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The Effects of Oppositional Meaning in Incidental Learning: An Empirical Demonstration of the Dialectic

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Two studies are presented which examine whether oppositional meanings facilitate learning and memory. Both studies employed an incidental learning paradigm. In the first study the learning list consisted of antonym and non-antonym word pairs. Antonym pairs were recalled significantly better than non-antonym pairs. This effect was stronger for the subjects who performed the semantic rather than the non-semantic incidental tasks. In the second study, the semantic incidental tasks consisted of generating a synonym or an antonym to each word in a learning list. There was no advantage in recall due to generating either a synonym or an antonym; however, analysis of recall errors revealed that subjects who generated antonyms made more semantic than non-semantic false recall errors, while subjects who generated synonyms made fewer false recall errors overall, but made more non-semantic than semantic errors. It is suggested that the meaning dimension created by the oppositional task was present for subjects during recall, but that the particular words were not. It is suggested that oppositional meanings are influential in learning and memory. Results are discussed in terms of Rychlak's Logical Learning Theory. Implications for cognitive models of memory and larger issue of human free will are discussed.

Dialectics has a long history in philosophy, but it has been the subject of relatively little investigation in psychology. This is due in part to the fact that so many varied meanings have been attached to the concept through history (see Reese, 1982; Rychlak, 1976). Another reason the dialectic has not been widely studied is that it presents a challenge to the prevailing metaphysics upon which modern empirical psychology rests (Georgoudi, 1983).

The investigation reported here concentrates on only two aspects of the much broader concept of the dialectic, and dialectical thought: the oppositionality present in the meaning of words and concepts, and the human capacity to think and reason in terms of such oppositionality. Rychlak (1976, 1977, 1979) has proposed that the human capacity for dialectical (oppositional) thinking is the foundation of human free will. Logical Learning Theory (Rychlak, 1977) main-

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tains that many—or most—meanings in the world are bipolar, and they can be apprehended only in terms of their opposites. Furthermore, human beings are by nature capable of dealing with this oppositionality, and even creating dialectical alternatives. Because of this, there is never only a single cognitive or behavioral alternative available to a person at any one time. Freedom of choice is thus assured.

When oppositionality has been involved in studies of human learning and memory, it has usually been as a semantic relationship (antonymy) useful in studying some other aspect of the cognitive process. The theoretical importance of dialectical meanings and dialectical capacities *per se* has been largely overlooked by cognitive and behavioristic psychologists.

Although the research has been limited, a number of empirical findings lend support to the notion that oppositionality in meaning is an important feature of human cognition. In association tasks, there is a strong tendency toward oppositional responses over synonymic ones (Karowski and Schachter, 1948; Kjeldergaard, 1962; Siipola, Walker, and Kolb, 1955). Oppositionality has also exhibited transfer effects in learning (Weiss-Shed, 1977; Wickens and Cermack, 1967). Oppositionality of meaning has been shown to be semantic rather than simply a syntactic or lexical feature (Brewer and Lichtenstein, 1974; Grossman and Eagle, 1970), implying that there is real meaning involved in the oppositionality of words. The state of oppositional thinking can thus be seen to involve the person as a whole and as meaningfully involved in the world, rather than merely the person as a sort of "feature detector."

The ability to deal with opposition in meaning begins very early in life (Brewer and Stone, 1975), and has been shown to be associated with mental maturity, creativity, and mental health (Baseeches, 1980; Hogben and Jacobs, 1972; Rothenberg, 1973). There is evidence of differences in evoked responses in the brain associated with the processing of synonymic and antonymic word pairs (Vaughan, Sherif, O'Sullivan, Herrmann, and Weldon, 1982).

The purpose of the present research was to investigate directly a) the extent to which oppositional meanings are salient in learning and memory tasks, and b) the effects of dialectical thinking on the behaviors associated with learning and recall. If dialectical meaning and reasoning can be shown to be salient features of human mental life, then the contentions of Logical Learning Theory are given empirical support, and a burden is placed on currrent cognitive and behavioral theories to offer a meaningful alternative account of the empirical phenomena.

In an important early paper Hyde and Jenkins (1969) demonstrated the effects of different types of incidental tasks on the recall of related words in incidental learning. The essential features of the design involved presenting a list of word pairs to three different groups. One group was instructed to learn the words for future recall, a second group was instructed to evaluate the words for pleasantness or unpleasantness (a semantic task), and a third group was

given a task of searching the words for a particular letter (a non-semantic task). It was found that the recall of the group which performed the semantic task was equal to the group which learned the list intentionally, and superior to the group which performed the non-semantic task (see Eysenck, 1982, for a review of the literature of incidental learning).

Research utilizing the incidental learning paradigm has been responsible for much of the empirical support for the depth of processing model of memory (Craik and Lockhart, 1972). This model proposes that memory is a function of the depth to which material is processed, and that the depth of processing is influenced by the type of material to be learned, as well as the nature of the learning task. In general, "deep" is equivalent to semantic. A task requiring subjects to deal with the material on a semantic level should result in deep processing and memory nearly equal to intentional learning. Our research question, expressed in terms of the depth of processing model (although supporting this model was not the primary purpose of the research) was whether dialectical meaning, operationalized as antonymy, would lead to "deeper" processing, and thus to better recall.

The first experiment reported here used the incidental learning strategy of Hyde and Jenkins to investigate the effects of oppositional meaning in conjunction with the type (semantic vs. non-semantic) of incidental learning task on recall of words. It is interesting to note that Hyde and Jenkins used antonym and synonym pairs in their original study but did not investigate the possibility of effects due to oppositionality.

It was hypothesized in the present study that antonym pairs would be recalled better than synonym pairs, and that this effect would be stronger in the intentional group and in the group that performed the semantic incidental task than in the group that performed the non-semantic incidental task. If oppositionality is a salient feature of meaning, then its effects should be manifested even under conditions (such as in an incidental learning task) in which the semantic relationship among the words is not made salient to the learner. Since antonymy has been shown to be a semantic feature rather than a syntactic one (Anisfeld, 1970; Brewer and Lichtenstein, 1974), it was hypothesized that the effect would be strongest in the group that was performing a semantic task.

The second experiment modified the incidental learning procedure somewhat. In this experiment, the semantic incidental task required the generation of either a synonym or an antonym for each word presented. Directional hypotheses were more difficult to formulate for this study. Current cognitive or associationist theories might argue that either group would be expected to manifest better memory. On the one hand, it might be argued that the synonym group should manifest better memory because of the similarity and strength of association of the meanings of the two words. It might be argued, on the other hand, that the antonym group should have better memory because of the uniqueness, or contrast, and thus the noninterference of the meanings of the

two words. An alternative associationist argument which would predict superior memory for the antonym group would be simply that oppositional words are strongly associated because of their frequent co-occurrence in the language. We initially hypothesized that if dialectical thinking is a natural (or even the most natural) way of thinking, then generating an antonym should result in higher recall than generating a synonym. These two groups, since they are performing a semantic task, should have levels of recall roughly equal to the intentional group and superior to the non-semantic group.

Method

Study 1

Subjects. Forty-five undergraduate students at a small liberal arts college in the Midwest served as subjects for the study. There were approximately equal numbers of males and females in the sample. All subjects received course credit in introductory psychology or sociology courses for their participation.

Procedure. From the list of words used by Jenkins and Russell (1952, as well as by Hyde and Jenkins, 1969), selected from the Kent-Rosonoff norms, six oppositional first-associate pairs and six non-oppositional first-associate pairs were selected. It should be noted here that the oppositional pairs were composed of simple adjectives while the non-oppositional pairs were composed of simple nouns. This introduced, of course, a potential confound in that the "part of speech" of the words is confounded with oppositionality. Given that all the words are simple and rather common in the language, that we could find no research indicating a differential learning effect for adjectives vs. nouns, and that the words were selected and equated on the basis of their associative strength, we determined to use the list. One additional consideration would seem to make this potential confound inevitable. It is very difficult to conceive of a noun having an opposite at all, so no nouns can really be included in a list of oppositional pairs. On the other hand, for adjectives which have opposites, the opposite is nearly always the first associate. Consequently, adjective non-oppositional pairs will not be first associates. A study of the word-association norms given by Palermo and Jenkins (1964) reveals only a few (18) cases where a word has an opposite but the opposite is not the first associate. These words are not generally as common as those used in Study 1; they were employed, however, in Study 2. In short, there seems to be no good alternative but to allow the potential confound introduced by adjective vs. noun pairs in the learning list of Study 1, but there also seems to be no obvious alternative explanation of the data introduced by the confound.

These 24 words were then put in random order, to constitute the word list for the incidental learning task (see Table 1). In no case did the two members of a pair occur together in the list. The words were recorded by a male speaker at the

rate of one word every five seconds and presented to the subjects by means of tape recorders.

Table 1

Antonym and Non-antonym Word Pairs from the Learning List of Study 1

Antonym Pairs	*Non-antonym Pairs*
Black – White	Table – Chair
Slow – Fast	Mountain – Hill
Rough – Smooth	Eagle – Bird
Sour – Sweet	Lamp – Light
Hard – Soft	Butter – Bread
Long – Short	Bed – Sleep

Subjects were assigned to one of four groups (an intentional group and three incidental groups) in a nonsystematic manner. The task of the Intentional group (11 subjects) was to learn the word list; subjects were told they would be expected to recall the words after presentation. They were not allowed to write anything during the presentation of the words. Subjects in the Like-Dislike group (12 subjects) were instructed to listen to each word and decide whether they liked or disliked it, and to indicate their like or dislike on a bipolar (like-dislike) scale. This task required subjects to deal with the semantic content of the words; it is the task typically used in incidental learning studies. Subjects in the Concrete-Abstract group (11 subjects) were to listen to each word and decide whether the word brought to mind vivid images (e.g., "dog"), or whether the word did not (e.g., "democracy"), the first type of words being called concrete, and the latter being called abstract. (This definition of the concrete-abstract dimension differs somewhat from the usual one, but it was deemed appropriate to make the idea accessible to subjects.) Subjects were instructed to indicate on a bipolar scale (concrete-abstract) whether each word seemed to them to be concrete or abstract. This task required subjects to deal with the semantic content of the words, but did not entail affective judgments. We were interested in whether affective judgment might be different from semantic judgment, and be more closely tied to dialectical meaning. The task of the Letter Estimation group (11 subjects) was to listen to the words and estimate the number of letters in each one. Subjects were instructed not to count them, but to estimate, and indicate on a bipolar (4-5) scale whether their estimate was that the word had four or fewer letters (a choice of 4 on the scale) or five or more letters (a choice of 5 on the scale).

The four groups were assigned to different rooms, each with a different experimenter, and the data from all the groups were collected on the same occasion. Since each experimental group was assigned to a different experimenter, potential effects due to the particular experimenter are confounded with the

experimental treatments. To minimize such potential effects, experimenters were nonsystematically assigned, given a common set of instructions to read to subjects, and instructed to adhere as closely as possible to the written procedures. The actual tape used for presenting the stimulus words was identical for all groups. After the words were presented, all subjects were given a five-minute immediate free recall period. They were instructed to write down, on the back of their instructions or rating forms, in any order, all the words they could remember from the list they had heard.

Results. Although subjects were asked to recall single words, the dependent variable of interest was the number of complete antonym and non-antonym pairs recalled. In order to count as recall, both members of the pair must have been recalled; however, they need not have been recalled together (as a pair). The means and standard deviations of the four groups for each type of word pair and for total words recalled are given in Table 2.

Table 2

Means (M) and Standard Deviations (SD) for Recall Scores of Oppositional and Non-oppositional Pairs and for Total Words Recalled for Three Incidental Groups and the Intentional Learning Group from Study 1

	Learning Group							
	Like-Dislike		*Concrete-Abstract*		*Letter-Estimation*		*Intentional Learning*	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Oppositional Pairs Recalled	4.08	0.90	3.46	0.93	2.18	1.66	1.64	0.81
Non-oppositional Pairs Recalled	2.91	1.30	1.36	0.81	1.54	0.93	1.46	1.21
Total Words Recalled	16.75	2.90	12.33	2.46	11.08	3.48	10.83	2.33

The data were submitted to a 4 (learning group) × 2 (oppositional vs. non-oppositional association of the pair) analysis of variance. The group factor was a between-subjects factor, and the association of the pair was a within-subjects factor. The analysis yielded a significant main effect for group ($F(3,41) = 11.412$, $p < .001$). The Like-Dislike group was shown, by Bonferroni's procedure, ($\alpha = .05$, Hays, 1981) to have recall superior to all of the other groups, while the other three groups did not differ significantly from each other.

The analysis also revealed a significant main effect for the association of the word pair ($F(1,41) = 23.270$, $p < .001$). Oppositional pairs were recalled significantly better than non-oppositional pairs. In addition, there was a significant interaction effect ($F(3,41) = 3.436$, $p < .026$). Post hoc comparisons (Bonferroni, $\alpha = .05$) showed that the difference in the recall of oppositional vs. non-oppositional

pairs was significant for the Like-Dislike and the Concrete-Abstract groups but not for the other two.

An unexpected finding emerged from this study when total recall (rather than recall of pairs) was examined. The Intentional Learning group exhibited the poorest recall of any of the groups, including the non-semantic, Letter Estimation group. A one-way independent groups analysis of variance showed that there was a main effect for incidental task ($F(3,44) = 11.329$, $p < .05$). According to a Newman-Keuls analysis ($\alpha = .05$), the Like-Dislike groups recalled significantly more words than the other groups, and the other groups did not differ significantly from one another. The findings suggest that, for some reason that is not clear, subjects in the Intentional group were not using the semantic information available in the words as a strategy for learning.

This unexpected finding does not bear to a major degree upon the question of the present research, which is, specifically, the effects of oppositionality on recall. If a prediction were to be made on the basis of Logical Learning Theory, the Like-Dislike group would be expected to recall better than groups performing other incidental tasks because of the affective nature of the like-dislike task. However, it would not be contended that the Intentional group would display inferior recall. This clearly has not been the case in previous work on incidental verbal learning.

Since the predictions of Logical Learning Theory regarding the superior recall of oppositional word pairs were supported in this initial study, the study was cross-validated using another sample. This unexpectedly poor performance by the Intentional group was one of the issues which we hoped to clarify in our replication of the study.

Replication. The replication employed a sample of 51 undergraduates at a large private university in the intermountain region of the United States. Subjects were non-systematically assigned to the same groups as in the original study. There were 15 subjects in the Intentional group, 11 in the Like-Dislike group, 13 in the Concrete-Abstract group, and 12 in the Letter Estimation group. The words in the learning list were the same as in the first study, but the order was slightly different, in that two of the words were interchanged. All other procedures were, as nearly as possible, identical to those of the original study. The means and standard deviations of the groups are presented in Table 3.

In the analysis of variance, a significant main effect for association of the pairs (oppositional or non-oppositional) was obtained ($F(1,47) = 6.135$, $p < .017$). The antonym pairs were recalled better than the non-antonym pairs for all groups. In this replication, however, there were no significant main effects, for either group ($F(3,47) = 2.328$, $p < .087$), although the trend manifested in the original study—superior recall by the Like-Dislike group—was again obtained; nor was there a significant group × association interaction ($F(3,47) = 1.757$, $p < .168$). An analysis of variance on the total recall scores failed to show a significant main

Table 3

Means (M) and Standard Deviations (SD) for Recall Scores of Oppositional and Non-oppositional Pairs and for Total Words Recalled for Three Incidental Groups and the Intentional Learning Group from the Replication of Study 1

	Learning Group							
	Like-Dislike		*Concrete-Abstract*		*Letter-Estimation*		*Intentional Learning*	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Oppositional Pairs Recalled	3.64	1.50	2.46	1.13	3.00	1.41	2.47	1.46
Non-oppositional Pairs Recalled	2.91	0.94	2.31	1.44	1.58	1.08	2.40	1.30
Total Words Recalled	15.64	2.38	13.46	3.18	12.50	3.06	13.13	3.83

effect for group ($F(3,47) = 2.049$, $p < .120$). In this replication, the Intentional group did not have the lowest recall scores,and the non-semantic task (the Letter-Estimation group) produced higher recall than had been attained in the initial study.

The principal findings of interest in the original study, that oppositionality in meaning facilitates recall in an incidental task, were found to hold for an independent sample. We conclude that the first of our experimental hypotheses was supported.

It should be noted that the word pairs used in the study do not represent, strictly speaking, antonyms and synonyms. This is most readily seen in the non-antonym pairs. This category includes near synonymic relationships, but also category relationships such as "eagle-bird," and complements such as "table-chair." One explanation for the results of Study 1 might be that several semantic relationships were manifest in the non-antonym pairs while only one was present in the antonym pairs. It can be maintained, however, that on a linguistic basis the antonym pairs are not all really antonyms either, e.g., "sour-sweet," or that at least they are not strictly dichotomous antonyms ("long" is opposed to "short," but "short" may be the opposite of "tall"), or that the words are semantically ambiguous ("hard" might be opposed to "easy" rather than "soft"). Given that the words are randomly presented, so that they are not presented in pairs, we can see no way to decide whether either the antonymic associations or the synonymic associations should be considered more complex, and therefore, more difficult to learn. Subsequent research should be directed at this question. For purposes of the present study, however, it does seem justified to regard the non-antonym pairs as non-oppositional first associates, and the antonym pairs as oppositional first associates. Both groups are composed of *first associates*. Study 1 can legitimately investigate whether oppositional and non-oppositional associations have differing effects in incidental learning.

Discussion. The hypothesis concerning the salience of oppositional meaning in learning and memory was supported by the data of the first study and its replication. Oppositionally related pairs were recalled better than pairs which had no oppositional association. In the original study, this effect was stronger for the group which performed the affective semantic task. Although it is impossible to know from the results of a learning task alone (i.e., from looking at the words recalled) what cognitive processes were utilized by subjects in performing the task, the results of this study were consistent with the experimental hypothesis that subjects apprehended and made use of the bipolar meanings of the pairs as an aid to recall or learning even under conditions in which such meanings were not made salient due to the structure of the list and the incidental task. We claim support, therefore, for the conclusion that dialectical meaning facilitates recall of verbal material.

Study 2

Subjects. Forty-six undergraduate students from a small liberal arts college in the Midwest served as subjects. They received course credit in introductory psychology or sociology courses for their participation. There were approximately equal numbers of male and female subjects.

Procedure. A learning list was prepared consisting of fifteen words taken from the norms of Palermo and Jenkins (1964), such that each one had a common opposite in the language, but the opposite was not the first associate. This is unusual because for the great majority of words, when there is an opposite, it (the opposite) is the first associate. This constraint was imposed to control for the "strength" of the "associative bond" between words and their opposites. As noted above, the results of the first study, better recall of oppositional vs. non-oppositional pairs, might be predicted from a strictly associationist theory (since opposites tend to be strongly associated). If oppositionality is shown to facilitate learning when strength of association is controlled, the case for the importance of dialectical thought and meaning (as opposed to simple unipolar association) is strengthened. Only the "stimulus" words were included in the list; no antonyms nor synonyms (response words) were provided. The words were recorded in a male voice with a five-second pause between words. The list was presented to the subjects by means of tape recordings.

Subjects were nonsystematically assigned to one of four groups, an intentional learning group, or one of the three incidental learning groups. The subjects in the Intentional group ($n = 11$) were instructed to listen to the words and were informed that they would be asked to recall them. They were instructed not to write anything during the presentation of the list. Subjects in the Synonym Generation group ($n = 11$) were instructed to write down a synonym or a word which had nearly the same meaning as each word on the tape. Subjects in the Antonym Generation group ($n = 12$) were instructed to write an antonym or a

word which was nearly opposite in meaning to each word. It should be acknowledged here that most of the words which are considered to be opposites of the words in the learning list are not, by certain criteria, true antonyms. They should be more appropriately referred to as opposites. The intent of the research is not to clarify the meaning of, nor the different types of, antonymy; but rather to facilitate dialectial thought by involving subjects in a task of generating words with an opposite meaning and allowing the nature of the opposition to be idiosyncratic to each subject. The task of the Consonant Estimation group (n = 12) was to estimate the number of consonants in each word and write the number.

The four groups were assigned to different rooms, and a different experimenter conducted the experiment in each room. We should note here the same potential confound due to the use of multiple experimenters as outlined in the method section of Study 1. The same precautions were instituted. After presentation of the words, all subjects were given an immediate free recall task. They were instructed to turn their instruction sheet (and rating sheets) over and write on the back as many words from the tape as they could remember in any order. Five minutes were allowed for the recall task.

Results. The total recall scores were submitted to a one-way independent groups analysis of variance. There was a significant main effect for group ($F(3,42) = 3.032, p < .04$). A Newman-Keuls test ($\alpha = .05$) showed that the recall of the intentional group was significantly better than that of all the incidental groups, while the recall of the antonym generation group was significantly lower than the three other groups.

The initial hypothesis of the study was not confirmed. The results indicate that generating an "antonym," at least to words where the opposite is not the first associate, inhibits subsequent recall of the words. We became interested at this point in the nature of this inhibition of recall. A further examination of the data revealed that the antonym generation group made more false recall errors (38) than the synonym generation group (18). A directional t-test verified that the mean of the recall errors was different for the two groups ($t(20) = 1.921, p < .05$). For the most part, subjects in the synonym generation group recalled correctly or wrote nothing at all, while subjects in the antonym generation group had higher rates of false recognition.

The recall lists of the synonym and antonym generation groups were examined, and the recall errors were classified as being either non-semantic (an irrelevant word, or the wrong syntactic form of the correct word), or semantic (the word generated by the subject on the task, or some other synonym or antonym of the word from the learning list). The frequency of these two types of error for each group was obtained. A χ^2 test of independence ($\chi^2(1)=4.437, p<.05$) revealed that there was a relationship between task (synonym vs. antonym generation) and the type of recall errors made (semantic vs. non-semantic). The

Antonym Generation group had a higher ratio of semantic to non-semantic errors than did the Synonym Generation group.

The finding that there was a relationship between an oppositional or non-oppositional task and the sort of errors made in recall was consistent with Logical Learning Theory. We decided, on this basis to replicate the study to see whether the findings were reliable.

Replication. This study was replicated using a sample of 120 undergraduate students at a large private university in the intermountain region of the United States. The groups were constituted as in the original study, however, the experiment was not conducted simultaneously with all the groups, rather, a single experimenter administered the experiment to each group on different occasions. While this change in the procedures from Study 2 to the replication may have introduced new sources of error, it was part of the purpose of the replication to see whether the results would be generalizable over variations in the experimental setting. There were 27 subjects in the Intentional group, 32 in the Antonym Generation group, 30 in the Synonym Generation group, and 31 in the Consonant Estimation group. All procedures in the replication were as close as possible to those of the original study.

Analysis of the total recall scores revealed the same effects as in the original study. There was a significant main effect for task ($F(3,116) = 5.730$, $p < .001$). Individual comparisons, utilizing the Bonferroni procedure, ($\alpha = .05$) showed the recall of the Intentional group to be superior to that of the Antonym Generation group, and the Consonant Estimation group. No other individual comparisons produced significant results. The general trend found in the original study was present in the replication; however, the recall of the Antonym Generation group was better relative to the other groups in the replication than it had been in the original study.

Analysis of the recall errors of the Synonym and Antonym Generation groups in this study also replicated the findings of the original study. The Antonym group made significantly more false recall errors ($t(60)=2.595$, $p<.01$). A χ^2 test of independence ($\chi^2(1)=12.231$, $p<.001$) indicated a significant relationship between task (synonym vs. antonym generation) and type of error (semantic vs. non-semantic). Subjects in the Antonym Generation group made a higher proportion of semantic errors, while subjects in the Synonym Generation group made a higher proportion of non-semantic errors.

Discussion. The original hypothesis of this study was not supported. None of the Incidental groups exhibited recall equal to the Intentional Learning group. The hypothesized facilitation of recall by a dialectical incidental task was not found. However, an examination of the type and pattern of recall errors (see Parkin, 1983, for an example of the use of this strategy in incidental learning research) revealed that the proportion of semantic to non-semantic errors was different for the two groups. Subjects in the Antonym Generation group made more false recall errors overall, and more semantic errors than non-semantic

ones, while subjects in the Synonym Generation group made fewer false recall errors, and made more non-semantic errors than semantic ones.

The results of these studies support the contention that dialectical processes are influential in the learning and recall of verbal material. In spite of the fact that recall was not better overall for the Antonym Generation group, the study offers evidence that the meaning dimension underlying the word presented in the learning list and the word generated by the subjects was present and influential in recall, accounting for the production of semantic false recall errors. For example, in response to the word "swift" a subject in the antonym condition might generate the word "slow." The underlying oppositional meaning dimension, "swift-slow," was then influential in recall, as evidenced by the subjects' subsequent recall of, for example, the word "slow." Subjects seemed, however, not to be able to remember which end of the meaning dimension was given, and which generated, as evidenced by the higher number of meaningful (semantically related) recall errors for the Antonym group as compared to the Synonym group. A subject in the synonym condition, in response to "swift" might generate "fast." During recall, however, the underlying unipolar meaning dimension, "swift-fast" did not seem to be so influential. Subjects more often recalled correctly, made a morphological error, or recalled nothing. Since the recall of the Synonym group was not overall higher, it would seem that the Antonym group did as well in recall as the Synonym group, and in addition, had the meaning dimensions available for which they could not recall which word had been given and which had been generated.

Findings suggest that processing verbal material in a manner which creates an oppositional dimension enhances the meaning of the material, and the meaning is present and accessible during immediate recall although the particular pole of the meaning dimension which is relevant for the task may be forgotten. This explanation is consistent with the findings of Brewer and Stone (1975) that children acquire and use the polarity of meaning dimensions before they acquire the particular meaning labels of the dimensions, and with the work of Chaffin and Herrmann (1981) demonstrating that the semantic relationship between words, more than the meanings of the individual words, influences the processing of the semantic information in experimental verbal tasks (see also Chaffin, Russo, and Herrmann, 1981, and Herrmann, Chaffin, Conti, Peters, and Robbins, 1979). The meaning dimension present in an antonym pair appears to be more salient than the words themselves. This does not seem to be the case with unipolar word pairs.

Logical Learning Theory emphasizes the importance of "patterns" of relationship—the formal cause—in human learning and behavior. The oppositional meaning relationship between word pairs is construed to be such a pattern. It seems that this "logos" or pattern was what was available for recall by subjects in Study 2. This notion of learning contrasts with a strictly associationist view of learning in which the elements—in this case, words—are fundamental.

General Discussion

The studies reported here were devised as tests of hypotheses derived from Rychlak's (1977) Logical Learning Theory. In this theory, the notion that meaning is oppositional is taken seriously. Furthermore, human beings are seen as having the capacity to apprehend such dialectical meanings. This capacity for dialectical logic allows people to adopt dialectical strategies for learning and dealing with information; they can even create dialectical alternatives to given meanings.

The present studies employed the incidental learning paradigm to investigate the extent to which oppositional meaning is salient in learning and memory tasks, and the effects of dialectical thinking on behaviors associated with learning and recall. In the first study it was found that antonym pairs were recalled better than non-antonym pairs in an incidental learning situation. The effect was stronger for groups performing a semantic (rather than non-semantic) incidental task, and for groups performing an affective (rather than non-affective) semantic task, although in the replication of the study this finding was not statistically reliable. However, the main effect, superior recall of antonym pairs, was present in both studies. In an incidental learning task where recall is unexpected, subjects would not be expected to employ strategies for remembering the words presented. Subjects did, however, apparently make use of the oppositional meaning dimensions relating the words. The results of the first study are consistent with the conclusion that oppositional meaning is salient in verbal learning tasks, that people can make effective use of dialectical meaning in their learning, and that oppositional meaning facilitates recall.

One obvious alternative interpretation of the data deserves mention. It might be contended that antonym pairs were recalled better than non-antonym pairs because, as previous research has shown, antonymic associations are more common, and (it is implied) stronger than non-antonymic associations. Such an explanation would suggest that the study presented here is, therefore, trivial. This species of explanation, however, appears unsatisfactory in that it contributes little theoretical insight into the nature of human mentation which might account for the greater associative strength of oppositional words and meanings. Rather, it is assumed that oppositional words are more frequently associated than non-oppositional ones in the language. It would seem that an extensive study of the written and spoken language might be profitably carried out to discover whether this assumption is valid.

On a more superficial level, explanation of the finding of superior recall of oppositional over non-oppositional pairs is unsatisfactory because it invokes empirical findings (that antonymic associations are most frequent and most common in word association tasks) to explain other empirical findings (that antonym pairs are recalled better than non-antonym pairs in an incidental learning task). We contend that what is needed is a theoretical perspective

which can give an account of both findings. Logical Learning Theory, from which our research hypotheses were derived, offers such an account. The alternative explanation is a restatement of empirical findings resting on an extremely general presupposition of traditional associationist psychology. While it does not constitute a crucial experimental test which might allow us to prove the superiority of Logical Learning Theory as an explanation, the research presented in the first study adds to the credibility of the account.

The findings of the second study also lend support to the explanation offered by Logical Learning Theory of the first study. The second experiment modified the incidental learning paradigm slightly by employing two new incidental tasks—generating a synonym or an antonym for each word in the learning list. It was found that generating an antonym did not lead to better recall and, in fact, inhibited it.

Analysis of the errors of recall, however, showed that subjects who generated antonyms to the words in the learning list had the meaning dimensions, implied by the words presented, available during recall—to a greater extent than subjects who generated a synonym—but that they could not remember the particular word which had been on the list. Associationist theories emphasize the associations between particular words as the foundation of meaning. The data presented here suggest that bipolar meaning dimensions (patterns) are present and influential in recall even when the particular words are not. Logical Learning Theory offers a clear theoretical account of the findings.

The studies presented here do not by themselves, of course, demonstrate the importance of dialectical thought. In fact, antonymy is only one very narrow aspect of the larger notion of dialectics. It does provide, however, a useful operationalization of dialectical thinking. The studies reported here have utilized this operationalization, as well as the methods developed by traditional associationistic psychology to investigate hypotheses derived from non-associationistic theory, and have supported these hypotheses. These studies thus represent a first step toward empirical validation of theories of human mentation which emphasize dialectical processes. One of these theories, Logical Learning Theory, provided the experimental hypotheses investigated in the present studies.

While it was not the intent of the present studies to investigate the depth of processing model of memory, the data do suggest that the concept of depth might be related to oppositionality. Depth is most often defined in terms of semantic-level processing. If meanings in the language and in the world are truly dialectical, it is reasonable to assume that deep, semantic processing should involve dialectical meanings and dialectical thinking. This possibility merits further investigation.

The dialectic is an old and influential notion in the thought of the Western as well as the Eastern worlds. However, modern cognitive and behavioral theories of human learning have been based on a unipolar, demonstrative type of

meaning and logic (Rychlak, 1977). In a demonstrative model, human reason must proceed in a linear fashion through a process of association based on similarity and contiguity. The principle of contrast, although long important in theories of association, has been lost in modern associationist psychology (see Ogden, 1967). What little attention has been given to the idea of oppositionality in meaning and in learning has been within the context of demonstrative theories and has tended to treat such oppositionality as a manifestation of similarity or contiguity (Deese, 1965).

A model of human nature and capability based entirely on demonstrative meanings and logic has a distinctly mechanistic outlook on human action. Human reason, as well as action, is tightly bound to informational input, and historical precedent. Such a model cannot accommodate a meaningful conception of human free will. It is doubtful that a "will" would emerge under the conditions imposed by demonstrative models. Given that a will might exist, its capacity for choice is obviated if it cannot comprehend alternatives to its own perceptions in the perceptual acts themselves (see Warner and Williams, 1984, for a discussion of this problem).

If meanings in the world are dialectical, i.e., each meaning implies or contains its opposite, and if human beings have the capacity to apprehend such oppositionality, then thought and action are not wholly determined by informational input and past experience. Every perceptual act is by its very nature a perception of opposites and alternatives. It is in this point that Rychlak's (1977) Logical Learning Theory makes important contact with theories from the phenomenological, hermeneutical, and existentialist traditions. The notion of dialectical thought is closely related to the idea of perception as perception of alternatives and possibilities, or openness. A theory of human nature or human learning which takes into account dialectical meanings and dialectical thought offers an important alternative to mechanistic, demonstrative theories. In such a theory human free will is possible.

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