ABSTRACT
         This study used five cueing systems composed of 16
cues each in combination with three topical areas to form cue-topic
pairs which acted as stimulus items for the retrieval of naturally
stored information. The five cue systems were composed of: randomly
selected words, randomly selected nouns, the Wilson and Arnold
system, a modification of the Kant system of "categories of
understanding," and the subject's own self-generating cues. On the
basis of a frequency ranking, subjects from the same population as
the experimental sample ranked three topics from a list of 20. A
repeated measures design was used where subjects in each one of the
cue system's groups were in a random order presented the same 16 cues
three times, each time with a different one of the three topics
forming 48-cue topic pairs overall. The results indicated that the
subject's own self-generated cue system significantly facilitated a
retrieval of naturally stored information as compared to the other
four cue systems. There were no significant differences in the cue
systems: random word, random noun, Wilson and Arnold, and Kant with
respect to the facilitation of items or information retrieved.
(Author/WR)

ITEMS OF INFORMATION RETRIEVED AS A FUNCTION OF CUE SYSTEM AND TOPICAL AREA

by

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ABSTRACT   BEST COPY AVAILABLE

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Five cueing systems composed of sixteen cues each were used in
combination with three topical areas to form cue-topic pairs which
acted as stimulus items for the retrieval of naturally stored informa-
tion. The following composed the five cue systems: (1) randomly
selected words; (2) randomly selected nouns; (3) the Wilson and Arnold
system; (4) a modification of the Kant system of "categories of under-
standing"; (5) the subject's own self-generating cues. On the basis of
a frequency ranking, subjects from the same population as the experimen-
tal sample ranked three topics from a list of 20. The highest ranked
topics were:: (1) abortion; (2) wage and price control; and (3) poli-
tical election reform. A repeated measures design was used where sub-
jects in each one of the cue system's groups were in a random order
presented the same 16 cues three times, each time with a different one
of the three topics forming 48 cue-topic pairs overall. The results
indicate that the subject's own self-generated cue system significantly
facilitated a retrieval of naturally stored information as compared to
the other four cue systems. There were no significant differences in
the cue systems: random word, random noun, Wilson and Arnold, and Kant
with respect to the facilitation of items of information retrieved.
With exception of the topic, abortion, in the Kant system there were no
significant differences for the independent variable of topic.

ITEMS OF INFORMATION RETRIEVED AS
A FUNCTION OF CUE SYSTEM AND TOPICAL AREA

In response to the question of what should be the primary research

effort on the part of the communication scholar, Gerald Miller suggested

at the 1968 New Orleans Conference that the focus of c: :n should be

directed:

> . . . at questions involving interactional relationships
> between Information I and InformationII. Most scientifically
> useful generalizations concerning human information processing
> will have to take account of both the environmental stimuli
> available to the individual (Information I) and the background
> of experiences that he brings with him to the situation
> (Information II).[1]

Implicit in these comments is the suggestion that in order to deal

with this particular issue, the means for determining the available

fund of Information II must be developed and generalizations concerning

ways in which differences in Information II affect the processing of

Information I must also be sought.[2] It is with respect to the utilization

of external stimuli (Information I) as a strategy in retrieving items of

previously stored information (Information II) that the concerns of this

research effect are directed. A logical extension of this type of

research is to its applicability in describing psychological processes

and in human problem solving.

In a sense the conceptual way in which Miller develops his concept

of Information II stems from the historical scientific inquiry of the

theory of categories and categorizing behaviors. Axiomatic to most

theories of verbal behavior is a notion of man's propensity toward a
categorizing behavior which filters, differentiates and organizes know-
ledge. The necessity of such categorizing behavior has been pointed out
by Bruner, Goodnow and Austin who suggest that such categorizing behavior:
(1) reduces the complexity of man's environment; (2) enables him to
identify objects in his surrounding world; (3) tends to reduce the
necessity for constant learning; (4) tends to provide direction for
instrumental activity; (5) facilitates his ability to order and ate
classes of events; and (6) facilitates his capacity to anticipate he
consequences of future action.[3]

        Another theoretical approach to how man organizes his environment
was postulated by George Kelly in his personal construct theory. Kelly's
individuality corollary directly suggests that persons differ from each
other in their construction of events.[4] While theorists such as Bruner,
Goodnow and Austin and Kelly have concerned themselves with how man
categorizes and organizes his information, other researchers have inves-
tigated how man gains access to the information he has previously organ-
ized and categorized.

        The use of external stimuli as a strategy in directing our catego-
rizing behavior to improve man's intrinsic ability to precess and recall
information may be referred to as a cueing system. Such cueing systems
have been described by Gross as ". . . one or more sets of categories or
two or more variables that stand in ordinal, classificatory or functional
relationship to each other."[5] A number of theorists including George
Mandler have theorized that the human organism organizes his information
into superordinate structures with a hierarchy of subcategories or chunks

of information. Such behavior has been viewed as a three-stage process
initiating with the perception of stimuli input and its place in rela-
tion to other stimuli, to the chunking of that stimuli within lower
levels in the hierarchy to the establishing of links or relationships
at other levels.[6] Mandler's theory may be viewed as the psychological
processes involving Information I and Information II and their interaction.

While theoretical excursions into the nature of human information
processing have been broad in scope, empirical investigation has tended
to focus on: (1) the effects of categorizing behavior on information
recall; (2) the use of verbal stimuli in recall; and (3) the effects of
varying grammatical form and syntax of verbal stimuli on information
recall.

The emphasis, however, of research in this area has been upon the
use of cue systems in facilitating human recall of "artificially" stored
information. For the purposes of this study, "artificially" stored
information has been defined as information learned as a part of the
experimental treatment. Little investigation has been concerned with
the use of cue systems in facilitating retrieval of "naturally" stored
information, that is, primarily information learned by the subject inde-
pendent of experimental treatment.

Recently there has been an interest on the part of the communication
scholar in facilitating the retrieval of naturally stored information.
In an article based upon his Ph.D. dissertation, Nelson found that sub-
jects using the Wilson and Arnold Cue System based on the Aristotelian
topical system retrieved more items of information to high meaningful
issues and low meaningful issues than did subjects not using a cue system
(i.e. free recall).[7] Subsequently, Nelson and Petelle, using a similar

research design found that subjects using the Wilson and Arnold Cue
System retrieved more items of information to a social issue problem
than did free recall subjects. Also, when these items were arranged so
as to form a workable solution subjects using a cue system developed
solutions considered to be superior to solutions developed by free recall
groups when these solutions were rank ordered by both free recall and cue
recall groups.[8]

Although Nelson only utilized a single cueing system, he raised the
questions of the effectiveness of other possible cueing systems and the
generalized applicability of cueing systems for information retrieval
for different topical areas. In relation to the first question, Infante
varied the cueing system, the task and the form of recall and found that
subjects still discover more information and arguments when cued by Topoi.[9]

In response to the second question, Buchholz and Petelle compared
the Wilson and Arnold cue system, their modification of the Kant system,
a random word system and free recall. Significant differences were found
between the Wilson and Arnold system and free recall and between the
Kant and free recall. No significant differences were found between the
random word system and free recall and between the Kant and the Wilson
and Arnold systems.[10]

The usefulness of the Wilson and Arnold cue system to different
categories of issues as well as the relative ability of individual cues
within the system was investigated by Petelle. Using the topical areas
of big business, wage and price control and unemployment, significant
differences in number of items of information retrieved were only found
between unemployment and big business and unemployment and wage and price

control. Furthermore, results indicated certain cues accounted for a
significantly greater proportion of the items retrieved than did other
cues.[11]

Support for the findings of the differential utility of certain
cues is found in the results of Thompson and Tulving. They concluded
that retrieval cues facilitate recall when they are presented during
both learning and recall. Retrieval cues do not facilitate recall when
they are presented only for the recall trial unless the pre-established
association between the cue and the to be recalled word is of consider-
able strength. They further note that a retrieval cue is effective only
if the information about its relation to the recalled item is stored at
the same time that the item is stored. In general, they maintain that
the presence of a retrieval cue having a strong pre-experimental asso-
ciation with the to be recalled item has little influence on the recall
of the item if the item has been studied in the presence of a weak asso-
ciative. They have labeled the explanation of their findings the
"Encoding Specificity Hypothesis."[12]

In a related study but taking a significantly different approach,
Schaub and Lindley presented subjects with 36 high and low meaningful
trigrams. Subjects generated their own associations (i.e. cues) to the
trigrams. Subsequently, subjects who were presented their own associa-
tions (cues) prior to the presentation of the trigrams recalled signifi-
cantly more trigrams of both high and low meaningfulness than did sub-
jects who did not employ their own self-generated associations. The
frequent repetition of self-generated associations allowed subjects to
recall more low meaningful trigrams.[13]

Research using cue systems involving varying word order as well as
grammatical form has been conducted by Lambert and Paivio. They

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concluded that noun-adjective order was superior to adjective-noun order in the recall of information.[14] In a related study, DiVesta and Ross found that "the results supported the hypothesis that noun imagery is a more critical determinant of paired-associative learning that adjective imagery, and that this effect is more pronounced in the stimulus than in the response element."[15] Further research in this area, such as that of R. S. Lockhart, Paivio and Foth, and ~~Yuille~~ Yuille, Paivio and Lambert have produced similar results.[16]

The review of the previously cited research reveals the following comparative utility of cue systems for information retrieval: (1) the Wilson and Arnold and Kant cue systems were found to be superior in number of items of information retrieved as compared to the random werd and free recalled cue systems; (2) the use of noun forms as a cue system appears to be superior to cue systems of another grammatical form; (3) there appears to be no significant difference between tandom word cue systems and free recall systems; (4) self-generated association cues appear to be superior to the absence of associative cues and superior to repeated presentations; (5) there appears to be a differential utility for some cue systems over other cue systems for different topical areas.

Previous research findings indicate support for the viability of a priori cue systems in the retrieval of artificially stored information and naturally stored information. Based upon the previous theoretical and empirical research which has primarily been concerned with the retrieval of artificially stored information and the rather limited knowledge concerning the retrieval of naturally stored information, the following hypotheses were formulated: (a) there will be no significant

differences in the number of items of naturally stored informatic
retrieved among the five cue systems of random word, random noun,
Wilson and Arnold, Kant, and self-generated; (b) there will be n
significant differences in the number of items of naturally stored
information retrieved according to the topical areas of abortion,
wage and price control, and political election reform.

PROCEDURES

Two independent variables were manipulated: cue system and
topical area. Cue system had five levels: random word, random noun,
Wilson and Arnold, Kant, and self-generated. Topical area had three
levels: abortion, wage and price control and political election reform.
The dependent variable was the number of naturally stored items of
information retrieved.

The independent variable cue system was operationalized in the
following manner. The random word system of 16 words was created by ran-
domly selecting words from Roget's Thesaurus. The random noun cue system of
16 nouns was obtained in the same manner as the random word with the
exception that the first noun encountered on a randomly selected page
was chosen. The Wilson and Arnold cue system of 16 words was obtained
from the text, Public Speaking: As A Liberal Art, by the respective
authors.[17] The Kant system of 16 words was obtained from a modification
of the Kantian "Categories of Understanding" previously tested by Buchholz
in an unpublished paper.

(Insert Table 1)

The self-generated cue system of 16 words was developed in the following manner: Three weeks prior to the experimental treatment, subjects assigned to the self-generation group were asked to list "16 words which would help you solve any problem." Subjects were given five minutes in which to list the 16 words. Subjects were told to stop when they had listed 16 words even if the five-minute time period was not over. The self-generation group thus developed 16 of their own idiosyncratic cues.

The independent variable of topical area consisting of three topical areas was determined in the following way: 100 randomly selected subjects from the same population used in the experimental sample were asked to rank order, from a list of 20 preselected areas, those areas they felt were most important. Based on highest frequency rankings, the topics of abortion, wage and price control and political election reform were identified. Subjects who ranked topics were excluded from the experimental sample.

The dependent variable was operationalized as the number of items of information generated by the subject and consisted primarily of words and word phrases (a phrase was scored as one item of information).

One hundred sixty subjects were randomly assigned to the five cue system groups. Due to the random assignment procedure, groups of unequal size resulted. The three topical areas were randomly ordered for each subject with three sets of the 16 cues placed in an individual subject package, one cue-topic pair to a page. Upon entering the experimental room subjects were randomly assigned the treatment package.

Subjects (with the exception of the self-generation group who received

their own cues) were randomly assigned the treatment package containing

the instructions on the first page and the 48 cue-topic pairs on the

following pages. The experimenter read the instructions which essen-

tially asked the subject to generate a list of as many items of infor-

mation as he could think of after viewing the cue-topic pair. The subjects

were then given one minute to generate items of information for each

cue-topic pair. No talking was allowed between subjects and subjects

were separated by at least one seat.

Hypotheses were tested by means of a 5 x 3 analysis of variance for

unequal group sizes, with repeated measures on one factor (topical area).

Scheffe's post hoc comparison of means test was used to analyze the

specific nature of significant effects developed by the analysis of

variance. Due to the unfamiliarity of the dependent variable the F_{max}

procedure was used to assess the homogeneity of the variance to the

five cue system groups.[18]

RESULTS

Cue System Hypothesis.

Analysis of the cue system hypothesis was based on a 5 x 3 ANOVA

for repeated measures and unequal group size.[19] Repeated measures

were on the topical area since each subject received the three topics,

in a random order using three sets of the same 16 cues. Analysis yielded

a significant effect due to cue system group ($F = 3.42$, $df = 4/155$, $p < .05$)

(Insert Table 2)

The f_{max} for cue system groups yielded no significant differences in
the variance between the groups (F_{max} = 1.8   df = 5/70 p $<$ .05).
No interaction effect was found between cue system group and topical
area (F $<$ 1). The Scheffe test yielded significant differences between
the self-generating group and all other cue system groups. All other
between cue system comparisons were not significant.

(Insert Table 3)

The results indicate that the self-generating group, across three
topical areas, facilitates more items of information retrieved than
other cue systems tested.

(Insert Table 4)

Thus the hypothesis of no significant differences between cue systems
failed to receive support.

Topical Area Hypothesis.

Using the tests mentioned above, the analysis of variance due to
topical area was significant (F = 3.64, df = 2/310, p $<$ .05). (See
Table 2) The Scheffe test yielded a significant difference between the
topic abortion and the other two topical areas for all cue systems
combined.

(Insert Table 5)

No other comparisons were significant for topical area for all cue
systems combined. The results indicate that a significantly higher
number of items of information was retrieved on the topic abortion than
on the other topical areas. (See Table 4) Thus the hypothesis of no
significant differences between the topical areas failed to receive
support.

In order to more specifically assess the sources of the differential effect of the topic of abortion, a Scheffe test on topical area within individual cue systems was run and yielded a significant difference only for the Kant system on the topic of abortion (ψ/ψ = 2.83, df = 2/60, p < .05).

DISCUSSION

The importance of distinguishing between artificially and naturally stored information centers on the experimental paradigm in which the information was stored. If the use of cue systems as facilitators for the retrieval of information are to be extended to human communicative behavior in general, they must be appropriate for the retrieving of information beyond that which is a part of the experimental treatment.

Previous research has indicated the superiority of a priori cue systems over free recall in facilitating the retrieval of items of information. This study compared the effectiveness of four a priori cue systems and a self-generated cue system. The results revealed no significant differences in the number of items of information retrieved among the four a priori cue systems. Significant differences did occur, however, when each of the four a priori systems were compared with the self-generated system.

For four of the five cue systems (random word, random noun, Wilson and Arnold and self-generating) there were no significant differences in the number of items of information retrieved for the three topical areas of abortion, wage and price control and political election reform. That significant differences were found for only the

Kant system for the one topic of abortion suggests that the topic may have greater associations with some or all of the Kant system's cues. The isolated finding of topic effect on the Kant cue system is possibly supported by an earlier finding of Petelle that certain cues accounted for a greater proportion of the items retrieved compared to other cues within the same system. This suggests that for some topics specific cues may be more viable than others in facilitating recall. The limited extent, however, of the effects of topical area on cue systems found in this study in no way supports any generalizations concerning the facilitation effects of particular cues within cue systems for specific topical areas. The fact that the topic abortion facilitated retrieval for only one cue system suggests the need for more specific determination of individual cue effects on information retrieval in future research.

While this study dealt with naturally as opposed to artificially stored information the results can be partially interpreted by previous findings on artificially stored information.

Thompson and Tulving,[20] for example, concluded that the associative value of retrieval cues for artificially stored information was an important factor in the retrieval of that information. They also determined that the effectiveness of an a priori retrieval cue was directly related to its association with the artificially stored information. While the use of such a cue may be directly related to the subject's association with artifically stored information, it is quite possible as indicated by the results of this study that when a subject retrieves naturally stored information his own best stimulus is his own self-generated cue.

Tulving and Pearlstone[21] have suggested that subjects not only tend to group (categorize) artificially stored information according to (1) meaningful conceptual categories; (2) associative groupings; (3) structural characteristics; and (4) similarity of sound patterns, but also tend to store information in a unique and idiosyncratic order. Kelly's individuality corollary lends further credence to these findings. If, indeed, individuals do have unique ways in which they categorize and organize their information, this may, to a large extent, explain why subjects generating their own cues (idiosyncraticness) were able to retrieve more items of naturally stored information than were subjects who were provided with an a priori cue system.

Further credence to the utility of self-generated cue systems is given by Basden and Higgins who found that recall of items of information was directly associated with inter-item associative strength when categories were determined by the subject's own choice.[22]

As a final statement, it is worth noting that the use of self-generated cue systems is a significant contemporary extension of the ancient concept of invention and its role in improving human information processing. The need for further research in this area was suggested by Karl Wallace in the June, 1972 issue of Spectra when he expressed the importance of the renewed interest on the part of the rhetorician in the ancient concept of invention and the significance of the ". . . new concern for invention, i.e. for systems of topics that aid in recalling experience during moments of utterance and that direct search and inquiry into what is needed and not ready at hand."[23]

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The results of this study suggests that further research into the use of self-generated cue systems is a viable concern for the speech communication scholar and may very well provide additional insight into the nature of human information processing.

More specifically, future research in this area needs to focus on the application of self-generating cue systems as applied to individual and group problem solving and creative idea development.

Table 1

CUES FOR SYSTEMS: RANDOM WORD, RANDOM NOUN, WILSON AND ARNOLD AND KANT

Random Word	Random Noun
husbandman	fluke
axe	boat
celebration	colorlessness
do	creator
create	twilight
made short work of	elasticity
doctrine	feature
evident	handle
ornamental stroke	magnification
handle	keel
be dishonest	measure
clever	total
liberate	**acknowledgment**
miser	prodigy
total	rejoinder
participation	sap

Wilson and Arnold	Kant
existence	quantity
degree	unity
spatial	plurality
time	totality
motion	quality
form	affirmation of reality
substance	negation
capacity to change	limitation
potency	relationship
desirability	substance
feasibility	cause-effect
causality	community
correlation	modality
genus-species	possibility
possibility-impossibility	existence
similarity-dissimilarity	necessity-result

Table 2

ANALYSIS OF VARIANCE (UNWEIGHTED MEANS SOLUTION)

FOR CUE SYSTEM DIFFERENCES

N = 160

Source	df	ms	P
Cue System (A)	4	8,456.02	3.42*
Topical Area (B)	2	693.06	3.64*
AB	8	4.42	1
Subjects within groups	155	2,471.19	
BX Subjects within groups	310	190.52	

*$p < .05$. Total source of variance is not given as in the unweighted means solution within subject's error plus between subject's error total.

Table 3

MULTIPLE COMPARISONS (SCHEFFE) OF THE MEAN
ITEMS OF INFORMATION RETRIEVED FOR CUE SYSTEM GROUP

Comparison	Random Word (RW) $n = 33$ $x = 247.18$	Random Noun (RN) $n = 31$ $x = 239.79$	Wilson & Arnold (WA) $n = 30$ $x = 239.27$	Kant (KA) $n = 30$ $x = 238.25$	Self-Generation (SG) $n = 36$ $x = 303.73$
		$\bar{x}$ difference			
RW vs. RN	7.39		0.58		
RW vs. WA	7.91		0.62		
RW vs. KA	8.93		0.70		
RW vs. SG	56.55		4.41*		
RN vs. WA	.52		0.04		
RN vs. KA	1.54		0.01		
RN vs. SG	63.94		4.69*		
WA vs. KA	1.02		0.74		
WA vs. SG	64.46		5.03*		
KA vs. SG	65.48		5.12*		

*$p < .05$. The critical ratio necessary for significance was ±3.109.

Table 4

MEAN NUMBER OF ITEMS OF INFORMATION GENERATED AS A FUNCTION
OF CUE-TOPIC SET FOR EACH OF THE CUE SYSTEM GROUPS AND
EACH OF THE TOPICAL AREAS

Cue System	Topical Area Abortion	Wage and Price Control	Political Election Reform	Total
Random Word	83.0	80.76	83.42	247.18
Random Noun	80.65	78.62	80.52	239.79
Wilson and Arnold	81.30	79.87	78.10	239.27
Kant	84.74	75.17	78.34	238.25
Introspective	105.03	101.25	97.45	303.73
Total	434.72	415.67	417.83	1268.22

Table 5

MULTIPLE COMPARISONS (SCHEFFE) AMONG THE
MEAN ITEMS OF INFORMATION RETRIEVED
FOR TOPICAL AREA

Comparison	ABORTION (AB) $\underline{n}$ = 160 $\overline{x}$ = 434.72	WAGE & PRICE CONTROL (WP) $\underline{n}$ = 160 $\overline{x}$ = 415.67	POLITICAL ELECTION REFORM (PR) $\underline{n}$ = 160 $\overline{x}$ = 417.83
	$\overline{x}$ difference		$\hat{\mathcal{F}}/\hat{\mathcal{S}}\,\mathcal{L}$
AB vs. WP	19.05		12.29*
AB vs. PR	16.89		10.89*
WP vs. PR	2.16		1.39

*$p < .05$. The critical $\hat{\mathcal{F}}/\hat{\mathcal{F}}\,\mathcal{L}$ ratio necessary for significance was ± 2.45.

FOOTNOTES

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