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MCKAUGHAN, PATRICIA LOUISE
INFLUENCES OF SEMANTIC ASSOCIATIONS IN A
CONCEPTUAL TASK: A DEVELOPMENTAL VIEW.

UNIVERSITY OF HAWAI'I, PH.D., 1979
INFLUENCES OF SEMANTIC ASSOCIATIONS
IN A CONCEPTUAL TASK:
A DEVELOPMENTAL VIEW

A DISSERTATION SUBMITTED TO THE GRADUATE DIVISION OF
THE UNIVERSITY OF HAWAII IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY
IN PSYCHOLOGY
MAY 1979

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This study concerns the influence of developmental aspects of word associations in the conceptual area of cognition. Review of relevant word association literature points to the need for using a refined classification system in dealing with these influences. After defining several types of syntactic and semantic associations, the contention is made that since words are most often associated on the basis of meaning relationships, a semantic classification system may be of significant value. Review of the literature also suggests that association preferences as demonstrated by free association responding may affect conceptual behavior in related tasks.

In order to determine the influence of the developmental aspects of word associations in the conceptual area of cognition, the use of functional and coordinate associations by third and sixth graders was investigated. The procedure included a paired associate memory task in an attempt to affect the children's association preferences. A no-list memory condition was also included to allow investigation of effects by the syntagmatic-paradigmatic shift. The influences of associations on conceptual behavior were tested in conceptual discrimination problems involving functional, coordinate and non-meaningful paradigmatic associates. Results indicated that word
association preferences were affected by the memory task; but the preferences did not affect performance on the conceptual task. However, significant differences in conceptual performance confirmed that the various semantic associations did have an effect. The functional association problem was easiest, while the coordinate and non-meaningful paradigmatic problems were progressively more difficult. The study thus substantiates the value of a semantic classification system of word associations used in conceptual tasks.
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I. INTRODUCTION

Word association has been extensively studied over the years as one relatively accessible aspect of cognition. The use of various procedures involving verbal associations has proven fruitful in recent studies investigating such components of cognition as: memory (e.g., McFarland & Kellas, 1975), meaning (e.g., Anglin, 1970; Steinberg & Anderson, 1975), and the use of cognitive strategies (e.g., Emerson & Gekoski, 1976; Tenney, 1975). As Nelson (1977) points out, the study of word association patterns may shed light upon more generalized cognitive functions.

The study of word associations may prove useful to the investigation of conceptual aspects of cognition as well. Memory tasks such as free recall (e.g., Halperin, 1974; Moynahan, 1973; Rossi & Rossi, 1965; Rossi & Wittrock, 1971; Vaughan, 1968) and false recognition (e.g., Bach & Underwood, 1970; Felzen & Anisfeld, 1970; Freund & Johnson, 1972; Hall & Crown, 1972; Hall & Halperin, 1972) have indicated a possible link between the use of word associations and conceptual behavior. Unfortunately, few studies involving conceptual tasks have focused on word associations.

Also, it is becoming clear that there are different types of word associations, and that these different types of associations may have a variety of effects upon cognitive task performance. The investigation of word
association effects in free association, memory, and paired associate learning tasks underscores the intricacies which may be involved in the exploration of concepts via word associations (see Lange, 1973; McKaughan, 1977; Nelson, 1977). As these intricacies are illuminated and woven into the designs of research in concepts and conceptual development, the study of this area of cognition should become more productive.
II. LITERATURE REVIEW

To further the progress of research in the conceptual area of cognition, an appreciation of word associations is needed which reflects the complexity involved (see McKaughan, 1977; Nelson, 1977). When complex relationships are implicated, a generalized view tends to mask effects rather than to clarify them. Thus, in exploring the relationships between word associations and conceptual activities, a refined system for classification of the associations may be useful.

A developmental view of the area may also prove productive. Many interesting cognitive phenomena have been demonstrated in developmental studies (e.g., Flavell, 1970; Lange, 1973; Rossi & Rossi, 1965); the word association phenomenon which perhaps has been the most widely discussed--the syntagmatic-paradigmatic shift--is, in fact, viewed as a developmental phenomenon. This writer suggests that further exploration using a refined view of word associations in a developmental design is of interest at this point in the investigation of the influences of word associations in conceptual activities.

A Classification System

The author has previously proposed an extensive system of classification for word associations (McKaughan, 1977). The system contains three broad schemes of
classification: the phonological, the syntactic, and the semantic association schemes. Briefly, phonological associations are those made on the basis of some sound similarity; syntactic associations generally are those which are at least roughly grammatical; and semantic associations are those which are based on meaning relationships. Each of these general schemes consists of several different types of associations of a more refined order. For the purposes of this discussion, the syntactic and semantic schemes are the most immediately relevant.

Syntactic associations are defined in terms of an emphasis upon the form class (i.e., grammatical part of speech) of the associates. Syntagmatic associations are those in which the emphasis is on variant form class, sequentiality, and/or strict grammatical structure depending on the purposes of the investigation. Paradigmatic associations are those in which the emphasis is on an identity of form class. In both cases the defining characteristics are stated in terms of the structure of the association. Thus syntagmatic and paradigmatic associations may be viewed as two different types of syntactic associations.

The syntactic associations have been studied most in connection with developmental free association studies—which will be viewed at length later in this discussion. Other tasks have also occasionally been employed to
investigate the effects of syntactic associations in cognitive activities. In paired associate learning tasks it has been found that adding a syntactic context, and thereby increasing syntactic associations included in the task, facilitates performance (e.g., Davidson & Adams, 1970; Erhi & Rohwer, 1969; Hughes & Walsh, 1971; Milgrim, 1967). Syntactic associations have also been shown to be influential in word learning (e.g., Prentice, 1966) and in sentence recall (e.g., Rosenberg, 1968). Syntactic associations may thus also be influential in the cognitive activities involved in conceptual behavior.

The semantic association scheme is divided into six types of semantic associations which are then further refined and subdivided into even more specific types of word relationships. The six types of semantic associations are the functional, the perceptual, the dimensional, the conceptual, the definitional, and the subjective associations.

Functional associates are words which are related on the basis of function; they may therefore be objects related to each other through their use, objects and actions which may be performed on (or with) them, objects and agents, or actions and results. Examples of functional associates include CHAIR-SIT and CLAP-HANDS.

Perceptual associations are those which involve predication of an attribute. Sensory predicates are
relatively concrete perceptual associations and denote an object and some sensory aspect of it (e.g., BANANA-YELLOW, ROUND-BALL). Abstract predicates involve associations between an entity and a nonsensory aspect (e.g., BOLD-EAGLE, CHILD-SWEET).

Dimensional associations include words which are members of some category or class. Thus, in a category or class hierarchy, dimensional associations are related on a horizontal basis (i.e., the associates are at the same category level within the hierarchy). Contrasts are dimensional associations in which the words negate or are opposites of each other (e.g., DARK-LIGHT, ABOVE-BELOW). Coordinates are noncontrastive dimensional associations (e.g., BLUE-YELLOW, APPLE-PEACH). Some coordinates may be further classified as complements. These words appear together with high frequency and seem to "especially belong" or have a complementary relationship (e.g., SALT-PEPPER, BOY-GIRL).

Conceptual associations are those in which the words are, as implied by the term, related conceptually. Synonyms are conceptual associations in which the words are related horizontally as are dimensional associates. However, instead of being related because they are different members of the same class, synonyms are words which are related because they refer to the same concept (e.g., SMALL-LITTLE, GIRL-FEMALE). Superordinates and
subordinates are conceptual associations which are related vertically in a hierarchy. Superordinates are higher order and more inclusive general categories or concepts relative to their associates. Subordinates are lower order and more restricted specific categories or concepts relative to their associates. Superordinate and subordinate associations may involve the same word pairs. But whether the vertical association is classified as superordinate or subordinate depends merely upon the order in which the associates occur, i.e., which is the stimulus and which is the response (e.g., CARROT-VEGETABLE, SMALL-SIZE vs. VEGETABLE-CARROT, SIZE-SMALL).

Definitional and subjective semantic associations have rarely been studied in a manner leading to refinement of these categories of associations. The labels are relatively self-explanatory—definitional associates are those words which are related to a particular stimulus word because they define the stimulus; subjective associations are those made on the basis of affective meaning systems.

To date, there has been relatively little investigation of word associations at the level of this classification system (cf. Clark, 1972; Lippman, 1971; Moran & Swartz, 1970; Palermo & Jenkins, 1965). Of those studies which have been done at this level of semantic associations, the subtypes used most often are functional, contrast and
coordinate (dimensional), and superordinate (conceptual). Perceptual association types occasionally have been used in designs which include children.

It is noteworthy that although only the synonyms and superordinates bear the label "conceptual associations," all of the semantic associations are inherently conceptual. "Concept," as it is used most often in the literature, refers to cognitive organization of information about objects or events. All of the semantic types of associations fit this description.

This is not to say, however, that all word associations are considered to be conceptual in nature (e.g., words associated on the basis of sound alone are "perceptually organized" rather than "conceptually organized"). Nor is it to say that semantics and concepts or conceptualization are equivalent. (See Nelson, 1974b for a discussion of the relationship between semantic knowledge and conceptual knowledge.) When words are associated on the basis of some aspect of their meaning--whether the aspect is function, attribute, class-membership, or subjective value--information is being cognitively organized, and thus the association may be described as conceptual.

Although interest in semantic associations has only begun to produce studies of the specific types, experimental results concerning general aspects and
effects of semantic associations have been pervasive in the word association literature. Free association responding, for example, may virtually be assumed to result from semantic associations. As is noted by Moran & Swartz (1970), when individuals are instructed to "give the first word that comes to mind," they will spontaneously impose an added constraint that the association must be meaningful. It is therefore possible that there are some semantic aspects to syntactic styles of associative responding.

Several of the semantic association types result in associates of consistent syntactic type. The contrasts, coordinates, synonyms, and superordinates are paradigmatic (i.e., the associates are of the same form class). The perceptual—both sensory and abstract—and many of the functional associates are syntagmatic. It is proposed that the semantic nature rather than the syntactic nature of associations is likely to influence cognitive activity. In other words this writer contends that it is the meaning relationship rather than the structural relationship which makes an association type influential. Thus it is suggested here that in studying the influences of word associations in conceptual activities the semantic association scheme may prove highly valuable.
A Developmental View

Developmental trends have been demonstrated in many areas of cognition, and such trends are apparent in both the cognitive areas of word association preferences and conceptual problem solving. An interaction between word associations and conceptual behavior may thus be most evident when developmental phenomena in these areas are taken into consideration.

Association Preferences

One area of emphasis in the study of word associations has been that of association preferences. Much of the work with free association designs has been aimed at the determination of what styles of word associations are preferred by various groups of people. In fact, since by definition of the task subjects in free association designs have freedom to respond in the style they wish, any apparent pattern or style of responding may be called an association preference.

Generally, free association studies have shown an age-related change in children's style of syntactic association responses (e.g., Brown & Berko, 1960; Entwisle, 1966a, 1966b; Entwisle, Forsyth, & Muuss, 1964; Ervin, 1961; Lippman, 1971; Masters, 1969; Sharp & Cole, 1972). This change has been called the syntagmatic-paradigmatic shift. Briefly, the shift may be described as young children's tendency to respond with a word which frequently
follows the stimulus word (e.g., GO-HOME, RED-BALL) and older children's tendency to respond with a word that may substitute for and is thus in the same form class as the stimulus word (e.g., GO-WENT, RED-BLUE).

The parameters of the syntagmatic-paradigmatic shift vary somewhat depending on stimulus words used (e.g., Deese, 1962; Entwisle, 1966a; Lippman, 1971; Stolz & Tiffany, 1972) and some general demographic variables (e.g., Entwisle et al., 1964; Palermo & Jenkins, 1965). However, the general phenomenon seems to be fairly reliable.

Moran and Swartz (1970) found that following the syntagmatic-paradigmatic shift, an individual's style of syntactic association is relatively stable over a period of several years. This indicates that the timing of the shift may change; but once the shift has occurred, there is stability of individual response styles.

A few studies have also demonstrated that people show associative preferences for subtypes within the semantic scheme (e.g., Moran, 1966; Moran & Swartz, 1970). When stimulus words allow for several different types of associations (e.g., contrasts, coordinates, synonyms, superordinates), a preference or set is indicated by a predominance of responding with a particular type of semantic association (e.g., contrasts).

In view of the syntagmatic-paradigmatic shift in
free syntactic associations it is not surprising to find that there are substantial and regular increases with age of contrasts, coordinates, synonyms and superordinates in free semantic associations (e.g., Palermo, 1971; Sullivan & Moran, 1967; Swartz & Moran, 1968). Long-term increases in paradigmatic responding may also be accounted for semantically, at least in part, by increases in contrast responses (Palermo & Jenkins, 1965). And the stability of individual styles of syntactic responding over a period of several years has been related to stability in the predominance of specific types of semantic associations, e.g., contrasts vs. functionals (Moran & Swartz, 1970). Thus syntactic styles of word associations may correspond developmentally to semantic styles.

It is noteworthy that recent reinvestigation of the syntagmatic-paradigmatic shift has indicated that researchers may be dealing with a semantic-conceptual phenomenon rather than a purely syntactic one (Emerson & Gekoski, 1976; Nelson, 1977). A young child responding in a free association task may display a syntagmatic preference due to a preference for functional relationships on a semantic-conceptual level. It may be found that for this child, the paradigmatic responses that are given are also functionally related. Thus the response preference on a syntactic level may be, at least in part, an artifact of
a particular preference on a semantic level—which may in turn be related to a particular style preference at a conceptual level.

**Concepts**

Developmental changes have been demonstrated in the area of conceptual behavior as well as in the area of association preferences. Several of these changes may be similar to developmental changes in association preferences. Thus a developmental view of conceptual performance as well as of association preferences may be productive.

Conceptual development has been shown to affect the content of concepts used by children. Both expansion and restriction of concepts content have been shown to be related to age (e.g., Nelson, 1974a). Young children (about 5 years old) appear to have wide unbounded general concepts. As the boundaries for such concepts approach stability, they become more restricted. The expansion of children's concept content has been observed to increase as their knowledge of subclass membership within the concept increases.

Studies of semantic aspects of language development (e.g., Anglin, 1970) also demonstrate that concept content may change with age. As new words are learned, underlying concepts related to these words may be refined or extended. It is important to acknowledge this fact in designing stimuli—especially verbal stimuli—for conceptual tasks.
Developmental differences have also been demonstrated in the efficiency with which cognitive strategies are used. The increase with age in the efficiency of memory strategies, for example, is well established (e.g., Flavell, 1970; McFarland & Kellas, 1975; Rossi & Rossi, 1965). Older children perform better on memory tasks than do younger children, and the same is true of conceptual task performance (e.g., Bourne & O'Banion, 1971). It thus seems reasonable that in a developmental study of semantic association effects in a conceptual task, young children will perform with less overall efficiency than older children.

Flexibility of approach to a conceptual task may also increase with age. Young children may have a greater tendency to hold to a preferred strategy even if it is inappropriate; while older children and adults may start with a preferred strategy but change it easily if it proves ineffective. Studies of such strategy preferences (e.g., Ingison & Levin, 1975; Rollins & Castle, 1973; Tighe, Tighe & Schechter, 1975) indicate that young children are influenced enough by preferences to produce measurable performance effects.

Most interesting in light of developmental shifts in association preferences have been suggestions that conceptual development affects the types of concepts used in cognitive strategies as well as the content of the
concepts. Studies of the bases used for categorizing objects have indicated a developmental shift from a perceptual to a functional and, finally, to a relational concept preference (Bruner, Olver, & Greenfield, 1966; Kagan, Moss, & Sigel, 1963). The relational concepts referred to by these investigators are very similar to the coordinate and especially the superordinate classifications within word association relationships.

Denney (1975; Denney & Moulton, 1976) has also demonstrated that response patterns in a conceptual picture pairing test indicate a distinct developmental sequence in which perceptible, functional, and then nominal concepts each increased in turn. The "nominal" concepts were described as objects possessing a common superordinate (e.g., a dog and a cow are both animals). Thus, the nominal concept label used by Denney is highly similar to a coordinate association relationship.

In reference to the syntagmatic-paradigmatic shift, it is interesting that Denney and Moulton found a significant increase in the use of nominal concepts between the ages of 5 and 9 years. The syntagmatic-paradigmatic shift is usually said to occur between the ages of 6 and 10 years. It is also noteworthy, however, that even the 9 year olds in this study used more functional than nominal pairings.

Although there does seem to be a developmental shift
from a perceptual to a functional to a relational (coordinate, superordinate) concept preference, it has also been found that under certain conditions superordinate concepts can be used effectively by children as young as 5 years of age (Harris, 1975; Steinberg & Anderson, 1975). Coordinate concepts, however, are not used at this age with the same efficiency as are superordinates (Steinberg & Anderson, 1975).

Associations and Concepts

Considering the conceptual nature of semantic associations and the stability of association preferences over time, it is possible that preferences for semantic associations are indicative of preferences for particular types of conceptual schemes.

The next question to be posed, therefore, concerns the extent to which such preferences or sets for semantic association types are influential in conceptual tasks. It is possible that solution strategies used in verbal conceptual problems are influenced by association sets.

Different types of sets or preferences have already been demonstrated to affect children's performance in several areas of cognition. Investigation of dimensional preferences in preschool children indicate that such preferences influence performance on non-verbal concept identification tasks (Rollins & Castle, 1973). It has also been found that discrimination learning is affected
by preferences for attending to perceptible (shape) or conceptual (class membership) attributes of the stimuli (Ingison & Levin, 1975). Memory studies (e.g., Bach & Underwood, 1970) have also demonstrated effects of sets for different general schemes of word associations (phonological and semantic). These findings suggest that semantic association preferences may affect conceptual task performance.

It is also possible that conceptual strategies either are so complex in structure or are processed at a cognitive level so much higher than is tapped by free association, that any influence of free association preferences is negligible.

In contrasting association and concept Lange (1973) noted an aspect of studying conceptual development via word associations which must be acknowledged in interpreting experimental results. He pointed out that, although children under 8 years of age perform poorly in tasks involving symbolic-conceptual skills, children as young as 3 years consistently display above-chance clustering in free recall tasks. Such clustering, or recall by category, has generally been attributed to the use of concepts in memory strategies (e.g., Rossi & Rossi, 1965). Lange's study demonstrates that this clustering by young children may be due to the use of highly practiced word pairings rather than the use of high-level conceptual
strategies. The point is well taken: Word associations are not necessarily isomorphic with concepts or conceptual organization.

Nelson (1974b, 1977), however, contends that since words and word associations are based on concepts and conceptual organization, word associations are probably indicative of underlying concepts. The relationship between word associations and conceptual bases may be complex; but word associations which are carefully evaluated according to their conceptual relationships should prove useful in the study of concepts.

It is highly probable that any effect of a semantic association set depends at least partially upon whether or not the set is appropriate to the task. For example, if the concept task contains only words which have no opposites (e.g., colors) a free association response set for contrasts will hardly be appropriate. In such a case any influence of the free association preference would be negligible in the conceptual strategies used for the task. If, however, the task includes words which have both contrast and coordinate associates, a set for one or the other type of association may affect the conceptual strategy used.

To study the influence of association sets in conceptual tasks it may be experimentally appropriate to induce an associative set suitable to the task. This
can be done by using a pretraining task which orients the subject toward a particular type of semantic association. The use of orienting and pretraining tasks has been shown to affect cognitive performance. Hyde and Jenkins (1973) found that semantic orienting tasks modify memory performance of college students. Rollins and Castle (1973) demonstrated that pretraining may effectively influence dimensional preferences of preschool students. Their pretraining procedure was so effective, in fact, that it reversed the subjects' preference hierarchy. After pretraining, the originally nonpreferred dimension became the preferred dimension. The writer contends that it thus may be possible to study the effects of semantic association sets by using pretraining to control the appropriateness of the set for the conceptual task.

It is also relevant to such a study to use a verbal conceptual task sensitive to the "naturally occurring" syntagmatic-paradigmatic shift since this shift may reflect conceptual and semantic development as well as syntactic development. The developmental shift in semantic-conceptual preferences may be demonstrated in conceptual task performance which varies by age with association type if the conceptual task is relevant to the associations and vice versa.

It is possible, however, that the particular demands of the conceptual task confronting the child may have a
greater effect than any prior set (see Tenney, 1975)—whether it is a naturally occurring preference or a pretrained orientation. If this is indeed the case, then performance will not be expected to vary developmentally with either the type of association involved in the task or the type of set induced by pretraining.
III. THE STUDY

A direct outgrowth of the current discussion is an experiment designed to investigate developmental aspects of the effects of semantic word associations in a conceptual task. Since the list of semantic association types is relatively long, it would be efficacious to narrow the focus to one or two types of semantic associations which are of specific interest. Functional and coordinate associates were selected as likely candidates due to (a) their particular relevance to research performed in the area of conceptual development (e.g., Denney & Moulton, 1976; Kagan, Moss, & Sigel, 1963), and (b) the possibility of using varying syntactic association structures. Coordinate associates are inherently restricted to paradigmatic structures and the functional associates used were restricted to syntagmatic structures. The syntactic arrangement of the associates allowed a linking of the task to the syntagmatic-paradigmatic shift. Effort was made in designing the stimuli to insure that both functional and coordinate associates were available for each of the words selected so that the effects of a set for one or the other type of association would be possible.

In an attempt to control the appropriateness of associative set for the conceptual task several pretraining conditions were included in the design. A paired associate
memory task served as a pretraining task, and various memory lists were used in this task to establish an orientation in the subjects for a particular type of word association. The various lists used were comprised of (a) only functional associates, (b) only coordinate associates, and (c) a mixture of half functional associates and half coordinate associates. A no-list condition was also included to gauge effects of any naturally occurring association preferences related to the syntagmatic-paradigmatic shift.

Effects of the word associations were measured by performance on three conceptual discrimination problems: one in which functional associations were appropriate, one in which coordinate associations were appropriate, and one in which associations which were paradigmatic in structure (comparable on the syntactic level to coordinates) but which were not meaningfully related were appropriate. This last conceptual problem allowed comparison of the influence of the semantic nature of associations with that of the syntactic nature of associations. It was expected that the meaningful paradigmatic relationship (coordinate) would lead to more efficient solution than the non-meaningful paradigmatic relationship thus indicating the importance of the semantic aspect of associations. To insure a test for the effect of the association type rather than memory for specific word pairs, a list of
words which differed from those used in the pretraining task was used for the conceptual task.

To study developmental effects, children in grades three and six were included. The syntagmatic-paradigmatic shift is usually apparent between these two grade levels; yet the third grade children were old enough not to display any difficulties with basic understanding of the stimuli or the tasks. It was expected that the sixth graders would perform better overall than the third graders. It was also expected that the effects of association preferences would be evidenced in (a) variation of conceptual task performance by pretraining list condition for children who received the various memory lists, and (b) variation of conceptual task performance by grade in the no-list conditions due to effects of developmental changes in association preferences.

Method

Design

The study included the between-subject factors of Grade (third, sixth) and Paired Associate List Type (functional, coordinate, mixed, no-list). Each child in the eight groups defined by grade and list type received three Conceptual Problems (functional solution, coordinate solution, non-meaningful paradigmatic solution). Presentation of the three problems was counterbalanced across
subjects to control for order effects.

Subjects

All of the children who participated attended Maryknoll Grade School in Honolulu where the study was conducted. Seventy-two children from each of grades 3 and 6 were randomly assigned to four groups resulting in 18 children in each group. Thus a total of 144 subjects were tested.

Stimuli

The words used in the study materials were selected with reference to free association norms for children compiled by Palermo and Jenkins (1964) and Entwisle (1966b). However, due to the specialized requirements of the present study, it was necessary to supplement the words adopted from these norms. Several constraints were involved in the selection of stimulus words: The words had to be familiar—both in speech and in print—to the youngest subject group; and each of the words had to have both functional and coordinate associates which were also familiar to the youngest subject group.

Memory task stimuli. The stimuli for the paired associate memory task consisted of a basic set of eight relatively unrelated words and two sets of associates. One set of associates was functionally related and the other set was coordinately related to the basic set (see Table 1). Three paired associate memory lists were
Table 1
Paired Associate Memory Task Stimuli

<table>
<thead>
<tr>
<th>Basic Stimulus Words</th>
<th>Functional Associates Set</th>
<th>Coordinate Associates Set</th>
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<td>chair</td>
<td>sit</td>
<td>table</td>
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<tr>
<td>bake</td>
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<td>ocean</td>
<td>swim</td>
<td>sea</td>
</tr>
<tr>
<td>dog</td>
<td>bark</td>
<td>cat</td>
</tr>
<tr>
<td>pencil</td>
<td>draw</td>
<td>pen</td>
</tr>
<tr>
<td>dirt</td>
<td>dig</td>
<td>mud</td>
</tr>
<tr>
<td>toys</td>
<td>play</td>
<td>games</td>
</tr>
</tbody>
</table>

Table 2
Conceptual Task Stimuli

<table>
<thead>
<tr>
<th>EAT</th>
<th>--</th>
<th>DRINK</th>
<th>SEE</th>
<th>--</th>
<th>HEAR</th>
<th>CLAP</th>
<th>--</th>
<th>KICK</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>PLATES</td>
<td>--</td>
<td>CUPS</td>
<td>LIGHTS</td>
<td>--</td>
<td>SOUNDS</td>
<td>HANDS</td>
<td>--</td>
<td>FEET</td>
</tr>
</tbody>
</table>

^Words connected horizontally are coordinate associates; words connected vertically are functional associates.
constructed using these sets: a functional list consisting of the basic stimulus set and its functional associate set, a coordinate list consisting of the basic stimulus set and its coordinate associate set, and a mixed list consisting of the basic stimulus set and associates half of which were from the functional set and half of which were from the coordinate set (the functional and coordinate associations were randomly distributed within this third list).

The order of the words in the basic stimulus set was the same for all three lists to minimize variance due to intralist word order. The words START and END were placed at the beginning and end of each list as cues for the subjects.

Conceputal task stimuli. The stimuli in the conceptual task included a total of 12 words which were chosen so that there were six coordinately related pairs each of which was functionally related to one other pair (see Table 2). Thus each word involved in the task had one functional and one coordinate associate among the remaining words in the task. Each of the words was also paired with two non-meaningfully associated words: one word was of the same form class (paradigmatic associate), and one word was of different form class (syntagmatic associate). Thus only six each of the possible non-meaningful syntagmatic and paradigmatic pairs were used
(see Table 3). Pair reversals were also used (e.g., EAT-DRINK and DRINK-EAT) yielding a total of 12 pairs for each of the four different types of associations.

Table 3
Non-Meaningful Pairs
Used in the Conceptual Task

<table>
<thead>
<tr>
<th>Syntagmatic Associates</th>
<th>Paradigmatic Associates</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAT</td>
<td>LIGHTS</td>
</tr>
<tr>
<td>SOUNDS</td>
<td>DRINK</td>
</tr>
<tr>
<td>HANDS</td>
<td>SEE</td>
</tr>
<tr>
<td>HEAR</td>
<td>FEET</td>
</tr>
<tr>
<td>CLAP</td>
<td>CUPS</td>
</tr>
<tr>
<td>PLATES</td>
<td>KICK</td>
</tr>
</tbody>
</table>

Only nouns and verbs were included in this study; thus the functional and syntagmatic associates were noun-verb or verb-noun arrangements, and the coordinate and paradigmatic associates were noun-noun or verb-verb arrangements. Functional and coordinate associates were meaningful arrangements, and, for the purposes of this study, syntagmatic and paradigmatic associates were non-meaningful arrangements.

Each of the conceptual problems consisted of two decks
of 36 trial cards. A trial card was constructed by taping a 3-inch x 5-inch unlined blue card along one edge to a 4-inch x 6-inch beige card. The blue card had a word pair typed on it; the beige card had the word YES or NO (whichever was appropriate to the word pair for that problem) typed on it so that it could be read when the blue card was raised. Colored cards (especially the blue ones) were chosen for their opacity so that no discrimination could be made by looking for the YES or NO through the card. All the cards were sprayed with a sealer so that differential handling of the cards would not be evident to later-run subjects.

For each of the three conceptual problems only one association type was correct (functional, coordinate, or paradigmatic). Any trial card carrying a word pair of the correct association type was a YES card; any other trial card was a NO card. When the stimulus decks were arranged side by side, the first word of each of the two pairs for the trial was the same while its associate varied (e.g., SEE-LIGHTS; SEE-HANDS). One association per trial was correct with a randomized left-right position distribution.

Each problem was constructed so that the 12 words appeared with equal frequency within the problem. Also, word pairs were used so that each of the three non-correct association types were represented with equal frequency.
The non-correct association types were also distributed randomly throughout the problem with the restriction that within each of three 12-trial blocks each association type appeared four times.

Procedure

The procedure involved two different tasks administered by different experimenters. The first task was a traditional paired associate memory task using a standard memory drum apparatus. Those subjects not assigned to the no-list condition received one of three paired associate lists (functional, coordinate, or mixed). Since this task was used to attempt to "set" the subjects for a particular association type, the criterion was two consecutive correct trials (i.e., runs through the list). See Appendix A for the instructions to the paired associate memory task. Also, to limit the time spent on this task and possible frustration any particular child might have been exposed to, an upper limit of 14 trials was set. After the 14th trial, the memory drum was stopped and the procedure continued as though criterion had been reached. Only eight of the 144 children did not attain criterion within 14 trials.

To determine if the memory procedure did indeed have some effect on the child's "association preference," each one was asked to give free associations to three stimulus words which were selected on the basis of the
criteria used to select all the words used in the study. The instructions used to ask for these associations were as follows:

    Now I'd like you to tell me some words, ok? I'll give you a word and you tell me the first word that comes into your head. Ready? What's the first word that comes into your head when I say BUS? And what is it when I say READ? And KNIFE?

The children assigned to the no-list condition were asked for these free associations directly after they had been asked (as all the children were) their name and age.

    Since the second task generally took more time than the first, there was often a brief waiting period (5 - 10 minutes) between the memory task and the conceptual task. To make sure the children did not engage in any verbal task likely to cause interference with the association set induced by the memory task (e.g., reading--the procedure was conducted in the school library), they were given a motor task to perform which consisted of making designs with a spirograph game. The children assigned to the no-list condition performed this motor task for a minimum of 10 minutes (the time typically spent on the memory task) plus any additional waiting time.

    The second task consisted of three conceptual
problems. Each problem was given to the child in a discrimination task fashion. Two decks of 36 cards each were arranged side by side in front of the child. The top card of each deck was read to the child, and the experimenter demonstrated how by lifting the blue card, the child would find a YES or NO on the attached beige card. The child was told that for each two cards (the current top card on each deck), one would have a YES and one a NO underneath it depending on the kind of word pair appearing on the card. The "object of the game" was to find the word pairs with YES under them; the child indicated a discrimination choice by raising the card he/she thought was correct. See Appendix B for instructions to the conceptual task. Feedback thus followed directly upon the choice. After a choice was made, the top card on each deck was turned over to expose the following card and thus the next discrimination trial.

The criterion for problem solution was 12 consecutive correct choices. When criterion was reached or 36 trials had been completed, the child was stopped and asked if he/she could tell the experimenter the reason for the choices made. The next problem was then introduced.

Results

An analysis of variance was performed on the number of errors made in the conceptual task. This analysis
indicated that, as expected, the third graders made significantly more errors overall (M = 11.12) than did the sixth graders (M = 7.80), F(2, 136) = 29.05, p < .001. The main effect of Conceptual Problem also proved to be highly significant, F(2, 272) = 110.38, p < .001. Newman-Keuls tests showed that the functional problem (M = 5.43) was significantly easier than both the coordinate problem (M = 9.01), q(2, 272) = 8.79, p < .01, and the paradigmatic problem (M = 13.94), q(3, 272), p < .01. The coordinate problem also proved to be significantly easier than the paradigmatic problem, q(2, 272) = 12.13, p < .01. Thus performance on each problem was significantly different from performance on the other two problems.

No other factors or interactions in the conceptual task analysis attained significance. Thus the paired associate list condition did not produce any statistically significant effect upon performance on the conceptual problems. Also, the lack of a grade by problems interaction indicates that although the sixth graders made fewer errors than the third graders, the pattern of problem difficulty was essentially the same for the two grade levels (see Figure 1).

An analysis of variance was also performed on the errors made in the paired associate memory task. A factorial design which included the factors of Grade
Figure 1. Mean number of errors in each conceptual problem type and each grade level
(third, sixth) and Paired Associate List (functional, coordinate, mixed) was used in this analysis. Results indicated that the third graders made significantly more errors ($M = 13.42$) than did the sixth graders ($M = 2.85$) on the memory task as well as on the conceptual task, $F(1, 102) = 36.81$, $p < .001$. Differences in performance on the three list types did not reach significance.

To determine if the attempt to affect the children's association preferences with the different memory lists was effective, the three free association responses given at the end of the memory task procedure were analyzed. The responses were classified as having a functional, a coordinate or some other relationship to the stimulus word. For purposes of summarizing the data, the children who gave at least two responses which could be clearly classified as functionally related to the stimulus were said to have responded in a functional manner; the children who gave at least two responses which could be clearly classified as coordinately related to the stimulus were said to have responded in a coordinate manner; and children who did not give at least two functionally or two coordinately related responses were said to have responded in some other manner.

As seen in Figures 2 and 3, the memory lists did indeed influence the children's manner of responding to the free association stimuli. A predominant number of
Figure 2. Number of third grade children in each memory list type group who responded to free association stimuli in a functional, coordinate, or other manner (■ = functional manner, □ = coordinate manner, ★ = other manner).
Figure 3. Number of sixth grade children in each memory list type group who responded to free association stimuli in a functional, coordinate, or other manner (\(\square\) = functional manner, \(\square\) = coordinate manner, \(\square\) = other manner).

Grade 6
children in the functional list group responded in a functional manner to the free association stimuli; and a predominant number of children in the coordinate list group responded in a coordinate manner to the free association stimuli at both the third grade (\( \chi^2 = 12.70, df = 1, p < .01 \)) and the sixth grade (\( \chi^2 = 8.57, df = 1, p < .01 \)) levels.

Due to the importance for the study of the syntagmatic-paradigmatic shift, the free-association responses made by the children in the no-list conditions were also classified on the syntactic level as having a syntagmatic or a paradigmatic relationship to the stimulus word. Again, children who responded with at least two of the same syntactic type of associates were said to have responded in that particular manner. Figure 4 demonstrates that the shift was indeed apparent in the free association responses of these children. A majority of the third graders responded in a syntagmatic manner while a predominant number of sixth graders responded in a paradigmatic manner (\( \chi^2 = 5.60, df = 1, p < .05 \)).

It is also interesting to note the grade level differences on the semantic level for the no-list memory conditions. The relative number of children responding in a coordinate manner increased with grade level while the relative number of children responding in a functional manner decreased (\( \chi^2 = 4.57, df = 1, p < .05 \)). The shift
Figure 4. Number of children in the no-list conditions of each grade level who responded to free association stimuli in a syntagmatic or a paradigmatic manner ([ ] = syntagmatic manner, □ = paradigmatic manner).
toward paradigmatic responding on the syntactic level was thus apparently accompanied by a shift toward coordinate responding on the semantic level.

Overall the results of the study indicate that although the memory lists did not vary significantly in difficulty, they did influence the children's free association responding or "association preferences." However, these association preferences did not significantly influence the difficulty of the conceptual problems. Instead children in all list conditions made fewer errors on the functional problem and increasingly more errors on the coordinate and paradigmatic problems.

Discussion

The results of this study indicate that word association preferences, at least in terms of free association responding, are not highly influential in conceptual problems such as those used here. Neither the free association preferences which were induced (as in the functional and coordinate list groups) nor those which were "natural" (as in the no-list groups) affected performance on the conceptual problems, even though the preferences were relevant to the solution of the problems.

It was expected that the influence of word associa-
tions on the solutions of the conceptual problems might be evident at various levels of the analysis. The syntagmatic-paradigmatic shift, which is a relatively reliable phenomenon in the developmental literature, was expected to be apparent in a variation of conceptual task performance by grade level. That is, it was anticipated that sixth graders would perform better on the coordinate problem than on the functional problem and that the third graders would reverse this pattern (the coordinate problem was paradigmatic and the functional problem was syntagmatic when classified syntactically). The syntagmatic-paradigmatic shift was also expected to be evident in performance differences by grade on the memory lists themselves. Neither of these expectations were fulfilled.

It is possible that the shift was not evident in the memory task performance because the lists were too easy to produce differential responding since they were relatively short and contained commonly used word pairs. However, the free association responses given by the children in the no-list conditions did give some indication that the syntagmatic-paradigmatic shift was in operation. The third graders may have been in mid-shift but still seem to have had some tendency toward syntagmatic responding; while a predominant number of sixth graders responded paradigmatically. The no-list conditions also demonstrate that the shift toward paradigmatic
responding on the syntactic level was accompanied by a shift toward increased coordinate responding on the semantic level. Thus the lack of an interaction between grade and conceptual problem type cannot be accounted for by an absence of the relevant word association shift.

The main purpose for the memory task was to induce a preference for, or a tendency toward, a specific association type. The preference set was then expected to influence the difficulty of the various conceptual problems by facilitating a conceptual solution corresponding to the set and possibly interfering with a solution at variance with the set. Again the expectation was not fulfilled. The interaction between memory list type and conceptual problem type did not attain significance.

However, the free association responses given by the children in the functional and coordinate memory list groups indicate that the memory task did fulfill the purpose of inducing an association preference set. A predominant number of children in the functional list group of both grade levels responded in a functional manner, and a predominant number of children in the coordinate list groups of both grade levels responded in a coordinate manner to free association stimuli given following the memory task. So again, the lack of an interaction between memory list type and conceptual problem type cannot be accounted for by an absence of
the relevant word association preference set.

Although the paired associate memory task accomplished its main purpose, it had no apparent effect upon performance in the conceptual task. The various list conditions did not significantly affect the various conceptual problems, nor did the memory task itself (as compared with no memory list) have any apparent facilitation effect upon the conceptual task either generally or differentially by grade level. Thus the results of the present study indicate generally that although word association preferences were in evidence and were affected by the memory procedure, they had no significant influence over a highly related conceptual task—one in which these particular associations were relevant.

The word association types themselves, however, were important in the conceptual task as is evidenced by the highly significant conceptual problems effect. As was expected, the semantic nature of the association proved to be more important for the solution of the problems than did the syntactic. Both the coordinate problem and the non-meaningful paradigmatic problem involved solutions which were syntactically classified as paradigmatic associations (noun-noun and verb-verb associates). The two problems were thus the same on a syntactic level. On a semantic level however, they differed widely: The coordinate problem solution involved meaningfully related
associates while the paradigmatic problem solution involved non-meaningfully related associates. The fact that the coordinate problem was the easier of the two lends support to the contention that associations are generally made on the basis of semantics rather than on the basis of syntax.

The significant difference between the functional and the coordinate conceptual problems is also important for several reasons. It shows that there are indeed different types of associations within the semantic framework which result in different performance on a conceptual level of cognitive activity. The value of semantic classification of the various associations used in the study of conceptual behavior as well as of other cognitive behavior is thus indicated.

The difference between the functional and the coordinate conceptual problems is also interesting since the direction of difference--functional being significantly easier than coordinate--held across both grade levels. It was expected that the third graders would find the functional problem consonant with their conceptual preferences and thus solve it more easily than the coordinate problem. However, the fact that the sixth graders, who apparently prefer to make associations in a coordinate as opposed to a functional mode, also found the functional problem to be easier than the coordinate
problem was somewhat surprising.

This performance pattern further supports the conclusion indicated by other facets of the study discussed above; namely, that association preferences at the cognitive level of free associations do not carry over directly to the cognitive level of conceptual problem solving. However, the difference between performance on the functional and coordinate problems signifies that there was a preference for the one type of association over the other at the conceptual level. The full implications of a difference in association preference at different levels of cognitive activity cannot be revealed in this one study.

It is possible that a shift from functional to coordinate preference would be evidenced if the age range were expanded upward to include college students. There is some indication that for various cognitive activities (e.g., perspective taking in communication skills) there are wide age discrepancies for developmental changes which may be related to task difficulty (see Flavell, 1977). When the cognitive task involves high levels of abstraction and information processing, the developmental shift may appear relatively late. The same type of developmental shift may appear early when the task is relatively easy and requires low levels of information processing.
The task involved in this study probably ranks fairly high in the conceptual processing level. Solutions required that the children abstract the association type from the instances given. This was done purposely because it was the association types rather than instances that were of interest. However, there is some indication that children tend to process instances rather than categories whereas adults process categories over instances (e.g., Kendler & Ward, 1971; Tighe & Tighe, 1972; Tighe, Tighe, & Schechter, 1975). This would make the information processing load relatively high for children working on the conceptual problems used in this study. The shift in association preferences for conceptual tasks of the level used here might thus not be apparent unless adult subjects are included. Further research is necessary to explore such possibilities.

The findings of this study however, are in themselves significant. They indicate that free association response preferences can be affected with relative ease. They denote that association preferences at one cognitive level may not directly affect performance on another cognitive level even when these association preferences are relevant to the higher level task. They also reveal the value of a semantic classification system of word associations used in conceptual tasks.
APPENDIX A

Paired Associate Memory Task

Instructions

We are going to play some games today. This one is a memory game. After you finish here, you'll be going to the other side of the library for some other games that will be different types of word games.

Now--as I said, this will be a memory game. You'll be learning a list of word pairs. The words will come into the space here so you can read them. First one word will come in, then that word will come in along with its partner. After those two words, another word will show in the space; and then it will come in again with its partner; and that will happen again for six more pairs.

When the words come into the space by themselves, your job will be to see if you can remember what the partner is and tell me before it comes into the space, okay?

So the first time through the list, you will just read the words as they show up in the space. You'll be trying to remember the words with their partners. Then, the second time through the list, when each word comes in by itself, you tell me what its partner is before the pair comes into the window. We'll go through the list
several times until you get all the right partners with the words twice. In other words, we'll stop when you've remembered the whole list right two times in a row. You think you understand everything?

Good. Then I'll start the machine. The first time around just read the words and try to remember the pairs.

(The machine was turned on and was left on until the subject reached criterion or 14 trials were completed. Between the end of the first run through the list and the beginning of the first trial, the experimenter continued.)

When the list gets back to START, try to tell me what the partners are when the single words show up.

(If the subject had any questions or looked puzzled at any point during the instructions, the experimenter repeated that section of the instructions which the subject had not understood.)
Conceptual Task

Instructions

I've got 3 word games today that I'd like you to try. All three games are sort of like this first one.

See these two cards? They have word pairs on them. This card has SEE LIGHTS and this one has SEE HANDS. SEE LIGHTS is one kind of pair, and SEE HANDS is another kind of pair. Underneath each card is a YES or a NO. (The experimenter demonstrated lifting the blue top card during this sentence.) In this game you'll be trying to figure out which pairs have YES under them. The YES will depend on what kind of pair is on the card.

This is how to play the game: You'll see two cards at a time. Read the pair on each card and try to tell which one has the YES under it. Then you pick the one that you think has the YES under it by lifting it up. After you pick one, turn both cards over so you can read the next ones. Do you understand everything so far?

Good. Then for these cards, SEE LIGHTS has YES under here; and SEE HANDS has NO. Here are two more cards: HANDS SOUNDS and HANDS CLAP. HANDS SOUNDS is one kind of pair, and HANDS CLAP is another. Now see if you can tell which of the pairs has the YES underneath.

(The actual word pairs used in the instructions
depended on which problem was being introduced. Again, if the subject asked questions or looked puzzled, the experimenter repeated that part of the instructions which the subject had not understood. After the subjects finished the problem, they were asked how they had been picking which pairs had YES under them. The experimenter then introduced the next problem. Instructions for the second and third problems were the same.

Now here's the second/third game. It is just like the first game because you're still going to figure out which pairs have the YES under them, but the YES pairs may be different. Here's the first set: EAT DRINK and EAT SEE. EAT DRINK is one kind of pair, and EAT SEE is another. For these cards, EAT DRINK has the YES underneath, and EAT SEE has the NO underneath. Now you read the words and try to tell me which ones have the YES under them for the rest of the cards. Remember that the YES will depend on what kind of pair is on the card.
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