

MEANINGFULNESS OF THE MEDIATOR AND
VERBAL MEDIATION

A Thesis
Presented to
the Faculty of Graduate Studies and Research
University of Manitoba

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts

by
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April 1964



ABSTRACT OF THESIS

The purpose of the present research was to investigate the relevance of the meaningfulness of a symbol used as a mediator. Meaningfulness was defined as the frequency of occurrence and associative value of the mediator.

Twelve of Attneave's random shapes at two levels of meaningfulness (six at low and six at high) chosen according to scaled associative values established by Vanderplas and Garvin (1958) were used. An attempt was made to change the meaningfulness of the shapes by having the subjects manipulate them. One group of subjects manipulated shapes of low associative value while another group used shapes of high associative value.

It was concluded that shapes of higher associative value were more useful as mediators than shapes with lower associative value. It was also found that manipulation of the shapes improved their mediating properties.

ACKNOWLEDGEMENTS

The author wishes to express her appreciation to Dr. A. Shephard for his encouragement and advice in the preparation of this research.

This research was supported in part by Defence Research Board Grant 9401-19 as well as a grant from the President's research fund.

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CHAPTER I

INTRODUCTION

Interest in the concept of mediation has centered largely about attempts to explain transfer effects in learning which occur immediately without any obvious connection between the stimulus and the responses which this stimulus comes to evoke.

Recently studies have indicated that young children are unable to carry out certain mediation-type tasks. The purpose of this study is to test the hypothesis that lack of meaningfulness or familiarity of the mediator may be the basic condition determining this apparent mediation deficiency. For this study, meaningfulness or familiarity is defined as the associative value and frequency of occurrence of the mediator.

Mediators initially differing in familiarity will be used and procedures ensuring the manipulation of these mediators will be employed in order to attempt to change their familiarity.

CHAPTER II

HISTORICAL INTRODUCTION

There are a number of areas related to this topic, some of which are concerned with method of approach, some with the source of the problem and others with the solution itself. Previous studies in each of these areas are reviewed here.

Mediation

Mediation first received the attention of the British Associationists in the nineteenth century. Hume postulated an indirect associative connection between two items of experience as opposed to a direct type of associative connection. In learning two ideas, A and C, it is noted that A had been previously associated with another idea B, and B in turn had been associated with C. The learning of A-C, then, is facilitated by the associative link or mediator, B.

Since the time of Hume and other Associationists, numerous experiments have been conducted to demonstrate the facilitating effect of a mediator. Bugelski and Scharlock (1952) gave college students three lists of paired-associate words so arranged as to provide a possibility of mediated association. The three lists followed the order of A-B, B-C, A-C. The group receiving relevant A-B, B-C training before learning A-C learned A-C faster than the control group. The control group also received A-B, B-C training. However, the C in this first part of the experiment was different from the C used for the test pair A-C. While this is not a completely

satisfactory control group since the first C may have interfered with learning the association A-C, other investigators (Norcross and Spiker, 1958; Palermo, 1962; Seidel, 1962) have improved the control conditions and have found the facilitating effects of mediation. A more satisfactory control (Norcross and Spiker, 1958) involves learning three lists A-B, D-C, A-C. Other investigators who have lengthened the associative chain (Cofer and Yarczower, 1957; Russell and Storms, 1955; Underwood and Schulz, 1961) have also produced mediation. Backward mediation (A-B, C-B, A-C) has also been found (McCormack, 1961; Seidel, 1962).

The method of approach presented by Bugelski and Scharlock and others is the one used in this experiment. This method involves overt mediation since the mediator B is established by the experimenter and is learned to the stimulus A and to the response C in the experimental situation. This is in contrast to those experimental methods used in forming the mediation deficiency hypothesis discussed below.

Mediation Deficiency

The mediation deficiency hypothesis, first proposed by Kuenne (1946) states that there is a developmental stage in which the child, although able appropriately to label different stimuli, cannot act upon this verbalization. That is, the stimulus may receive its appropriate label but this label does not act as a mediator between the stimulus and the response the child learns to associate to it. It is the general hypothesis of the present research that it is the lack of

meaningfulness of the mediator which prevents young children from mediating.

There are three major learning situations presumed to involve directly mediation which have shown evidence of differences in performance between younger (between three and five years of age) and older children (above six years of age), 1) reversal shift, 2) transposition, 3) acquired distinctiveness of cues. Generally older children are superior in performance of the task. In all of these situations the mediator is implicit, i.e., is presumed to be established before the subject comes into the experimental situation and is inferred from the behaviour on the task.

Reversal and Nonreversal Shifts

Subjects in a reversal shift learning condition are required, first, to discriminate between two stimuli differing along a particular dimension. For example, they may learn to respond to the colour red (positive) while not responding to green (negative). In the second part of the experiment the previously positive stimulus becomes negative and the negative stimulus, positive. Subjects in a nonreversal shift learn one discrimination (red positive, green negative) but in the second part of the experiment they shift to a new dimension (large positive, small negative).

Investigators reason that if mediation occurs a reversal shift should prove easier than a nonreversal shift since the relevant mediators are set up in the first part of the experiment before the shift occurs. For example, if the original test involves responding to red

(positive) while not responding to green (negative) the mediators, the words "red" and "green" are established. In the shift part of the experiment when "green" becomes positive and "red" negative, the mediators are present. In a nonreversal shift situation, where the original discrimination calls for the mediators "red" and "green" the shift may call for the mediators "large" and "small". It has been found (Kendler and D'Amato, 1955; Kendler and Kendler, 1959, 1960, 1961; Kendler, Kendler and Leonard, 1962; O'Connor and Hermelin, 1959) that younger children find a reversal shift more difficult than do older children, thus indicating according to this hypothesis a lack of mediation with younger children.

Verbalization of the mediators in a reversal shift has not altered these conclusions (Kendler and Kendler, 1960). When children were asked after the experiment to name the stimuli even those young children who could attach the labels "red" and "green" to the stimuli were found to be inferior to the older children on a reversal shift. Therefore, as the mediation deficiency hypothesis proposes, while young children have the mediators or labels these do not appear to control their behaviour.

Transposition

Kuenne (1946) hypothesized that the learning of a concept of the relation between stimuli should facilitate transposition by means of the mediating properties of the concept. Since then a number of developmental transposition studies have been conducted.

Transposition is studied in a discrimination problem situation. Transposition refers to the application of a relational concept (such as larger than), previously learned in connection with particular stimuli differing on some dimension, to new stimuli removed along the same dimension. For example, by training subjects to respond to the larger of two stimuli, the size concept is presumably set up. When subjects are tested on two stimuli removed from the training stimuli along the size dimension (e.g. both smaller than the original pair), the mediating concept should facilitate learning. A number of investigators including Kuenne (1946), Alberts and Ehrenfreund (1961) and others (Jackson, Stonex, Lane, and Dominguez, 1938; Rudel, 1958; Spiker, 1956) have found that young children on the test stimuli do not show transposition or facilitation while older children do.

Hunter (1952), on the other hand, found no differences over ages on the transposition test. However, his method has been criticized for going beyond transposition since he first trained his subjects on three discrimination tasks before giving them the transposition test. The three discrimination tasks and the test stimuli all differed along the size dimension. It is significant in terms of the present research that training or familiarity with the relevant concept apparently removed differences in performance between the age groups.

Studies of transposition (Reese, 1961, 1962; Rudel, 1957, 1960; Spiker and Terrill, 1955; Stevenson and Bitterman, 1955) involving the intermediate size problem have supported the above findings. The intermediate size problem refers to the use, in part one of the experiment,

of three stimuli differing in size with the middle stimulus positive. The subject must grasp the idea that he must respond to the "middle" stimulus, i.e. the concept of "middle sizedness". On the transposition test three stimuli differing in size but removed along the size dimension (e.g. all smaller) are used.

Acquired Distinctiveness of Cues

Acquired distinctiveness of cues or stimulus predifferentiation has been considered important in the area of mediation since Spiker (1956) proposed that acquired distinctiveness may have its effect through the use of stimulus names for rehearsal of the S-R connections during the interstimulus interval. This interpretation calls upon the concept of mediation. The results of these studies will be discussed below.

Familiarity

A large number of various types of studies have been done in which the experience of the subjects has been manipulated. The results of this manipulation of experience have shown that experience has an effect on future intellectual development and learning.

The role of experience in the instinctive behaviour of lower animals provides evidence of interest here. These studies have been reviewed in Hunt's "Intelligence and Experience". Birch (1956) found that female rats who were reared with collars to prevent them from licking their own genitalia ate their young at parturition rather than licking them. Birch reasoned that this behaviour may be attributed

to the fact that the females had not learned to inhibit chewing and swallowing responses originally directed to their own genitalia.

Riess (1950, 1954) interfered with the nest building behaviour of female rats by separating female rats from nest building materials until the time of their first litter. At that time, even when provided with the appropriate materials the rats built very inadequate nests.

Gestalt Psychology, which emphasizes predetermined development rather than experience holds that pattern perception and insight are dependent upon the development of the relevant cerebral structures.

Observation of patients who have regained their sight through surgical removal of congenital cataracts reveals that these individuals are very confused when they first see. It took months for them to learn the names for many visual shapes (Hunt, 1961).

Hebb (1937a, 1937b) reared rats in darkness and then tested them on a discrimination task involving horizontal and vertical lines. Using Lashley's (1938) experiment as control data, Hebb found that rats reared in darkness required many more trials to learn the task thus indicating the importance of experience.

Reisen and his associates (1951) reared chimpanzees in darkness and showed that patterned visual experience appears to be essential for the development of visual perception. In two experiments (Riesen, Kurke and Mellinger, 1953; Riesen and Mellinger, 1956) studying inter-ocular transfer, animals reared in darkness each day were given a period of patterned vision to one eye with the other receiving only diffuse light. During the test phase subjects, using only the eye

which had received pattern vision (control animals using only one eye) were trained to go to a container on which there was a triangle as distinguished from another container with a circle. When animals returned to the test and used the other eye, it was found that animals previously receiving diffuse light showed no transfer while control animals did show it. These animals reared in darkness were also much inferior to normally reared animals in the original acquisition of such a discrimination.

Insightful behaviour has also been shown to be dependent upon experience (Bingham, 1929; Birch, 1945). For example, Jackson (1942) found that chimpanzees would not use a stick to reach for a banana unless they had been previously permitted to play with the stick.

Harlow's learning set studies in which animals, generally monkeys, after repeated practice in performing discrimination tasks show improvement on later, similar, learning tasks reinforce the importance of experience in learning.

Studies of enriched environment (Forgus, 1954, 1955a, 1955b; Forgus and Forgay, 1952) initiated by Hebb (1949) have shown a correlation between experience and learning. Gibson and Walk (1956, 1958) have shown that the similarity of material experienced previous to the test task, with the test task material, is a significant factor here. These investigators found that patterns inside a living cage could have a facilitating effect on the subsequent learning of a discrimination task involving these patterns.

Physiological changes have been correlated with environmental

situations. Krech, Rozensweig and Bennett (1960) have found that the more complex the environment, the lower the cortical-subcortical ratio of cholinesterase activity.

Underwood and Schulz (1960) have defined meaningfulness (M) mainly in terms of frequency of occurrence and have postulated a positive correlation between meaningfulness and rate of learning. Closely associated with frequency is the associative value of the stimulus. The present research combines both frequency and associative value in a definition of meaningfulness.

A large number of studies in the area of verbal learning have shown a relationship between associative value of words (according to the Glaze or Noble scales) and speed of learning (Dowling and Braun, 1957; Mandler and Huttenlocher, 1956; McGeoch, 1930; Noble, 1952; Noble and McNeely, 1957) and others have shown that when stimulus and response meaningfulness are varied independently, both are directly related to rate of learning but the magnitude of the effect is greater for response meaningfulness than for stimulus meaningfulness (Cieutat, Stockwell and Noble, 1958; Jantz and Underwood, 1958; Mandler and Campbell, 1957).

Frequency of occurrence has been manipulated by choosing word, trigrams, bigrams and single letters of varying frequency according to scales set up by Noble, Glaze and Underwood and Schulz. These studies have again shown a correlation between frequency and rate of learning (Underwood and Schulz, 1960, Experiments, 5,6,7,8,9,10,11,13,14,15,16). In addition, familiarization training has been given by having subjects

repeat the word to be learned either vocally, by spelling or by writing, or by recognition tests with similar results (Noble, 1955; Sheffield, 1946; Underwood and Schulz, 1960, Experiments 1,2,3,4; Waters, 1939).

Acquired distinctiveness of cues or stimulus predifferentiation is another area which should be noted when considering "familiarity". In studies of this variable subjects learn differential responses to the test stimuli. During the test phase new responses are learned. Subjects who had stimulus predifferentiation show facilitation effects on part two of the experiment.

Spiker (1956) as well as others (Cantor, 1955; Norcross and Spiker, 1957; Reese, 1960; Shepard, 1954; Weir and Stevenson, 1959) found no differences in the effect of acquired distinctiveness between younger and older children. These results are not consistent with the mediation deficiency hypothesis. However the general hypothesis of this thesis, that familiarity with the mediator facilitates meaning, could account for these contradictory results. Since the definition of meaningfulness involves both frequency and number of associations, the pretraining may be thought of as adding associations to the stimuli.

Manipulation of the meaningfulness of the shapes used in this experiment was carried out by Pylyshyn (1963) to explore temporal factors in immediate memory. Although Pylyshyn generally used familiarization tasks differing from those used here (e.g. naming shapes) he did have the subjects scale the shapes. A recognition test indicated increased recognition with increased meaningfulness.

CHAPTER III

EXPERIMENTAL METHOD AND RESULTS

I. METHOD

Materials

Twelve of Attneave's shapes, scaled according to associative value by Vanderplas and Garvin (1959) were used as mediators: six shapes of low associative value, Vanderplas and Garvin's six-point shapes, Numbers 28, 29, 20 and twelve-point shapes, Numbers 27, 28, 29 and six shapes of high associative value, six-point shapes, Numbers 5, 7, 8 and twelve-point shapes, Numbers 1, 2, 3. The former shapes were all scaled at associative value 26 and the latter shapes varied from values 48 to 52. The association values refer to the percentage of subjects able to give a response to the shape. Five other shapes, randomly chosen, were used in one of the manipulation tasks described below: six-point shapes, Numbers 4 and 25, twelve-point shapes, Numbers 8 and 24 and twenty-four point shape, Number 30.

For the control groups having irrelevant manipulation, six common shapes, circle, square, triangle, diamond, cross and rectangle were used. Five other common shapes were used in one manipulation task in addition to the six major shapes. These five shapes included a heart, a triangle and cross differing from the two used above, a wider rectangle than that used above and a parallelogram.

The shapes were presented to the subjects during the manipulation period in the form of four by four inch pictures, white shapes on

a black background. During the mediation part of the experiment 35-millimeter slides of the shapes, white on black were projected onto a black screen eighteen by thirteen inches.

The stimuli and responses for mediation appear in Appendix A and consist of ten pairs of two syllable adjectives chosen to minimize associative value between the two words of the pair. A memory drum was employed to present these words during the test phase of the experiment. All of the words used here appear at least once per million words according to the Thorndike-Lorge tables. The frequency values vary from one per million (bearded) to over 100 per million (human). The words, then, should be quite familiar to all university students.

Conditions

Two major groups were first chosen for investigation, one group receiving the low associative value shapes as mediators and the other group the high associative value shapes. To determine whether manipulation of the shapes would have any effect on their subsequent use as mediators, each group was divided into those having manipulation of the shapes before mediation (relevant manipulation, R) and a control group manipulating circles, squares, etc. (irrelevant manipulation, I). Since it seemed possible that the manipulation of irrelevant shapes might interfere with mediation two more groups were added, one using low and the other high associative value shapes but with no previous manipulation. The conditions used in this experiment are presented in Table I.

TABLE I
SUMMARY OF THE SIX GROUPS FOR DIFFERENT CONDITIONS OF
FAMILIARITY AND MANIPULATION

	No Manipulation (N)	Irrelevant Manipulation (I)	Relevant Manipulation (R)
Unfamiliar	Group 1	Group 3	Group 5
Familiar	Group 2	Group 4	Group 6

Subjects

The subjects were 120 Introductory Psychology students required to serve as subjects for four hours of experimental work. All were naive to the task and apparatus. Twenty subjects were randomly assigned to each of the six groups.

Procedure

Manipulation Tasks. Subjects in the relevant and irrelevant manipulation groups received the same instructions but differed in the type of material to be manipulated.

Subjects were seated at a table and were told:

"You are going to measure and manipulate a number of shapes in order to become familiar with them¹. You will have quite a few things to do with these shapes so work as quickly but as carefully as you can!"

¹This last phrase was omitted for the irrelevant manipulation group.

After the designs were laid out the subject was told not to turn them around in any way.

1. The first task required the subject to arrange the shapes in order of similarity as perceived by him. All subjects in a particular group started with the same shape.

2. The subject was instructed to close his eyes while the experimenter randomly intermixed five other shapes among the ones the subject had used in Task 1. The subject was then told to pick out the six shapes he had just seen.

3. Five scaling methods using Osgood's Semantic Differential method were used. The subject was given the following instructions:

"Now I'm going to have you scale the shapes five different ways, that is according to five different dimensions.

(a) "The first thing I want you to do is to assign a number from one to seven to each shape to describe the pleasantness or unpleasantness of the shape. So the most pleasant shapes, or the ones you like the most, will receive a number toward the seven end of the scale and the unpleasant shapes, or the ones you like the least, will receive a number toward the one end of the scale. You realize that you have six shapes and seven numbers so you may give any number of shapes the same number, you may skip numbers. I just want to know how pleasant the shapes are to you."

When this task had been completed and the experimenter felt that the subject understood the nature of the scaling technique, the

following instructions were given:

(b) "This time assign a number from one to seven to each shape to estimate how much the shape would weigh if it were solid, the heavy looking shapes toward the seven end, the lighter looking shapes toward the one end."

The same instructions as in (b) were given for the following:

(c) estimating the probability of the shape being able to roll down a slope if it were solid.

(d) estimating the probability of the shape being able to fly if it were solid.

(e) estimating the amount of abstractness of the shape.

The final task required the subject to put together the two halves of the shapes which were arranged randomly before him.

Mediation

All subjects took part in this part of the experiment.

The subjects received these instructions for the A-B (word-stimulus to mediator) part of the experiment:

"What will happen here is that I will say a word and then the picture of a shape (one of the shapes you have just seen, for the relevant manipulation groups; a different shape from the ones you have just seen, for the irrelevant manipulation groups) will be flashed on the screen in front of you over there. There are six words, six shapes. I want you to learn which word goes with which shape. We will go through them four times with the shapes being in a different order each time. The important point for you to remember is that I

will say the word first and then the shape that goes with it will come on. Are there any questions?"

The apparatus was set up to project one shape for two seconds and then wait two seconds for the next shape. In the two seconds before each shape the word that went with it was given.

For the B-C (mediators to response word) part of the experiment the subjects were told:

"This time the same shape will come on as before but I want you to learn another new word to go with it. This time the shape will come on first and then I'll tell you the word that goes with it. Now we'll go through it once: the shape will come on, I'll tell you the word. Then I'll tell you to go ahead and when each shape comes on after that I want you to tell me what word goes with it from this second group of words. We will go through it four times altogether. Are there any questions?"

For the test part of the experiment (A-C) the subject was told:

"Now for this part of the experiment you will be using the machine in front of you. What you are going to get here are paired-associate words. To give you an example of a paired-associate, the word 'red' might appear alone at that little window in front of you. Then, two seconds later, two words will appear, 'red' and 'ask'. You have to associate 'red' with 'ask' so that when 'red' comes up again alone, you can say 'ask'. Now I'm giving you ten pairs of words. Some of the words you just heard in the previous part of the experiment. So the very first time we go through the words, when you see one word alone

that you recognize try to tell me the word that goes with it if you can. Guess if you like. We keep going through the words until you get them all correct on one trial. The words are in a different order each time. Are there any questions?"

Every effort was made to clarify the instructions in all parts of the experiment.

II. RESULTS

Trials to A-C Learning Criterion

No difference was demonstrable between the six groups in number of trials taken to reach A-C criterion ($F = 1.41$, $df = 19$, $p > .05$). This could be interpreted to mean either that the effects of the familiarity of the mediator and the manipulation of the shapes were relatively insignificant in determining number of trials to criterion, or that the variability of the data is so large as to mask their effects. The latter interpretation was favored because the number of trials to criterion for each control group was greater than those for the corresponding manipulation groups and because there were marked differences between subjects in number of trials to criterion. Since the fastest subjects in a pilot study, as well as in the experiment itself, learned to the criterion in four trials, only the first four trials of A-C learning were analyzed.

The Effect of Familiarity and Manipulation of the Mediator on the First Four Trials of A-C Learning.

The data used to investigate the effects of the nature of the

mediator were the absolute number of words on each of the first four trials of A-C (word-word) learning. The highest possible score for a subject on any trial was six since six of the word pairs had previously had an intermediate symbol (shape) established as a potential mediator between A and C.

TABLE II
ANALYSIS OF THE EFFECTS OF FAMILIARITY AND MANIPULATION OF THE
MEDIATOR FOR THE FIRST FOUR TRIALS OF LEARNING

Source	df	ms	F
Familiarity (Un. and Fam.)	1	23.41	20.01*
Manipulation (N, I, R)	2	99.04	84.64*
Trials	3	137.21	113.85*
Interaction: Familiarity X Manipulation	2	2.63	2.24
Interaction: Familiarity X Trials	3	.29	
Interaction: Manipulation X Trials	6	.95	
Interaction: Familiarity X Manipulation X Trials	6	.74	
Within Cells	456	1.17	

*p < .01

As can be seen from the analysis in Table II, manipulation of the shapes, familiarity of the shapes and trials each determined a

significant portion of the variability in level of performance in learning the A-C associations.

The no-manipulation (N) and the irrelevant manipulation (I) groups were not different ($t = .97$, $df = 58$, $p > .05$) in absolute number of pairs correct on the first four trials of learning.

Mediation

Possible mediation effects on the six experimental pairs were examined in terms of a comparison with control pairs where no direct mediation was possible. Each subject received two percentage scores, 1) response words correct for mediated pairs, and 2) response words correct for non-mediated pairs, both being compared with the total number of each possible during A-C learning. For example, if a subject required ten trials to learn the ten words he had a possible mediation score of 60 and a possible non-mediation score of 40. If he managed to get 40 mediation words and 20 non-mediation words correct his scores were: mediation, .66 and non-mediation, .50. A difference score (mediation minus non-mediation) was then computed for each subject.

Table III shows that the within-subjects difference between mediated and non-mediated pairs of words in learning A-C associations differed depending on whether the mediator was familiar or unfamiliar. These differences are made more explicit in Table IV, which shows the means of the differences among mediated and non-mediated pairs for the six conditions of A-C learning.

TABLE III

ANALYSIS OF DIFFERENCES BETWEEN PERCENTAGE CORRECT ON MEDIATION AND
NON-MEDIATION WORDS FOR ALL MANIPULATION AND FAMILIARITY GROUPS

Source	df	ms	F
Manipulation (N, I, R)	2	510.63	2.35
Familiarity (Un. and Fam.)	1	1592.03	7.34*
Interaction: Manipulation X Familiarity	2	172.11	
Within Cells	114	216.77	

* $p < .01$

TABLE IV

MEANS OF THE DIFFERENCE SCORES BETWEEN THE PERCENT CORRECT
FOR MEDIATION AND NON-MEDIATION PAIRS

	No Manipulation (N)	Irrelevant Manipulation (I)	Relevant Manipulation (R)
Unfamiliar	-4.55	-1.85	5.60
Familiar	7.25	4.40	9.35

As indicated in Table IV the raw difference scores reveal that the control groups having an unfamiliar mediator were generally not mediating. The means of their raw scores resulted in a minus quantity therefore indicating a higher percentage correct on non-mediated rather

than mediated pairs. There is the possibility that if, for example, Shape 1 is learned as a response to the word "bearded" in the A-B part of the experiment and the word "noonday" is learned incorrectly to Shape 1 in the B-C part of the experiment, when the subject comes to learn "bearded-arctic", the correct A-C pair, "bearded" tends to evoke the response "noonday". A situation such as this is more likely to arise with unfamiliar mediators, if the basic hypothesis of this experiment is correct.

CHAPTER IV

DISCUSSION

The results of this experiment support the hypothesis that meaningfulness of a symbol affects its potential usefulness as a mediator. A familiar symbol facilitates mediation more than an unfamiliar one, and there is a suggestion that an unfamiliar symbol does not mediate at all. This study also demonstrates that manipulation of the symbol before it is established as a mediating link between two other responses facilitates mediation.

The major concern of this experiment was to provide a possible explanation for the apparent lack of mediation in young children. For this reason no attempt was made to separate the two components of meaningfulness, frequency of occurrence and associative value. It was believed that generally a symbol (object, shape, word, etc.) might be expected to be encountered more frequently in the life of a young child simply because it is an aspect of various environmental situations. The different environmental situations or contexts may be expected to add new associations to the symbol.

Therefore it was postulated that the more frequently a symbol is encountered and the more associations it had, the easier it would be to learn new associations to it.

It must be noted that this thesis deals with what might be considered as only one type of mediation. Further, while the definition of meaningfulness used here is a restricted one, it is useful in explaining

how words first acquire meaning for the young child. Words which have acquired a limited amount of meaning by being frequently encountered and by having a number of associations attached to them become part of language structure. As a part of language, words may acquire new meanings through structure and context, resulting in mediation that may be thought of as different from that considered here.

Frequency of occurrence and associative value are thus seen as providing a substructure of meaning for a word before this word becomes part of the language.

The process by which children probably begin to learn the concepts "red" and "green" can be considered in terms of the above suggestions. Children have often been asked, "What colour is this?" They have responded with "red" or "green". Similar situations have probably occurred frequently for the young child while statements such as, "Bring me the red book" or "Bring me the red sweater" have not been encountered as frequently. While the first question requires the labelling of a stimulus in terms of colour, the second statement requires a response to the label. The second set of statements may occur more often for the child as he grows older, resulting in the formation of new associations thus increasing the meaning of the word. That is, questions of the first kind tend only to strengthen one association (stimulus-red), while statements of the second kind may be effective in establishing new associations (red to book, sweater, etc.).

With meaning acquired in this manner, the word is included in complex sentences and gains additional meaning from their formal structure.

The example of the process by which children learn the concept of "red" and "green" again brings up the question of the two components of meaningfulness, frequency of occurrence and associative value, suggesting a conceptual separation of these two aspects of meaningfulness.

It was hypothesized that repetition of the response "red" to the stimulus "colour" should only serve to strengthen the link between the stimulus and the response (colour-red). Frequency of occurrence, is not, in this instance, seen as playing a part in the formation of new associations with the label "red". However, the occurrence of the label "red" in connection with objects such as "sweater" and "book" etc., has been presented as significant in forming new associations.

A further analysis may serve to clarify the separation of frequency and number of associations proposed above. Sherman and Henry as reported by Valentine (1941) cite the example of children living in isolated communities who, when asked to define the word "post-office" said that the post-office was a place with baskets of apples in front of it. Certainly the children had seen the post-office a large number of times but in only one context--the general store. The meaning of the word "post-office" was very limited for these children. Through numerous contacts with the post-office the child's original associations with post-office (baskets of apples--post-office) had been strengthened. However, the child had formed no new associations with the word "post-office". It might be expected that such symbols or objects, although quite familiar, would be of limited value as mediators in a different learning situation because of their limited number of associations.

The importance of the two aspects of meaningfulness as defined here, frequency of occurrence and associative value, should now be apparent. In discussing frequency of occurrence, the repetition of a symbol in the same context has been referred to. Repetition is generally instrumental in strengthening the associative connections between the symbol and its particular context. Given this context as a stimulus there is a high probability that the symbol often encountered in this context may be evoked as a response. However, the probability of this symbol being evoked as a response in another context is low. The number of associations attached to a symbol is dependent upon the number of contexts in which the symbol appears. Therefore a symbol which appears in five different situations could become attached to more associations than a symbol which appears in only one context and thus the former symbol should be more meaningful and more useful as a mediator.

Consider now two symbols which appear in the same number of situations (e.g. five) but one of the symbols has been encountered twice in each situation and the other only once in each of its five environmental situations. Both symbols may be equally meaningful while the first may be seen as having stronger links with its various associations.

The respective importance of frequency and associative value as components of meaningfulness having been reviewed, experiments are indicated which will methodologically separate these aspects and verify their significance.

CHAPTER V

SUMMARY AND CONCLUSIONS

This investigation was concerned with the significance of the meaningfulness of a symbol on its effectiveness as a mediator. It was proposed that the general conclusion noted in the literature, that young children do not mediate while older children and adults do, can be explained by the fact that the mediator lacks the necessary meaningfulness for young children. Meaningfulness was defined in terms of frequency of occurrence and associative value of a symbol.

Twelve of Attneave's shapes were chosen as mediators. Six of these shapes scaled by Vanderplas and Garvin (1958) of low associative value and six of high associative value were used. To change their meaningfulness, two groups of subjects manipulated the shapes, one group using shapes of low associative value, the other shapes of high associative value. Two syllable adjectives, scaled by Thorndike and Lorge at a frequency value of at least one per million words were used as stimuli and responses.

The results suggested:

1. Shapes of higher associative value (more meaningfulness) resulted in mediation superior to that for low associative value shapes.
2. Manipulation of the shapes, both high and low associative value shapes, improved their mediating properties.

It was concluded that meaningfulness of the symbol is a significant variable in the effectiveness of a mediator.

In the discussion the two aspects of meaningfulness were considered and their possible importance in determining the meaningfulness of a symbol was presented. It was suggested that further experiments be done to test the hypothesized importance of each variable.

BIBLIOGRAPHY

- Alberts, E., and Ehrenfreund, D. Transposition in children as a function of age. J. exp. Psychol., 1951, 41, 30-38.
- Bingham, H.C. Chimpanzee translocation by means of boxes. Comp. Psychol. Monogr., 1929, 5, 1-91.
- Birch, H.G. The relation of previous experience to insightful problem solving., J. comp. Psychol., 1945, 38, 367-383.
- Bugelski, B.R., and Scharlock, D.P. An experimental demonstration of unconscious mediated association., J. exp. Psychol., 1952, 44, 334-338.
- Cantor, G.N. Effects of three types of pretraining on discrimination learning in preschool children. J. exp. Psychol., 1955, 49, 339-342.
- Cieutat, V.J., Stockwell, F.E. and Noble, C.E. The interaction of ability and amount of practice with stimulus meaningfulness (m, m') in paired-associate learning., J. exp. Psychol., 1958, 56, 193-202.
- Cofer, C.N. and Yarczower, M. Further study of implicit verbal chaining in paired-associate learning., Psychol. Rep., 1957, 3, 453-456.
- Conzalez, R.C., and Ross, S. The basis of solution by preverbal children of the intermediate size problem. Amer. J. Psychol., 1958, 71, 742, 746.
- Dowling, R.M. and Braun, H.W. Retention and meaningfulness of material. J. exp. Psychol., 1957, 54, 213-217.
- Forgays, D.G. and Forgay, J.W. The nature of free environmental experience in the rat. J. comp. physiol. Psychol., 1952, 45, 322-338.
- Forgus, R.H. Early visual and motor experience as determiners of complex maze-learning ability under rich and reduced environment. J. comp. physiol. Psychol., 1955b, 48, 215-220.
- _____. The effect of early perceptual learning on the behavioural organization of adult rats. J. comp. physiol. Psychol., 1954, 47, 331-336.
- _____. Influence of early experience on maze-learning with and without visual cues. Canad. J. Psychol., 1955a, 9, 207-214.

- Gibson, E.J., and Walk, R.D. The effect of prolonged exposure to visually presented patterns on learning to discriminate between them. J. comp. physiol. Psychol., 1956, 49, 239-242.
- _____, Walk, R.D., Pick, H.P. Jr., and Tighe, T.J. The effect of prolonged exposure to visual patterns on learning to discriminate similar and different patterns. J. comp. physiol. Psychol., 1958, 51, 584-587.
- Hebb, D.O. The innate organization of visual activity: 1. Perception of figures by rats reared in total darkness. J. genet. Psychol., 1937a, 51, 101-126.
- _____. The innate organization of visual activity: 2. Transfer of response in the discrimination of brightness and size by rats reared in total darkness. J. comp. physiol. Psychol., 1937b, 24, 277-299.
- Hunt, J. McV. Intelligence and Experience. The Ronald Press Co., New York, 1961.
- Hunter, I.M.L. An experimental investigation of the absolute and relative theories of transposition behaviour in children. Brit. J. Psychol., 1952, 43, 113-128.
- Jackson, T.A., Stonex, E., Lane, E., and Dominguez, R. Studies in the transposition of learning by children: 1. Relative vs. absolute choice as a function of the amount of training. J. exp. Psychol., 1938, 23, 578-599.
- _____. Use of the stick as a tool by young chimpanzees. J. Can. Psychol., 34, 223-225.
- Jantz, E.M., and Underwood, B.J. R-S Learning as a function of meaningfulness and degree of S-R learning. J. exp. Psychol., 1958, 56, 174-179.
- Kendler, H.H., and D'Amato. A comparison of reversal and nonreversal shifts in human concept formation behaviour. J. exp. Psychol., 1955, 49, 165-174.
- _____, and Kendler, T.S. Effect of verbalization on reversal shifts in children. Science, 1961, 134, 1619-1620.
- Kendler, T.S., and Kendler, H.H. Reversal and nonreversal shifts in kindergarten children. J. exp. Psychol., 1959, 58, 56-60.

- Kendler, T.S., Kendler, H.H., and Wells, D. Reversal and nonreversal shifts in nursery school children. J. comp. physiol. Psychol., 1960, 53, 83-88.
- _____, Kendler, H.H., and Leonard, B. Mediated response to size and brightness as a function of age. Amer. J. Psychol., 1962, 75 (4), 571-586.
- Krech, D., Rozensweig, M.R., and Bennett, E.L. Effects of environmental complexity and training on brain chemistry. J. comp. physiol. Psychol., 1960, 53, 509-519.
- Kuenne, M.K. Experimental investigation of the relation of language to transposition behaviour in young children. J. exp. Psychol., 1946, 36, 471-490.
- Lindquist, E.F. Design and Analysis of Experiments in Psychology and Education. Boston: Houghton Mifflin Co., 1956.
- Mandler, G., and Huttenlocher, J. The relationship between associative frequency, associative ability and paired-associate learning. Amer. J. Psychol., 1956, 69, 424-428.
- _____, and Campbell, E.H. Effect of variation in associative frequency of stimulus and response members on paired-associate learning. J. exp. Psychol., 1957, 54, 269-273.
- McCormack, P.D. Backward mediated positive transfer in a paired-associate task. J. exp. Psychol., 1961, 61, 138-141.
- McGeoch, J.A. The influence of associative value upon the difficulty of non-sense-syllable lists. J. genet. Psychol., 1930, 37, 421-426.
- Noble, C.E. An analysis of meaning. Psychol. Rev., 1952, 59, 421-430.
- _____. The role of stimulus meaning, (m) in serial verbal learning. J. exp. Psychol., 1952, 43, 437-446.
- _____. The effect of familiarization upon serial verbal learning. J. exp. Psychol., 1955, 49, 333-338.
- _____, and McNeely, D.A. The role of meaningfulness (m) in paired-associate learning. J. exp. Psychol., 1957, 53, 16-22.
- Norcross, K.J., and Spiker, C.C. The effects of type of stimulus pre-training on discrimination performance in preschool children. Child Develpm., 1957, 28, 79-84.

- Norcross, K.J., and Spiker, C.C. Mediated association on transfer in paired-associate learning. J. exp. Psychol., 1958, 55, 129-135.
- O'Connor, N., and Hermelin, B. Discrimination and reversal learning in imbeciles. J. abnorm. soc. Psychol., 1959, 59, 409-413.
- Palermo, D.S. Mediated association in a paired-associate task. J. exp. Psychol., 1962, 64, 234-238.
- Peters, H.N. Mediate association. J. exp. Psychol., 1935, 18, 20-48.
- Pylyshyn, Z.W. Temporal Factors in Immediate Memory. Unpublished Doctoral Thesis. University of Saskatchewan. 1963.
- Reese, H.W. Motor paired-associate learning and stimulus pretraining. Child Develpm., 1960, 31, 505-513.
- _____. Transposition in the intermediate size problem by pre-school children., Child Develpm., 1961, 32, 311-314.
- _____. Verbal mediation as a function of age level. Psychol. Bull., 1962, 59, 502-509.
- _____. The distance effect in transposition in the intermediate size problem., J. comp. physiol. Psychol., 1962, 55, 528-531.
- Riesen, A.H., Chow, K.L., Semmes, J., and Nissen, H.M. Chimpanzee vision after four conditions of light deprivation. Amer. J. Psychol., 1951, 6, 282.
- _____, Kurke, M.I., and Mellinger, J.C. Interocular transfer of habits learned monocularly in visually naive and visually experienced cats. J. comp. physiol. Psychol., 1953, 46, 166-171.
- _____, and Mellinger, J. Interocular transfer of habits in cats after alternating monocular visual experience. J. comp. physiol. Psychol., 1956, 49, 516-520.
- Rudel, R.G. Transposition of response size by children trained in intermediate-size problems. J. comp. physiol. Psychol., 1957, 50, 292-295.
- _____. Transposition of response size in children. J. comp. physiol. Psychol., 1958, 51, 386-390.
- _____. The transposition of intermediate size by brain damaged and mongoloid children. J. comp. physiol. Psychol., 1960, 53, 89-94.

- Russell, N.A., and Storms, L.H. Implicit verbal chaining in paired-associate learning. J. exp. Psychol., 1955, 49, 287-293.
- Schaeffer, M.A., and Gerjuoy, I.R. The effect of stimulus naming on the discrimination learning of kindergarten children. Child Develpm., 1955, 26, 231-240.
- Seidel, R.J. The importance of the S-R role of the verbal mediator in mediate association. Canad. J. Psychol., 1962, 16, 170-176.
- Sheffield, F.D. The role of meaningfulness of stimulus and response in verbal learning. Ph.D. Dissertation, Yale University, 1946.
- Shepard, W.D. The effects of verbal pretraining on discrimination learning in preschool children. Dissert. Abstr., 1954, 14, 2415.
- Spiker, C.C., and Terrell, G. Jr., Factors associated with transposition behaviour of preschool children. J. genet. Psychol., 1955, 86, 143-158.
- _____. Experiments with children on the hypothesis of acquired distinctiveness of cues. Child Develpm., 1956, 27, 253-263.
- _____. Stimulus pretraining and subsequent performance in the delayed reaction experiment. J. exp. Psychol., 1956, 52, 107-111.
- _____, Gerjuoy, I.R., and Shepard, W.D. Children's concept of middle-sizedness and performance on the intermediate size problem. J. comp. physiol. Psychol., 1956, 49, 416-419.
- _____, and Norcross, K.J. Effects of previously acquired stimulus names on discrimination performance. Child Develpm., 1962, 33, 859-864.
- Stevenson, H.W. and Bitterman, M.E. The distance effect in the transposition of intermediate size by children. Amer. J. Psychol., 1955, 68, 274-279.
- Thorndike, E.L., and Lorge, I. The Teacher's Word Book of 30,000 Words., New York: Columbia University, 1944.
- Underwood, B.J., and Schulz, R.W. Meaningfulness and Verbal Learning. New York: J.B. Lippincott Co., 1960.
- _____, and Schulz, R.W. Mediation in paired-associate learning. J. exp. Psychol., 1961, 62, 565-570.
- Valentine, W.L. Experimental Foundations of General Psychology. New York, Rhinehart, 1941.

- Vanderplas, J.M., and Garvin, A. The association value of random shapes. J. exp. Psychol., 1958, 57, 147-154.
- Waters, R.H. The law of acquaintance. J. exp. Psychol., 1939, 24, 180-191.
- Weir, M.W., and Stevenson, H.W. The effect of verbalization in children's learning as a function of chronological age. Child Develpm., 1959, 30, 143-149.

APPENDIX A

Pairs of Stimulus and Response Words (A and C) on which Mediation Is Possible Through Random Shapes (B)

A-Stimulus Word

Local
Bearded
Tender
Skinny
Human
Undone

C-Response Word

Antique
Arctic
Noonday
Coiled
Neuter
Modest

Pairs of Stimulus and Response Words (A and C) Not Receiving Relevant Mediation Practice

A-Stimulus Word

Nervous
Joyful
Extreme
Oldish

C-Response Word

Western
Level
Modern
Chilly