ASSOCIATIVE STIMULUS HIERARCHIES

by

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ABSTRACT

The present study presents normative stimulus hierarchies for 26 common English words. One hundred stimulus items chosen from data presented by Rogers (1965) were presented to 625 subjects for free association. Subjects were undergraduate students at the University of Arizona. Discussion was in terms of 1) potential applications of the data and 2) methodological problems associated with the research area.

INTRODUCTION

Over the past two decades there has been increasing experimental application of word association norms (Blick, 1965; Bousfield, 1953; Deese, 1959; Fox, 1964; Jenkins, 1952). Within the last twelve years the Russell-Jenkins (1954) norms have been most extensively exploited by researchers in verbal learning and psycholinguistics. Other more recent norms have been provided by Palermo and Jenkins (1964) and Bilodeau and Howell (1965). All of these norms specify discrete free associative response probabilities given for common stimulus words. Bilodeau and Howell, in addition, included continued association norms on response hierarchies.

Deese (1962) discussed the need for stimulus hierarchies but raised methodological problems of obtaining such hierarchies experimentally. He proposed that the only feasible way to obtain stimulus hierarchies is to have subjects free associate to all of the words of a given language. In this manner it would be insured that all high frequency evokers of a given word would be obtained. Rogers (1965) presented a method of backward association intended to sample stimulus hierarchies of individual subjects. This sampling was achieved by presenting a Word (W) to an individual and asking that he write some other word (item) that would remind him of the first one. In this manner S searches his pre-experimental language habits and retrieves some item which in his past has served to evoke W. In this fashion Rogers obtained a list of several hundred items based upon the performance of some

400 Ss. He then indicated that these items could not be accepted prima facie as adequate stimuli, but rather that they must be administered as stimuli to a different S population in order to 1) ascertain whether these items would evoke the desired Rs in discrete free association and 2) determine precise S-R probabilities.

The purpose of the present study, then, was to collect stimulus norms, as suggested by Rogers, using those items delimited in his study as stimuli. As a result stimulus hierarchies for specific words could be constructed.

METHOD

A total of 625 students in an introductory psychology class at the University of Arizona served as subjects.

A four-page verbal booklet patterned after Bilodeau and Howell (1965) was used. Following a cover, an instruction page described the free association procedure and included examples. Five free association stimulus words were presented on each of the next two pages.

One hundred stimulus words were chosen from Rogers' data to produce ten lists of ten words each. Only nouns and adjectives were used. These stimulus words were assigned to twenty lists of five words each, in such a fashion as to minimize intra- and inter-page associations. Every word was presented in two sequences to reduce possible position effects.

Less than two percent of the Ss were voided because of failure to follow instructions. Final analyses were then based upon an N of 50 responses per stimulus item.

RESULTS

Twenty-six free associative stimulus hierarchies are presented. The word CAR in Table II will serve to illustrate the structure of the following tables. Wheel (.46), Seat (.06), New (.04), Bug (.02), Seed (.02), Small (.02) all evoked the response CAR with the probability shown following each word. Table I contain those words selected for special consideration and evaluation in the discussion section which follows.

TABLE I

Stimulus Words Yielding Ten R Words Used by Rogers in Backward Association With $\underline{p}$ of S-R Relationship.

CHAIR		FLOWER	
Rocking	.84	Tulip	.70
Table	.56	Bloom	.66
Seat	.46	Daisy	.62
Desk	.30	Petal	.54
Sit	.16	Garden	.34
Arm	.12	Meadow	.04
Lawn	.06	Pot	.04
Daisy	.02	Pretty	.02
		Wall	.02

GRASS		GROUND	
Green	.40	Earth	.16
Mower	.34	Soil	.16
Lawn	.30	Plow	.12
Bermuda	.28	Dirt	.08
Meadow	.20	Sky	.02
Snake	.18		
Cricket	.04		
Seed	.04		
Cut	.02		
Plow	.02		

TABLE I--Continued

INSECT		LAMB	
Cricket	.14	Ewe	.20
Bug	.12	Sheep	.16
DDT	.12	Fleece	.14
Roach	.10	Wool	.12
Ant	.10	Baa	.08
Mosquito	.08		
Bee	.04		
Gnat	.04		
Fleece	.02		

QUEEN		SKY	
King	.52	Stars	.54
Royalty	.20	Cloud	.46
Princess	.14	Blue	.34
Crown	.12	Earth	.12
Daisy	.02	Clear	.08
		Moon	.08
		High	.08
		Heaven	.06
		Air	.02
		Sea	.02

TABLE I--Continued

SONG		WATER	
Sing	.60	Thirsty	.64
Lyrics	.50	Lake	.30
Tune	.30	Drink	.26
Music	.12	Sea	.22
Record	.08	Wet	.14
		Clear	.12
		Glass	.12
		Rain	.12
		Ship	.08
		Mud	.06
		Air	.04
		Tower	.04
		Bermuda	.02
		Cold	.02
		Garden	.02
		Green	.02
		Sweet	.02

TABLE II

Stimulus Words Yielding Each of Sixteen R Words With p of S-R Relationship.

BLUE		BOY	
Sky	.56	Girl	.64
Red	.20	Small	.18
Lake	.10	Big	.04
Green	.08	Plow	.04
Heaven	.04	Ant	.02
Clear	.02	Blue	.02
Cloud	.02	Car	.02
Royalty	.02	Cow	.02
		High	.02
		Love	.02
		Tiny	.02

BUG		CAR	
Roach	.38	Wheel	.46
Cricket	.20	Seat	.06
Gnat	.18	New	.04
Ant	.12	Bug	.02
Mosquito	.08	Seed	.02
DDT	.04	Small	.02
Bee	.02		

TABLE II--Continued

FIELD		FLY	
Plow	.24	Gnat	.40
Meadow	.10	DDT	.04
Cow	.02	Mosquito	.04
Daisy	.02	Air	.02
Earth	.02	Bug	.02
Garden	.02	Ship	.02
Sheep	.02		

GIRL(S)		GREEN	
Pretty	.52	Lawn	.20
Love	.16	Blue	.14
Woman	.12	Meadow	.14
Princess	.08	Red	.08
Soft	.06	Garden	.04
Small	.04	Bid	.02
Sweet	.04	Dead	.02
Girl	.02	Snake	.02
Group	.02	Tree	.02
Leg	.02		
Tiny	.02		

TABLE II--Continued

HARD		LIGHT	
Easy	.64	Dark	.54
Soft	.40	Moon	.12
Work	.18	Blue	.02
Bite	.02	Green	.02
New	.02	High	.02
Pot	.02	Red	.02
		Soft	.02
		Stars	.02
		Tall	.02
		Tower	.02

MAN		OCEAN	
Woman	.60	Sea	.30
Tall	.08	Ship	.06
Dead	.06	Lake	.04
Thirsty	.06	Blue	.02
Rich	.04	Clear	.02
Work	.04	Sky	.02
Big	.02		
Garden	.02		
Hand	.02		
King	.02		
Love	.02		
Moon	.02		
Red	.02		

TABLE II --Continued

PLANT		RAIN	
Seed	.36	Cloud	.30
Garden	.06	Wet	.16
Pot	.06	Mud	.10
Soil	.04	Cold	.02
Tulip	.04	Stars	.02
Daisy	.02		
Earth	.02		
Tree	.02		

SMALL		TREE	
Tiny	.32	Green	.20
Big	.28	Seed	.10
Ant	.04	Tall	.06
Bug	.02	Big	.04
Tall	.02	Red	.04
		Back	.02
		Bloom	.02
		Dead	.02
		Ewe	.02
		Garden	.02
		Love	.02
		Meadow	.02
		Tower	.02
		Wall	.02

DISCUSSION

The items originally selected from Rogers 1965 data were intended primarily to provide stimulus hierarchies for the ten response words in Table I. A brief inspection of the results indicates that a sufficiently wide range of probability of response evocation was obtained. While the list of stimuli provided is certainly not exhaustive; still, a sufficient sample is now available for at least a limited number of experimental applications. The additional sixteen hierarchies presented in Table II were determined by cross-indexing all responses elicited by the stimuli used. Only those words are presented which were elicited by five or more stimuli and where at least one S-R probability exceeded .12.

Certain problems in constructing stimulus hierarchies have emerged. A comparison of the stimulus distributions of WATER and GROUND shows that equal numbers and strengths of stimuli were not obtained for the two words. This disparity and the possible reasons for it are important. It may be that certain responses (verbal or motor) are so weak as to have no hierarchy at all under normal circumstances. Illustrative examples might be responding with the word jackal or antidisestablishmentarianism in free association or a motor movement such as putting one's foot in one's mouth (in the literal sense). While these responses may be available to an individual, one might well spend a lifetime searching for adequate stimuli to evoke them. Just as some responses may have no known adequate stimuli,

others may have only low probability or only high probability stimuli. It would be unwise to allow the neatness, symmetry, and width of free associate response distributions to trick one into believing that such must obtain also for stimulus distributions. Another factor to be considered in accounting for the variability of the above hierarchies is familiarity of the stimulus item to the subject. Petulant may be an unreliable stimulus. To subjects familiar with the item, an antonym such as sheepish may be evoked, but a large proportion of the population has not learned the meaning of petulant as indicated by the "now rare" notation in a current dictionary (Webster's, 1960). As a result, stimulus and response hierarchies obtained for that word would be of dubious value at best. Finally, it should be noted that, as of the date of writing of this article, no study has yet been done on the reliability of either free association or backward association.

A second facet of this discussion involves application of the stimulus hierarchies. Now that limited stimulus hierarchies are available it is possible to select material for various learning experiments wherein E can use meaningful material with some a priori knowledge of a variety of S-R relationships. Previously, with R distributive data only, a knowledge of two-component ($B \Rightarrow C$) relationships was available; now three-component ($A \Rightarrow B \Rightarrow C$) information should be especially useful to workers such as Deese who are interested in meaning, where the meaning of a given word is operationally defined by the stimuli which evoke it and those responses which it evokes.

Principles of stimulus generalization state that probabilities of response evocation varies along a stimulus similarity continuum. Now that data is available in quantity for the first time on meaningful verbal material the problem of an adequate definition of verbal similarity emerges. If one examines the data above on the word WATER, he may be hard put to show how Thirsty and Lake are more similar than Thirsty and Drink or Thirsty and Rain. As always, verbal researchers must face the problem of dealing with nominal scales.

Only nouns and adjectives were used in the present study. Use of other parts of speech, such as pronouns, adverbs, conjunctions, may raise a variety of unseen problems. Further research in this area is advocated.

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