04	.21	.06
Medium	.58	.09	.04	.23	.06
High	.57	.15	.03	.22	.03
Characterizing Triads					
Low	.00	.05	.35	.14	.46
Medium	.00	.03	.45	.06	.46
High	.00	.03	.65	.10	.22
S + C Triads					
Low	.42	.11	.24	.20	.03
Medium	.37	.09	.27	.22	.05
High	.36	.12	.30	.18	.04

level. It is of interest to know whether, in addition to the contribution of general verbal aptitude, there was separate contribution of reading skill to the prediction of level of adjective responses to characterizing triads. For 50 of the 60 high school subjects, standardized test scores were available on the School and College Ability Test (SCAT) for both verbal aptitude and reading subtests; for this sample, these two sets of scores showed a

considerable correlation ($r = .50$). The Pearson correlation coefficients of each of these scores with the number of adjective responses to these triads showed that the reading score was a better predictor ($r = .59$) than the verbal aptitude score ($r = .53$). Furthermore, the partial correlation of adjective responding with reading when the verbal aptitude scores were partialled out was still large ($r = .44$).

DISCUSSION

In the present study, different varieties of feature enhancement, as induced by systematic differences in shared features among the words in stimulus triads, were shown to govern the types of responses produced in free association to these triads. There were systematic differences observed in responses for elementary school children of different ages and for high school students of different reading abilities.

Absolute levels of responses reflecting sortal relations (superordinates, and probably most coordinates, to sortal triads) and those reflecting characterizing ties (adjective responses to characterizing triads) must be governed by the specific materials, and there is a scaling problem that precludes knowing whether the present materials can be taken to represent similar degrees or strength of the particular relationship among words in the two types of triads. For the present materials, however, at all levels and in all samples, the direction of this difference suggests greater salience of sortal than of characterizing ties. Furthermore, in triads in which both sortal and characterizing relations were present, the distribution of responses was very much more similar to that of sortal triads than to that of characterizing triads.

The finding of greater apparent salience of sortal than of characterizing relations is consistent with Reid's (1974) discussion of the bases of such responses. The conceptual processing of characterizing ties must reflect shared features of "participants," but these individual participants must have been identified prior to the discovery of the shared characterizing feature. As Reid said of characterizing ties, they "serve to group qualities, states and actions that are common to participants. A requirement is that participants must be distinguished before characterizing ties are possible" (1974, p. 327). Sortal ties group individual participants into natural categories that serve to identify participants on the basis of inherent features of their membership.

Interestingly, the difference in the relative salience of sortal and characterizing relations was of greatest magnitude for high school students of low reading ability (only 35% adjective responses to sortal triads). Although reading levels are unrelated to the salience of sortal relations, they are strongly related to the salience of characterizing relations. This suggests that individuals of the lowest reading level identify shared membership in a natural category as well as a good reader does, but they cannot as readily detect a shared sensory feature of items belonging to

different categories. Although this might reflect differences in instructional "set" or strategies that students of different reading levels adopt regarding the free association task (cf. Moran, 1966; Nelson, 1977), it may also reflect real differences in the extent to which feature enhancement of different types are perceived. Connected discourse is structured such that there is a great deal of constraint on what will follow given text elements; one facet of being a "good reader" is a sensitivity to such constraints, with an attendant increase in predictability of succeeding material. Individual differences in the ease with which people perceive potential characterizing ties may be related to individual differences in processes underlying the use of such incidental feature relations of language in reading.

Although this study is not directly comparable to most earlier studies since it employs triads rather than single-word stimuli, it should be noted that the developmental aspects of these data do not conform to a simple notion of syntagmatic-to-paradigmatic shift in free association as the child develops. If such responses are judged by form class of stimulus and response, superordinate and coordinate responses to sets of sortally related nouns represent paradigmatic responses, and these occur at least as early as the adjectival responses to nouns of characterizing triads that would be said to represent syntagmatic association.

The research and the materials shown here provide one approach to the general issue of structuring the stimulus materials for free association tasks in order to better understand the nature of the responses and the sort of conceptual relations they reflect. These data suggest that the salience of sortal relations is greater than that of characterizing ties and that, in addition to developmental increases in the salience of either relationship, individual differences in the salience of characterizing ties may be related to effectiveness of processing the sequential constraints of context in reading.

REFERENCES

- BATTIG, W. F., & MONTAGUE, W. E. Category norms for verbal items in 56 categories: A replication and extension of the Connecticut category norms. *Journal of Experimental Psychology Monographs*, 1969, **80**(No. 3), 1-46.
- MORAN, L. J. Generality of word association response sets. *Psychological Monographs*, 1966, **80**(No. 612).
- NELSON, K. The syntagmatic-paradigmatic shift revisited: A review of research and theory. *Psychological Bulletin*, 1977, **84**, 93-116.
- REID, L. S. Toward a grammar of the image. *Psychological Bulletin*, 1974, **81**, 319-334.
- STRAWSON, P. F. *Individuals: An essay in descriptive metaphysics*. London: Methuen, 1959.
- UNDERWOOD, B. J., & RICHARDSON, J. Some verbal materials for the study of concept formation. *Psychological Bulletin*, 1956, **53**, 84-95.

(Received for publication November 24, 1980.)