PRESCHOOL CHILDREN'S INCIDENTAL MEMORY FOR VISUAL AND
VERBAL MATERIALS: A LEVELS-OF-PROCESSING ACCOUNT

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By

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The Ohio State University
1985

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DEDICATION

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Chapter I
INTRODUCTION

The mature memory system has been characterized by cognitive psychologists through the use of the multistore memory (e.g., Atkinson & Shiffrin, 1968) and the levels-of-processing (e.g., Craik & Lockhart, 1972) perspectives. Although neither of these two orientations has a developmental focus, many developmental psychologists (e.g., Brown, 1975, 1979; Naus & Halasz, 1979; Naus, Ornstein, & Hoving, 1978; Ornstein & Corsale, 1979) have argued that the levels-of-processing perspective is particularly compatible with developmental theory. For example, Brown (1979) proposed that both the levels-of-processing perspective and developmental theories emphasize three major issues: the importance of involuntary memory or incidental learning, the "activity" of the subject and the "goal of that activity," and "headfitting"--i.e., the "compatibility between what is known and what can be known." Naus and Halasz (1979) also stated that both the levels-of-processing and developmental perspectives stress the interrelationship between memory processing and semantic memory (i.e., the organized knowledge a person possesses about words, meanings, relations, concepts, symbols, rules, etc.) (Tulving, 1972). In other words, the levels-of-processing orientation leads one to consider the relationship between stimulus input and the contents of permanent
memory. This consideration is really at the heart of much developmental research.

Levels-Processing Perspective

The levels-of-processing perspective, proposed by Craik and Lockhart (1972), suggests that the cognitive system is structured such that shallow levels of analysis are concerned with sensory and physical aspects of stimuli, whereas deeper levels of analysis are progressively concerned with abstract, semantic, and associative process. It is also suggested that the memory trace is the by-product of the depth of meaningfulness to which a stimulus is processed. Thus, deeper processing is associated with more durable traces and shallow processing with less durable traces.

In addition to depth of processing, memory has also been associated with semantically elaborate processing, or encoding elaboration (Craik & Tulving, 1975; Lockhart, Craik, & Jacoby, 1975). While the notion of depth focuses on the series of qualitatively different analyses that can be performed on stimuli, elaboration centers on the "spread" of encoding at a particular level, especially at deep semantic levels. Depth accounts for the process of interpretation through a build-up of perceptual units of analysis, which implies that the course of processing is rigid, proceeding in stepwise fashion along a route from shallow to deep. (Depth of processing is usually demonstrated by directing subjects' attention to different aspects of stimulus materials, e.g., semantic, phonemic, or structural information.) Elaboration, on the other hand, can account for the process of
interpretation that is directed from within the cognitive system at any level. (Elaboration is usually operationalized by improving memory performance due to answering affirmative questions, e.g., truck: Can people load big boxes onto this?, rather than negative questions, e.g., truck: Can this make a delicious pie?).

The levels-of-processing perspective has been revised to accommodate a more complex relationship between depth of processing and subsequent memory performance over the past few years (Craik, 1979).

First, it no longer seems reasonable to suggest one inflexible processing sequence that proceeds in a bottom-up fashion and is stopped at the level induced by the task...Whereas levels of analysis can be ordered logically from shallow to deep, the processing sequence is likely to reflect interactions and recursive operations among the various levels and types of representation...The particular analyses performed will depend very much on the task, leaving a record reflecting differential activity at various depths, rather than a linear sequence that proceeds to a certain level and then stops (pp. 457-458).

The concept of elaboration represents the differential activity at a particular depth, or level. It is also particularly important to note that semantic processing is not an all-or-none phenomenon. There are degrees of involvement of meaning just as any other qualitative type of processing can be performed more or less fully.

Secondly, it is emphasized that memory reflects elaboration as well as depth. Extensive sensory analysis can produce better memory performance than can minimal semantic analysis. However, deeper processing will be associated with higher recall or recognition either because deeper levels afford greater potential for "distinctiveness" or because deeper encoding operations are more richly interconnected and articulated.
An appropriate method of testing the levels-of-processing hypothesis is to apply orienting tasks (Hyde, 1973; Hyde & Jenkins, 1969; Jenkins, 1974; Mandler, 1967; Ornstein, Trabasso, & Johnson-Laird, 1974). The use of orienting tasks characterized what Postman (1964) refers to as Type I paradigms of incidental learning, i.e., where the subject is exposed to the stimulus materials but given no explicit instructions to learn. The degree of interaction between the subject and the material is determined by the nature of the orienting instructions. In other words, orienting tasks are used to control the nature of processing operations on stimuli. Orienting tasks then represent the operational definitions of the depths, or levels, of processing, and are usually varied in terms of their processing requirement. The most important determinant of subsequent recall or recognition will be whether the orienting task required a deep or shallow level of processing.

In general, numerous research investigations have shown that orientating tasks requiring semantic or affective processing led to better subsequent memory performance than tasks involving phonemic or structural processing (e.g., Craik & Tulving, 1975; Geis & Hall, 1976, 1978). In addition, the finding that orienting questions associated with positive responses (i.e., affirmative or congruous questions) tended to produce better recall or recognition than questions with negative responses (i.e., negative or incongruous questions), at least at deeper levels of processing, indicated the need for the concept of encoding elaboration (Craik & Tulving, 1975). Theoretically, the affirmative orienting question can be integrated with the stimulus
The result is a more elaborate trace and therefore better memory. The integration between the affirmative questions and the stimulus words is referred to as the principle of congruity and can be applied to semantic and phonemic questions (Schulman, 1974).

Levels-of-Processing of Verbal Material

Adult literature. Much research has supported the levels-of-processing hypothesis by using verbal materials as test stimuli in adults. For example, Hyde and Jenkins (1969) asked adult subjects either to judge the meaningfulness of items on a pleasant-unpleasant dimension (a task involving semantic processing) or to judge formal features of the words (e.g., number of syllables or whether or not the word contained a particular letter). They found that when given an incidental recall test subsequent to the orienting task, subjects who had dealt with the items on a meaningful basis recalled twice as many items as those who attended to the formal aspects of the materials. Further, these incidental learners who processed items semantically recalled about the same number of words as control groups of intentional learners who had been presented with the same material under typical recall conditions.

Craik and Tulving (1975, Experiments 1 - 4) also conducted a series of investigations on adult subjects' recall and recognition memory as a function of structural, phonemic, and semantic orienting tasks. A structural orienting task attends to the physical structures of words (e.g., "Is the word printed in capital letters?"). A phonemic orienting task attends to words' rhyming characteristics (e.g., "Does
the word rhyme with train?). Finally, a semantic orienting task attends
to either categorical questions (e.g., "Is the word an animal name?")
or "sentence" questions (e.g., "Would the word fit the following
sentence: 'The girl placed the ______ on the table'?"). In general,
the data indicated that semantic orienting tasks produced better memory
performance than phonemic orienting tasks which, in turn, produced
better memory performance than structural orienting tasks.

The data also showed that memory performance was better for words
associated with affirmative orienting questions than those with negative
ones in semantic and phonemic orienting conditions, but not in structural
orienting condition. Craik and Tulving (1975, Experiment 6) further
provided evidence supporting the proposition that the superior memory
performance following affirmative orienting questions was due to the
encoding elaboration, rather than the type of responses (i.e., yes or
no). They created questions which led to equivalent elaboration for
both affirmative and negative responses. For example, an orienting
question such as "Is the object bigger than the chair?" with a stimulus
word such as "house" (i.e., affirmative orienting) or "mouse" (i.e.,
negative orienting) would lead to equivalent degrees of elaboration.
The results indicated that with this particular kind of orienting
questions, words associated with both affirmative and negative orienting
questions were remembered equally well.

The applicability of the levels-of-processing theory to the domain
of verbal material was complicated, however, by a related study by
D'Agostino, O'Neill, and Pavio (1977). They compared, among other
things, adults' free recall of three orienting conditions: structural,
phonemic, and semantic orienting tasks. The results indicated that the levels-of-processing hypothesis was supported for concrete words in that the semantic orienting task produced higher recall than did the phonemic orienting task, which, in turn, was higher than the structural orienting task. However, for abstract words, the phonemic and semantic orienting tasks produced equivalent levels of recall which exceeded recall under the structural orienting condition. The levels-of-processing hypothesis appears to have difficulties in accommodating the different findings for concrete and abstract words.

Overall, in the studies mentioned above, semantic orienting means deep level processing and nonsemantic orienting shallow processing. Mistler-Lachman (1972, 1974) investigated the possibility that semantic processing could be either deep or shallow. She compared three different levels of semantic processing on some normal sentences. The shallowest level of orienting required the subjects to judge whether or not each stimulus sentence was meaningful. The intermediate level of orienting asked the subjects to judge whether a stimulus sentence reasonably followed a context sentence. Finally, the deepest level of processing required the subjects to make up a sentence to follow a stimulus sentence. Semantic recall then exact word recall were used to assess sentence memory. The main result of this study was that greater depth of processing resulted in better memory for sentences.

Developmental literature. Even though the levels-of-processing perspective of memory has generated much research in adult literature (e.g., Cermak & Craik, 1979), few research investigations have considered children's memory for verbal material from this standpoint.
The extension of the levels-of-processing perspective to children's memory is based on the following rationales. First, very young children do not appear to use even the most primitive rehearsal strategy in traditional memory experiments (i.e., those involving recall or recognition of verbal or visual material without the use of orienting tasks) (e.g., Flavell, 1970). As a result, memory performance of children suffers. Accordingly, children performing a semantic or favorable orienting task should do better than those under a nonsemantic or unfavorable orienting task. Second, given that the levels-of-processing hypothesis proposes that memory is positively related to the depth to which stimulus material is processed, developmental differences in memory performance can be accounted for by age-related differences in the depth to which stimulus material is processed. In other words, older children may perform better than younger children in memory situations because older children spontaneously engage in deep, semantic, and elaborate processing. Therefore, age differences in memory performance should be reduced if the depth of encoding is kept the same for subjects of all ages.

Geis and Hall (1976, 1978) tested these hypotheses and provided evidence partially supporting the levels-of-processing perspective. Geis and Hall (1976) examined the effects of semantic, phonemic, and orthographic orienting tasks on first, third, and fifth graders' free recall of some unrelated words and found that the semantic task yielded better recall than the phonemic or orthographic tasks, but the latter two did not differ. Further, the effects of the three orienting tasks did not vary as a function of the children's age. Age differences in
recall were absent. In a related study, Geis and Hall (1978) found only partial support for their earlier findings. Specifically, first and fifth graders' free recall was greater for words with semantic orienting tasks than words with phonemic orienting tasks. However, age differences in recall were found in that fifth graders' recall exceeded that of first graders. The finding that semantic orienting tasks produced superior recall than did phonemic orienting tasks was supported by Owings and Baumeister (1979) with second, fourth, and sixth graders, and junior and senior high school students.

Subsequent studies challenged Geis and Hall's (1976, 1978) findings. For example, Ghatala, Carbonari, and Bobele (1980) showed that the variables of repetition and encoding congruency, in addition to the orienting task, may influence the pattern of findings. They tested second, fifth, and ninth graders' incidental memory of words as a function of the encoding condition (i.e., the orienting task), repetition (i.e., how many times the stimulus words were presented), and encoding congruency (i.e., half of the questions were congruous with the stimulus words, e.g., "Pig: Is it a farm animal?", while the other half were incongruous, e.g., "Pig: Is it a type of furniture?").

When the words were presented once, the results appear to support Geis and Hall's (1976) findings. That is, recall was better under the semantic orienting processing condition than under the acoustic one and there was no main effect of grade nor a grade by orienting task interaction. However, when words were presented twice, grade level interacted with both orienting task and congruency in that older children's recall was better than younger children's only for words
which were semantically encoded. Thus, the results for the twice-presented words are consistent with the notion that with increasing age, there is a great increase in semantic elaboration but little increase in acoustic elaboration. Ghatala, Carbonari, and Wylie (1980) substantiated this hypothesis in demonstrating that superiority of semantic over acoustic encoding increases with age.

Ghatala, Carbonari, and Bobele (1980) further argued that the pattern of age differences in incidental memory performance may be related to the specific procedure used. In Geis and Hall's (1978) study, the questions were presented after the stimulus, whereas in Ghatala, Carbonari, and Bobele's (1980), the questions were presented before the stimulus word. When Ghatala, Carbonari, and Bobele's (1980) included both "before" and "after" procedures, they found that for ninth graders, the "after" procedure reduced the recall differences between semantic and acoustic encoding conditions in comparison to those in the "before" procedure.

It may be further noted that in Geis and Hall's (1976, 1978), Ghatala, Carbonari, and Bobele's (1980), and Ghatala, Carbonari, and Wylie's (1980) studies, the meaningfulness of the stimulus words was not controlled and thus, could become a confounding variable. Ghatala (1984) examined this hypothesis, among other things, in a study which investigated the influence of meaningfulness of the stimulus material on the pattern of recall. She tested second and sixth graders' incidental memory for words as a function of acoustic and semantic orienting tasks. The degree of meaningfulness of a word was determined by the number of associations produced for the word by the
same-aged subjects. Half of the sixth graders learned List A, which consisted of words of high meaningfulness for this age-grade level and half learned List B, which consisted of words low in meaningfulness. All second graders received List A. Comparisons between the acoustic and semantic orienting conditions at each grade level indicated that the semantic task produced higher recall than the acoustic task for sixth graders receiving List A. Recall under the two orienting tasks did not differ for second graders receiving List A nor for sixth graders receiving List B. Putting it differently, sixth graders recalled more words of high meaningfulness than those of low meaningfulness under semantic orienting condition, but their recall was not affected under acoustic condition. But, when meaningfulness of the lists was equivalent across grades, no age-related increase in recall was observed for both semantic and acoustic conditions.

The pattern of free recall in Ghatala's study indicated that semantic orienting tasks may be effective only with material attaining a certain level of meaningfulness. The data implied that knowledge base development is crucial in determining children's free recall of words. The importance of knowledge base development in children's memory performance has been emphasized by several developmental psychologists (e.g., Brown, 1975; Flavell, 1977; Hagen, Jongeward, & Kail, 1975; Reese, 1976) and confirmed by Lindberg's (1980) investigation. This latter investigator presented words which were highly salient to third graders (e.g., cartoons, games, etc.) and those which were from corresponding Battig and Montague (1969) category norms generated by college students, to both third graders and college students. The
results showed a significant age by word-type interaction with third graders superior on the third-grader items and college students superior on Battig and Montague's items.

In summary, in the domain of verbal material, the levels-of-processing perspective has been supported by research which has employed concrete words with adults (e.g., Craik & Tulving, 1975; Hyde & Jenkins, 1969; D'Agostino, O'Neill, & Paivio, 1977), highly meaningful words with adults (Ghatala, 1981), frequently used words with first, third, and fifth graders (Geis & Hall, 1976), high-frequency meaningful concrete words with second, fourth, and sixth graders and junior and senior high school students (Owings & Baumeister, 1979), or normal sentences with adults (Mistler-Lachman, 1972, 1974). However, investigations using words meaningful to sixth graders with second graders (Ghatala, 1984), low meaningful words with sixth graders (Ghatala, 1984), or abstract words with adults (D'Agostino, O'Neill, & Paivio, 1977) have failed to support the levels-of-processing hypothesis. Furthermore, some investigations (e.g., Geis & Hall, 1976; 1978; Ghatala, 1984; Ghatala, Carbonari, & Bobele, 1980; Ghatala, Carbonari, & Wylie, 1980) addressed the issue of age differences in the incidental memory performance. These developmentally-based studies showed that, in addition to the type of orienting tasks, the variables of repetition, congruency, and the meaningfulness of the stimulus material can influence the pattern of findings.
Levels-of-Processing of Visual Material or of Visual And Verbal Material

It is noteworthy that most of the studies supporting the levels-of-processing point of view have used verbal material as learning materials. The generality of such effects has been, however, examined within other stimulus domains. More specifically, pictures of faces (Bower & Karlin, 1974; Smith & Winograd, 1978), pictures of common objects (Emmerich & Ackerman, 1979; Murphy & Brown, 1975; Sophian & Hagen, 1978), and line drawings (D'Agostino, O'Neill, & Paivio, 1977) have all been used to test the levels-of-processing hypothesis.

Adult literature. Memory for pictures has been tested in adults by D'Agostino, O'Neill, and Paivio (1977). These investigators examined, among other things, the effects of structural, phonemic, and semantic orienting conditions on college students' free recall of pictures of line drawings. Structural orienting tasks required the subjects to differentiate the size of pictures presented by responding either "large" or "small." Phonemic orienting tasks required the subjects to decide if the name of the picture rhymed with a word read by the experimenter. Finally, semantic orienting tasks required the subjects to decide if the picture made sense in a particular sentence frame. The results indicated that free recall of pictures was poorest following structural processing, but there was little or no difference between phonemic and semantic orienting conditions. Since only one age group was used, the developmental implications cannot be assessed.

The issue of age differences in memory performance of visual material as a function of levels of processing was addressed by a study by Smith and Winograd (1978). They compared the recognition
memory for pictures of faces in two adult age groups (18 - 25 years vs. 50 - 80 years) following structural orienting instructions (i.e., judging whether the face had a big nose), elaborative orienting instructions (i.e., indicating whether the face looked friendly), or standard instructions (i.e., merely trying to remember the faces). The results indicated that judging friendliness led to better recognition memory than judging the size of nose or standard instructions for both groups. Furthermore, even though the younger group recognized more faces, a parallel effect of orienting condition for each age group instead of an interaction effect was found. The more elaborative processing task did not reduce or increase the age differences.

Child or developmental literature. Murphy and Brown (1975) studied 4-year-old children's free recall of pictures as a function of comprehension and formal orienting tasks. The comprehension task required the subjects to name and categorize each picture. The formal orienting task directed the subjects' attention to specific nonsemantic features (e.g., either to say the first sound of the pictures' name or to name the colors in the pictures). The stimuli employed were four categories of colored pictures (i.e., pets, clothing, food, and toys). Results indicated that free recall of pictures under comprehension instructions were better than those under formal instructions. Further, comprehension orienting task led to better recall than did an intentional learning instruction. Thus, comprehension tasks produced better recall than formal tasks in preschool children as they do in adults (e.g., Hyde & Jenkins, 1969). However, the developmental implications cannot be examined in this study either.
The developmental aspects of memory performance in preschool years as a function of orienting tasks were examined by Perlmutter, Schork, and Lewis (1982). The orienting questions asked about either the category (i.e., semantic orienting) or the color (i.e., perceptual orienting) of some line drawings of common objects. During the recall session, subjects were first asked to remember as many items as possible (i.e., free recall); then, cues, the categories or the colors, were provided to facilitate recall (i.e., cued recall). The results indicated that there were persistent age differences in both free and cued recall. Performance of 5-year-olds was superior to that of 3-year-olds. Also, for both age groups, the free recall was comparable after the semantic and perceptual orienting tasks, while the cued recall was superior after the semantic orienting task.

Note that in Perlmutter, Schork, and Lewis' (1982) study, the subjects were shown the picture before the experimenter asked the orienting question. As mentioned earlier, this particular sequence of presentation tends to reduce the recall difference between semantic and nonsemantic processing conditions. When the picture was presented before the orienting question, the subjects might have processed the picture to a level different from the one that was specified by the orienting question. Therefore, it is possible that the lack of orienting task effects in free recall is due to the particular procedure used.

Orienting tasks effects were reported by Sophian and Hagen (1978). Instead of using common orienting questions to restrain the levels of processing in subjects, these investigators used picture-sorting orienting tasks. A sorting task based on colors of pictures was compared
with a sorting task based on categorical membership of objects in preschool and kindergarten children. The color-sorting task required the subjects to put pictures into different groups based upon colors (i.e., red, blue, and yellow). The category-sorting task required the subjects to sort pictures into different categories (i.e., clothes, furniture, and vehicles).

Free recall, cued recall, and recognition were compared as a function of age and sorting tasks. For free recall, older children recalled more items than younger ones, and kindergarteners', but not preschoolers', recall was better for category-sorted items than for color-sorted items. Further, older children's recall differences between the two sorting tasks were larger than younger children's. For cued recall, older children recalled more items than did younger children and more category-sorted items than color-sorted items were recalled for both preschool and kindergarten children. For recognition, neither age nor sorting task effect was significant for both preschool and kindergarten children.

The different findings among free recall, cued recall, and recognition have important implications. As Sophian and Hagen (1978) pointed out, if information is stored in equivalent amounts but in different ways following different sorting tasks, free recall may reveal differences in accessibility to this information rather than differences in actual availability. Cues might well minimize or eliminate differences in accessibility. Thus, differences found in cued recall are more likely to represent the differences in availability of information in memory. The lack of interaction effect between age
and the sorting task found in cued recall indicated that accessibility might play a role in the free recall. That is, although information seemed to have been stored for the category-sorting tasks as compared to the color-sorting tasks, younger children did not retrieve information until retrieval cues were provided. Furthermore, since the recognition procedure minimizes the role of retrieval, the differences found in the free recall and cued recall may be due to differences in retrieval rather than storage processes.

After a sequence of investigations, Ghatala and Levin (1981, 1982) argued that semantic orienting tasks do not always facilitate later free recall in comparison to nonsemantic orienting tasks. They compared, among other things, the effects of three orienting tasks on first graders' free recall of pictures and words. The categorical orienting task was directed at the categorical membership of items in the list. The specific orienting task focused on the specific functions of individual items. Both categorical and specific orienting tasks were considered semantic. Finally, the physical orienting task directed the subjects' attention to nonsemantic attributes of the stimuli.

The results indicated that the categorical orienting task produced the highest recall and that there was comparable recall for pictures and words. Also, there was an interaction effect between the other two orienting tasks and the type of materials. For pictures, there was no difference between specific orienting task and the physical orienting task. However, the free recall of words was better following the specific orienting than following the physical orienting task. Therefore, the specific semantic orienting tasks could be more effective than or as
effective as the physical orienting tasks depending on the type of materials involved.

Ackerman (1985) also addressed the issue of the effects of variations in the processing of semantic information from the levels-of-processing point of view. Using a paired associative learning paradigm, he assessed, among other things, age differences in incidental cued recall. The second graders, fifth graders, and college adults showed congruency effects for both pictures and words. That is, all the subjects recalled more pictures and words associated with affirmative orienting questions than those with negative ones. However, the congruency effects were greater for specific than for categorical orienting questions.

In summary, even though few studies have been done in the domain of visual material, several conclusions can be made. First, it appears that levels-of-processing hypothesis was supported by preschoolers' free cued recall of line drawings (Perlmutter, Schork, & Lewis, 1982), preschool children's cued recall and kindergarten children's free and cued recall of pictures (Sophian & Hagen, 1978), the adults' recognition memory for pictures of faces (Smith & Winograd, 1978). Preschoolers' free recall of line drawings (Perlmutter, Schork, & Lewis, 1982), preschoolers' free recall and recognition and kindergarteners' recognition of pictures (Sophian & Hagen, 1978), the adults' free recall of line drawings (D'Agostino, O'Neill, & Paivio, 1977), however, failed to support this hypothesis. Also, even though memory performance was better following categorical semantic orienting tasks than following intentional learning tasks for preschoolers (Perlmutter, Schork, & Lewis, 1982), sixth graders (Ghatala & Levin, 1982), and adults (Smith & Winograd, 1978), developmental
data indicated that there were still age differences in memory performance after orienting tasks. Third, it is important to differentiate different types of semantic orienting tasks. Jacoby and Craik (1979) have also shown that semantic information processing might vary qualitatively, affecting subsequent memory. Finally, since orienting tasks only control encoding strategies, in order to draw conclusions on storage and retrieval processes, different memory tests (e.g., recall and recognition) should be included.

Statement of the Problem

The preceding review has shown that the levels-of-processing hypothesis and related orienting tasks represent an important determinant of subsequent memory performance. However, it may also be argued that the characteristics of the material (e.g., visual vs. verbal materials) and the memory tests (e.g., free recall vs. recognition), in addition to the demands of the orienting task, are also crucial to memory performance.

As to the developmental pattern of memory for verbal material, the effects of levels of processing depend on children's knowledge base development. That is, semantic orienting tasks may be effective if the meaningfulness of the material matches the subjects' level of development. It is less clear as to the developmental pattern of memory for visual material due to the relatively smaller number of studies conducted. Finally, for both verbal and visual materials, age differences remain, despite the use of orienting tasks.

One problem remains unanswered, however. Specifically, the developmental pattern of incidental memory in preschool years is still unknown.
Overall, no investigations have used the levels-of-processing perspectives to test preschoolers' memory for verbal material. This is understandable since preschool children cannot be tested with usual verbal procedures. Also, only one nondevelopmental study (Murphy & Brown, 1975) and two developmental studies (Perlmutter, Schork, & Lewis, 1982; Sophian & Hagen, 1978) have been conducted in the domain of visual material. Recall that these three studies used incomparable orienting tasks and/or experimental procedure and found inconsistent results. Further studies are needed to reconcile these discrepancies.

Perlmutter (1982) noted that even in the traditional memory research approach, work on memory in preschool children is minimal. This is quite surprising because the preschool years are generally viewed as a time of important cognitive growth. For example, this is the time for the transition from sensorimotor to preoperational thought, and for the development of symbolic and linguistic functions (Piaget, 1952). Furthermore, it is a rare time in that cognitive development is often not seriously confounded by education (Brown, 1977). Based on the limited research findings available in the traditional memory literature, it has been found that preschool children have considerable recognition abilities (e.g., Brown & Campione, 1972; Brown & Scott, 1971; Perlmutter & Myers, 1974, 1975, 1976) but limited recall abilities (e.g., Perlmutter & Myers, 1979; Perlmutter & Ricks, 1979).

The present study, therefore, examined the effects of two orienting tasks involving phonemic and specific semantic levels of
processing on the free recall of preschool children for visual and verbal materials. The following questions were tested: First, were there age differences in preschool years with respect to the free recall and recognition of visual and verbal materials following the two orienting tasks? Second, did a specific semantic orienting task produce better recall of visual and verbal materials than a phonemic orienting task? Third, could visual stimuli always be recalled more easily than verbal stimuli? Fourth, do preschoolers recall more words or pictures which are associated with affirmative questions (e.g., fork: "Can people eat cake with this?") than those with negative questions (e.g., fork: "Is this something you brush your teeth with?")?

For the first question, it was hypothesized that there would be age differences in the preschoolers' free recall of visual and verbal materials as a function of phonemic and specific semantic orienting tasks. The age differences in their recognition, however, would not be large if there are any. When no orienting tasks were used, Perlmutter and her colleagues (Perlmutter & Myers, 1979; Perlmutter & Ricks, 1979) found age differences in preschool children's free recall of familiar objects (e.g., toys, animals,...etc.). Age differences were also found in preschoolers' free recall and cued recall of line drawings of common objects with the use of orienting questions (Perlmutter, Schork, & Lewis, 1982), and of pictures of common objects with the use of picture-sorting tasks (Sophian & Hagen, 1978). In all these investigations, visual materials were used and older children were found to recall more items than younger
children. It was, however, not clear whether the pattern of the age differences for verbal memory would be different from the one for visual memory.

For the second question, specific semantic orienting tasks were expected to produce better recall than phonemic orienting tasks for both verbal and visual material. As to verbal material, the present study expected to extend this effect, which had been demonstrated in elementary children and college students, to preschool children. As to visual material, recall that the previous literature indicated inconsistent findings. Murphy and Brown (1975) reported that recall was higher following comprehension orienting tasks than following formal orienting tasks. In contrast, Sophian and Hagen (1978) and Perlmutter, Schork, and Lewis (1982) found that recall was comparable following both semantic and perceptual orienting tasks.

The absence of the orienting task effects in Perlmutter, Schork, and Lewis' study may be accounted for by the fact that the stimulus pictures were presented before the orienting questions and thus, the orienting task effects were reduced. In other words, when the to-be-remembered stimulus was presented before the orienting question, the subjects might have processed the stimulus to a level different from the one that was specified by the orienting task. If the order of presenting orienting questions and stimuli is reversed, as in other research with older subjects (e.g., Craik & Tulving, 1975), the orienting task effects are expected to be significant.

In addition to the experimental procedure, the nature of semantic orienting tasks may influence the significance of orienting
task effects. As Ackerman (1985) suggested, specific and distinctive encodings of information tend to promote better memory in children than categorical encodings. Young children, in particular, can profit from increased specification. Given that either category-sorting tasks (Sophian & Hagen, 1978) or category-orienting tasks (Perlmutter, Schork, & Lewis, 1982) were compared with color-sorting or color orienting tasks, the lack of orienting task effects in these studies might be due to the possibility that there were not enough differences between the depths of processing induced by the two orienting tasks in young children. If, however, specific semantic orienting tasks are paired with other perceptual tasks, greater orienting task effects should be obtained.

For the third question, overall, visual material was expected to be recalled more than the verbal material based on Paivio's (1975, 1979) dual-coding hypothesis. Paivio and Csapo (1973) found a 2:1 ratio in recall in favor of pictures over words. Paivio accounted for this by arguing that pictures are better remembered than corresponding words because subjects store the picture name as well as a visual representation in their memories. For words, on the other hand, the visual code as well as the verbal code are less likely to be stored. If material to be remembered is encoded in both visual and verbal codes, there will be two possible ways to gain access the material when retention is tested. In contrast, if the material is encoded in only one form, there will be only one possible way to gain access to it. The probability of successful access is assumed to be greater when there are more possible ways of access.
Research using paradigms other than orienting tasks has demonstrated the dual-coding effect in elementary children (e.g., Burton, 1982) and in preschool children (e.g., Perlmutter & Myers, 1975). Further, there might be an interaction effect between the orienting tasks and the material. In adult subjects, recall of concrete words and pictures did not differ under semantic orienting conditions, whereas picture recall was superior to word recall under structural and phonemic orienting conditions (D'Agostino, O'Neill, & Paivio, 1977).

Finally, preschool children were not expected to recall more items which were associated with affirmative orienting questions than those with negative orienting questions. The phenomenon that people remember more accurately when the answer to the orienting question is "yes" than when it is "no" is referred to as encoding congruency (Ackerman, 1985), or the principle of congruity (Schulman, 1974). The interaction effects of congruency and orienting tasks had been found in adults in that the congruous encoding improved memory of concrete words (Craik & Tulving, 1975), or pictures, concrete words, and abstract words (D'Agostino, O'Neill, & Paivio, 1977) under phonemic and semantic orienting conditions but did not improve memory performance under structural orienting condition. Also, as mentioned earlier, congruous encodings enhanced memory performance of first and fifth graders (Geis & Hall, 1978). However, Perlmutter, Schork, and Lewis (1982) found no congruency effect in preschoolers.
Design

The present investigation involved a 3 (3-year-old, 4-year-old, or 5-year-old) x 2 (visual vs. verbal materials) x 2 (semantic vs. phonemic orienting) x 2 (congruous vs. incongruous encoding) mixed factorial analysis of variance design, with the first two variables as between-subject variables and the latter two variables as within-subject variables. Thus, there were six groups of subjects.

Subject

The subjects were twenty 3-year-olds between 3 years and 3 years and 9 months (mean = 3 years 5 months), twenty-six 4-year-olds between 4 years 2 months and 4 years 9 months (mean = 4 years 4 months), twenty-one 5-year-olds between 5 years 3 months and 5 years 8 months (mean = 5 years 5 months), from three day care centers near the Ohio State University campus and in predominantly middle class neighborhoods. Ten 3-year-olds, thirteen 4-year-olds, and eleven 5-year-olds were assigned to the visual condition. Ten 3-year-olds, thirteen 4-year-olds, and ten 5-year-olds were assigned to the verbal condition. There were about equal numbers of boys and girls in each
group. All children were tested individually.

Materials

The visual stimulus materials consisted of 12 pictures taken from the Peabody Picture Collection. They were selected because of high identifiability by preschool children. The verbal stimulus material consisted of the most frequently given labels for the pictures. All the words and pictures were familiar to young children.

Four kinds of questions (i.e., semantic congruous, semantic incongruous, phonemic congruous, and phonemic incongruous) were created for each stimulus. The semantic congruous questions asked about the specific function of each stimulus and the correct answer was "yes," e.g., Truck: "Can people load big boxes onto this?". The semantic incongruous questions also asked about the specific meaning of each stimulus but the answer should be "no," e.g., Truck: "Can this make a delicious pie?". The phonemic congruous questions dealt with the rhyming characteristics of each stimulus and the answer was "yes," e.g., Truck: "Does this sound like duck?". Finally, the phonemic incongruous questions also dealt with rhyming characteristics but the answer was "no," e.g., Truck: "Does this sound like table?".

Each memory list was made up of 12 questions (i.e., 3 semantic congruous, 3 semantic incongruous, 3 phonemic congruous, and 3 phonemic incongruous questions). Three of the same kind of questions were chosen from three categories, i.e., eating utensils, vehicles,
and animals. The four versions of orienting questions may be found in Appendix A. All items were presented to the subjects in a random order. Four more lists were created by reversing the order of presentation of the former four versions of the orienting questions. The recognition list was composed of three old items, one from each category, and three new items, also one from each category. The recognition list was also presented to the subjects in a random order. The eight versions of recording sheets used during the experiment may be found in Appendix B. The subjects were randomly given one of the eight versions of orienting questions.

**Procedures**

Before the testing session took place, the experimenter spent at least several hours with the subjects to make them comfortable with the experimenter. After becoming comfortable with the experimenter, the subjects were given as much practice as needed to be familiar with the testing procedure. During the practice session, examples, different from the testing materials, of the four kinds of questions (i.e., semantic congruous, semantic incongruous, phonemic congruous, and phonemic incongruous) were provided. In general, the younger the subjects were, the more trials needed before the subjects could accurately follow the experimental procedure.

All subjects were tested individually by a female experimenter. The subjects were told they would be presented a series of words or pictures and asked a question concerning each item, but they were not informed that memory for these stimuli would be tested. The subjects
were instructed to answer these questions "yes" or "no." The testing session lasted about 15 minutes.

For the verbal material condition, the procedure basically followed Craik and Lockhart's (1972) framework in that subjects were required to make judgments concerning phonemic and specific semantic characteristics of some words read by the experimenter. On each trial, before a word was exposed, the subjects were asked a question about the word. Then, the experimenter read the word, the subjects repeated it, and answered the orienting question. After all 12 stimulus words were presented, the subjects were asked to name as many of the words as they could remember. Recall was subject paced. When the subjects gave no additional responses, the experimenter encouraged them to try harder by saying "Can you give me one more?". When they gave no more additional responses, they were told that "I am going to read you some more words. Half of them I have just read to you. Half of them I haven't. Tell me if I have already any of these words to you." The experimenter, then read the recognition list one at a time and recorded the subjects' responses.

The memory of visual material as a function of levels-of-processing was tested under similar conditions. Under the phonemic processing condition, the subjects were asked whether the name of the next picture rhymed with a word read by the experimenter and, under the semantic processing condition, they were asked whether the next picture possessed a specific semantic characteristic. During presentation, the subjects were shown one picture at a time, asked to name it, and then answered the orienting question. After
all the pictures were presented, the subjects were asked to remember as many items as they could. The free recall and recognition sessions followed the same procedures as the ones for the verbal material.
Overall, the orienting questions for each condition were answered correctly at mean rates exceeding 94%.

Free Recall

The mean number of pictures and words recalled as a function of age, orienting condition, and response judgment is shown in Table 1. The data were analyzed with a 3x2x2x2 analysis of variance incorporating age (3, 4, and 5), type of material (visual vs. verbal), orienting condition (semantic vs. phonemic), and response judgment (yes vs. no) (see Table 2). The type of material and the age were between-subjects variables, while the orienting condition and the response judgments were within-subject variables.

There was no main effect of congruency (or response judgment $F(1,61 = .39, p > .53)$. Likewise, none of the three-way and the four-way interactions was significant. The main effect of type of material was significant $F(1,61) = 66.66, p < .0002$. Overall, free recall was better for visual than for verbal materials. This main effect did not interact with any other variables in the present analysis. Simple main effects of type of material were significant for 3-year-olds, 4-year-olds, and 5-year-olds ($p < .05$). For all three age groups, pictures were recalled more readily than spoken words.
Table 1

Mean Number of Pictures and Words Recalled as a Function of Age, Orienting Condition, and Response Judgment

<table>
<thead>
<tr>
<th>Orienting Response</th>
<th>Condition</th>
<th>Judgment</th>
<th>Age</th>
<th>Picture</th>
<th>Word</th>
<th>Picture</th>
<th>Word</th>
<th>Picture</th>
<th>Word</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Semantic</td>
<td>Yes</td>
<td>3</td>
<td>1.00</td>
<td>.40</td>
<td>1.08</td>
<td>.77</td>
<td>1.91</td>
<td>.90</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>3</td>
<td>.40</td>
<td>.50</td>
<td>1.38</td>
<td>.62</td>
<td>1.73</td>
<td>1.10</td>
</tr>
<tr>
<td></td>
<td>Phonemic</td>
<td>Yes</td>
<td>3</td>
<td>.70</td>
<td>.30</td>
<td>1.31</td>
<td>.31</td>
<td>1.45</td>
<td>.30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>3</td>
<td>.80</td>
<td>.10</td>
<td>1.23</td>
<td>.31</td>
<td>.91</td>
<td>.60</td>
</tr>
</tbody>
</table>

Maximum score is 3.
Table 2

Analysis of Variance on Free Recall Data

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Between Subjects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of Material (A)</td>
<td>1</td>
<td>27.33</td>
<td>27.33</td>
<td>66.66***</td>
</tr>
<tr>
<td>Age (B)</td>
<td>2</td>
<td>14.30</td>
<td>7.15</td>
<td>17.44***</td>
</tr>
<tr>
<td>AxB</td>
<td>2</td>
<td>1.84</td>
<td>.92</td>
<td>2.24</td>
</tr>
<tr>
<td>Ss/AxB</td>
<td>61</td>
<td>24.98</td>
<td>.41</td>
<td></td>
</tr>
<tr>
<td><strong>Within Subjects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orienting Task (C)</td>
<td>1</td>
<td>5.51</td>
<td>5.51</td>
<td>18.89**</td>
</tr>
<tr>
<td>CxA</td>
<td>1</td>
<td>.75</td>
<td>.75</td>
<td>2.03</td>
</tr>
<tr>
<td>CxB</td>
<td>2</td>
<td>3.01</td>
<td>1.51</td>
<td>4.08*</td>
</tr>
<tr>
<td>CxAxB</td>
<td>2</td>
<td>.79</td>
<td>.40</td>
<td>1.08</td>
</tr>
<tr>
<td>CxSs/AxB</td>
<td>61</td>
<td>22.43</td>
<td>.37</td>
<td></td>
</tr>
<tr>
<td>Congruency (D)</td>
<td>1</td>
<td>.26</td>
<td>.26</td>
<td>.39</td>
</tr>
<tr>
<td>DxA</td>
<td>1</td>
<td>.70</td>
<td>.70</td>
<td>1.06</td>
</tr>
<tr>
<td>DxB</td>
<td>2</td>
<td>.32</td>
<td>.16</td>
<td>.24</td>
</tr>
<tr>
<td>DxAXB</td>
<td>2</td>
<td>1.89</td>
<td>.95</td>
<td>1.44</td>
</tr>
<tr>
<td>DxSs/AxB</td>
<td>61</td>
<td>40.52</td>
<td>.66</td>
<td></td>
</tr>
<tr>
<td>CxD</td>
<td>1</td>
<td>.004</td>
<td>.004</td>
<td>.01</td>
</tr>
<tr>
<td>CxDxA</td>
<td>1</td>
<td>.001</td>
<td>.001</td>
<td>.00</td>
</tr>
<tr>
<td>CxDxB</td>
<td>2</td>
<td>.37</td>
<td>.19</td>
<td>.39</td>
</tr>
<tr>
<td>CxDxAxB</td>
<td>2</td>
<td>1.99</td>
<td>1.00</td>
<td>2.08</td>
</tr>
<tr>
<td>CxDxSs/AxB</td>
<td>61</td>
<td>29.10</td>
<td>.48</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>267</td>
</tr>
</tbody>
</table>

*p < .03

**p < .0004

***p < .0002
Significant main effects were also obtained for age \(F(2,61) = 17.44, p < .0002\) and orienting task \(F(1,61) = 14.89, p < .0004\). The interaction between these two variables was the only significant interaction effect \(F(2,61) = 4.08, p < .03\) found in the present study. This interaction is summarized in Figure 1. Even though for all three age groups, the recall of pictures and words combined was better under semantic orienting condition than under phonemic orienting condition, orienting tasks made a pronounced difference in the recall for 5-year-olds, but only a slight difference for 4-year-olds and 3-year-olds. When the recall of pictures and words was separated (Figures 2 & 3), the data indicated that the picture recall difference between semantic and phonemic tasks was slightly greater than the word recall difference between the two tasks for 5-year-olds. But, for 4-year-olds and 3-year-olds, the recall difference between the two orienting tasks was greater for words than for pictures. Note that these differences between picture recall and word recall as a function of orienting task and age were not significant \(F(2,61) = 1.08, p > .35\).

When the recall of pictures and words were combined, simple effects of age were significant for both orienting tasks. Fisher's least significant difference (LSD) analyses indicated that for the phonemic processing tasks, 5-year-olds and 4-year-olds produced equivalent levels of recall which exceeded recall of 3-year-olds \(p < .05\). For the specific semantic processing tasks, 5-year-olds produced higher recall than did 4-year-olds, who, in turn, recalled more than 3-year-olds. Simple effects of the orienting tasks were
Figure 1: Mean number of recall for pictures and words combined as a function of orienting task and age.
Figure 2: Mean number of recall for pictures as a function of orienting task and age.
Figure 3: Mean number of recall for spoken words as a function of orienting task and age.
significant for 5-year-olds only. Fisher's LSD analyses indicated that 5-year-olds recalled more under the specific semantic processing condition than under the phonemic processing condition ($p < .05$). However, both processing conditions produced equivalent levels of recall for 4-year-olds and 3-year-olds.

**Recognition**

The recognition data are presented in Table 3. A 2 (picture vs. word) x 3 (3-year-old, 4-year-old, or 5-year-old) factorial analysis of variance was carried out on the data (see Table 4). Only the main effect of the type of material was significant ($F(1,61) = 18.88, p < .0002$). Simple main effects of the type of material were significant for all three age groups ($p < .05$). Picture recognition was consistently better than word recognition for all subjects.

Note that the main effect of age ($F(2,61) = .40, p > .67$) was not significant probably due to ceiling effect. For both pictures and words, the recognition performance of 3-year-olds, 4-year-olds, and 5-year-olds was comparable.
Table 3

Mean Number of Correct Recognition

<table>
<thead>
<tr>
<th>Type of Material</th>
<th>Age 3</th>
<th>Age 4</th>
<th>Age 5</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Picture</td>
<td>6.00</td>
<td>5.92</td>
<td>5.91</td>
<td>5.94</td>
</tr>
<tr>
<td>Word</td>
<td>5.40</td>
<td>5.15</td>
<td>5.20</td>
<td>5.24</td>
</tr>
<tr>
<td>X</td>
<td>5.70</td>
<td>5.54</td>
<td>5.57</td>
<td></td>
</tr>
</tbody>
</table>

Maximum score is 6.
Table 4

Analysis of Variance on Recognition Data

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Material (A)</td>
<td>1</td>
<td>7.93</td>
<td>7.93</td>
<td>18.88*</td>
</tr>
<tr>
<td>Age (B)</td>
<td>2</td>
<td>0.34</td>
<td>0.17</td>
<td>0.40</td>
</tr>
<tr>
<td>AxB</td>
<td>2</td>
<td>0.08</td>
<td>0.04</td>
<td>0.10</td>
</tr>
<tr>
<td>Ss/AxB</td>
<td>61</td>
<td>25.52</td>
<td>0.42</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>66</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .0002
The results of the present study add to the literature on incidental memory. The first purpose of the present study was to find out the patterns of age differences in the preschoolers' free recall and recognition of the visual and verbal materials as a function of the phonemic and specific semantic orienting tasks. When pictures and words were combined, free recall improved from 3 to 5 years of age. But recognition showed no age-related improvement. Even though the lack of age effects on recognition data may be due to ceiling effect, the high levels of recognition performance, in comparison to the poorer recall performance, supported previous literature (Sophian & Hagen, 1978) and indicated that the age differences in free recall might be due to the younger subjects' retrieval limitations. Since the retrieval requirements in the immediate and relatively simple recognition testing like the one used in the present study are said to be minimal (Mandler, 1980; Rabinowitz, Mandler, & Patterson, 1977) and in the free recall maximal, any differences between recognition and recall reflect the differences in retrieval demands. Although comparable amounts of information appear to have been stored by all three age groups in the present study, the older children might have used retrieval
strategies more effectively than did the younger ones. When retrieval aids were available, 3-year-olds' memory performance was as good as those of 4-year-olds and 5-year-olds.

Also, the lack of age differences and high levels of recognition support the view that involuntary, or automatic memory processes do not change as a function of age (Naus & Halasz, 1979; Brown, 1973, 1975). The distinction between deliberate or voluntary memory processing, and automatic or involuntary memory processing was propose by Brown (1975). Deliberate memory tasks are those that involve the use of mnemonic strategies. Subjects purposely adopt a voluntary plan to improve memory performance. In contrast, automatic memory processing is unplanned and is the product of a person's interaction with an environment. Thus involuntary memory results from comprehending or understanding a situation. The Type I incidental paradigm (Postman, 1964) used in the present study has been suggested to be able to reveal the automatic processes independent of the strategic intervention by the subjects (Naus & Halasz, 1979). In addition, the recognition test provides a measure of automatic memory, since it appears to be a relatively automatic function within memory (Perlmutter & Lange, 1978).

Of particular interest in the present findings are the different patterns of age differences in free recall subsequent to specific semantic and phonemic orienting tasks. For the specific semantic processing tasks, 5-year-olds recalled more than did 4-year-olds, who, in turn, recalled more than 3-year-olds. The phonemic orienting tasks, on the other hand, produced equivalent levels of recall for
5-year-olds and 4-year-olds, but lower level of recall for 3-year-olds. This pattern of age differences extended Ghatala, Carbonari, and Bobeke's (1980) findings, in which free recall of words increased linearly with grade (i.e., 2nd, 5th, and 9th grades) as a consequence of categorical semantic orienting tasks; but following phonemic orienting tasks, free recall showed little if any increase with grade.

Putting together the findings of the present study and Ghatala, Carbonari, and Bobeke's (1980) study, the author finds that semantic orienting tasks produce age-related increments in the free recall from preschool years to 9th grade. In contrast, phonemic orienting tasks tend to show age-related improvement between age 3 and age 4, but no age differences thereafter. The differences between semantic and phonemic orienting effects as a function of age indicate the increasing importance of semantic knowledge and the relatively minor role of phonemic knowledge in memory development.

As to the second question examined by the present study, concerning the relative effectiveness of the specific semantic and the phonemic orienting tasks, overall, the finding supports the hypothesis that the semantic encoding was more effective than the phonemic encoding in the free recall of visual and verbal materials. As indicated by Perlmutter, Schork, and Lewis (1982), this finding is noteworthy because of the evidence that young children's preferred mode of processing is perceptual rather than semantic (Geis & Hall, 1978; Perlmutter & Ricks, 1979). That is, these authors found that relative to 5th graders, first graders preferred acoustic encoding to
semantic encoding (Geis & Hall, 1978) and that 3- to 5-year olds depending on perceptual more than semantic processing (Perlmutter & Ricks, 1979). One might expect memory performance to be best when encoding process matches the individual's preferred mode of processing. Yet, as in the earlier research (e.g., Murphy & Brown, 1975), the present investigation found that semantic processing was more effective than the phonemic processing in 3- to 5-year olds' free recall. Obviously, even though preschool children tend to depend on perceptual processing, they can effectively perform semantic processing and benefit from it. This phenomenon is consistent with the assumption that young children have a production deficiency rather than a mediation deficiency for the use of mnemonic devices (Flavell, 1970; Pressley, 1982). That is, although young children may possess the ability to process information semantically, they tend not to use this strategy spontaneously.

As to the free recall of visual materials, the patterns of the present data are consistent with those of Sophian and Hagen (1978), but are not consistent with those of Murphy and Brown (1975) and Perlmutter, Schork, and Lewis (1982). The latter investigators found that for 3- to 5-year-old children, free recall was about the same level after categorical semantic and perceptual orienting tasks. Recall that the order of presenting orienting questions and to-be-remembered stimuli may have contributed to these differences. When the to-be-remembered stimulus was presented before the orienting question as in Perlmutter, Schork, and Lewis' study, the subjects might have processed the stimulus to a level different from the one
that was specified by the orienting question. Therefore, the 
orienting tasks had no effects on later memory performance. In 
addition, the present results and previous findings (Ackerman, 1985; 
Perlmutter, Schork, & Lewis, 1982) suggest that for 4-year-olds, but 
not 3- and 4-year-olds, specific semantic orienting tasks tend to 
induce deeper processing than categorical semantic orienting tasks. 
Thus, it is important to distinguish between kinds of semantic 
orienting tasks in future investigations. As to the free recall of 
verbal material, the patterns of the present finding extend the 
orienting task effects, which had been proven in elementary (Geis & 
Hall, 1976, 1978; Ghatala, Carbonari, & Bobele, 1980) and college 
students (e.g., Craik & Tulving, 1975), to preschool children.

The finding that there was a relative superiority of semantic to 
phonemic orienting processing in free recall also adds to Perlmutter, 
Schork, and Lewis' (1982) finding. They found that when provided 
with semantic retrieval cues during free recall, 3- to 5-year-old 
children recalled more items than they did with perceptual retrieval 
cues, indicating the importance of semantic retrieval support in very 
young children's memory performance. Thus, it is clear that both 
semantic encoding and semantic retrieval aid facilitate memory 
performance for children as young as 3 years old.

The third purpose of the present study was to contrast the 
recall and recognition of verbal and visual materials. Overall, 
Paivio's dual-coding hypothesis was supported for both recall and 
recognition. Preschool children recalled and recognized more 
pictures than spoken words. However, the lack of interaction effects
between the type of material and the orienting tasks contradicts Ghatala and Levin's (1981, 1982) and D'Agostino, O'Neill, and Paivio's (1977) findings. As in the present study, they found that the free recall of concrete words was better following the semantic orienting task than following the phonemic orienting task. In contrast to the results of the present study, these authors reported that the free recall of pictures was equivalent following the two orienting tasks.

The finding that orienting tasks did not interact with the type of material in the free recall in the present study, but did interact with the type of material in Ghatala and Levin's and D'Agostino, O'Neill, and Paivio's studies is still unexplained. The subjects in Ghatala and Levin's and in D'Agostino, O'Neill, and Paivio's studies were older (6-year-olds, 8-year-olds, & college students) than those in the present investigation (3-, 4-, & 5-year-olds). Even though in the present study, the three-way interaction effect among the type of material, the type of orienting task, and the age was not significant, the pattern of the data indicated that the performance of 3-year-olds and 4-year-olds was very much alike those of the older subjects in the other two studies, whereas the 5-year-olds' performance was totally different in that the semantic orienting task facilitated their pictures recall more than their word recall.

Finally, the hypothesis of the absence of encoding congruency effect in preschoolers was supported. Congruous or incongruous encoding made no differences in preschoolers' free recall. This finding is in agreement with those of Perlmutter, Schork, and Lewis
(1982). As discussed previously, the reasons why adults remember better following affirmative orienting questions than following negative ones are due to the greater elaboration of encodings (Craik & Tulving, 1975; Craik & Jacoby, 1979), rather than the type of responses. It appears that encoding elaboration is not verified in preschoolers for specific semantic and phonemic orienting tasks (as shown in the present study) as well as for categorical semantic and perceptual orienting tasks (Perlmutter, Schork, & Lewis, 1982).

According to Craik and Tulving (1975), adult memory is a function of depth of processing as well as of encoding elaboration. Two stimuli may be processed to the same depth (e.g., structural, phonemic, or semantic), but, the memory traces for the stimuli may differ in degree of richness or elaboration at that depth. Under most circumstances, an affirmative orienting question is assumed to provide better elaboration than a negative orienting question in adults due to an integrated unit formed between the affirmative orienting question, or encoding context, and the stimulus word. This is, however, not the case for preschoolers. They seem to encode stimuli associated with both affirmative and negative orienting questions equally well.

The question is why the integration with the affirmative encoding context is helpful for older children and adults but not for preschool children. One possibility is that the integration of the stimuli and the encoding context is based on past experience (Craik & Tulving, 1975). Specifically, at encoding the stimuli and the orienting context are interpreted in terms of the subjects'
structured past experience, or semantic memory, to form a unit, and
the encoded unit is then drawn upon to facilitate retrieval
processes. Since very young children's semantic memory is not as
extensive and complex as that of older children and adults, young
children may not integrate the encoding context and the stimuli well
enough to benefit from the resulted elaboration.

Besides the encoding elaboration, the age differences in
congruency effect may also be explained by age differences in the use
of retrieval strategy (Ghatala, Carbonari, & Bobele, 1980). Accord-
ing to the retrieval strategy interpretation, the presence of
congruency effects in older children and adults is due to the
utilization of the affirmative orienting questions as cues at the
time of recall. Moscovitch and Craik (1976) have demonstrated that
orienting questions could be effective retrieval cues only when they
are congruent with the stimuli. Also, given that preschool children
do not use retrieval strategies spontaneously (Kobasigawa, 1977), it
would follow that the reason why preschool children do not recall
more items associated with affirmative questions than those with
negative ones is that preschool children simply do not engage in
strategic attempts to use any of the orienting questions as cues
during recall.

Due to a limitation in the present study, it is impossible to
delineate which of the two alternative interpretations (i.e.,
encoding elaboration or retrieval strategy) best account for the age
differences in the congruency effects. Since the selection of the
three old items to be included in the recognition list did not take
the different response judgments into account, the present data do not allow for an examination of recognition performance as a function of response judgments (yes or no) and orienting tasks. As a result, a comparison between recall and recognition performance as a function of response judgments and orienting tasks is not attainable. Further research exploring the interrelationship of encoding and retrieval processes in incidental memory development is needed.

In summary, orienting task effects were observed in 5-year-olds' free recall. Moreover, there were age differences in free recall, but not in recognition probably due to a ceiling effect. These results provide evidence of young children's retrieval limitation. Paivio's dual-coding hypothesis was also supported with the use of orienting tasks. In addition, the different patterns of age differences in the free recall subsequent to the specific semantic and phonemic orienting tasks indicate the increasing importance of semantic knowledge and the relatively minor role of phonemic knowledge in memory development. Congruous or incongruous encoding made no differences in preschoolers' free recall. Finally, further research is needed to explore the interrelationship of encoding and retrieval processes in incidental memory development.
APPENDIX A

THE ORIENTING QUESTIONS

ORIENTING QUESTIONS (1-1 & 1-2)

glass  "Can people put milk in this?"  "Yes"
fork   "Is this something you brush your teeth with?"  "No"
car    "Do people drive this to work?"  "Yes"
bus    "Can this make a delicious pie?"  "No"
dog    "Does this go 'bow-wow'?"  "Yes"
bear   "Is this something you wash your face with?"  "No"
spoon  "Does this sound like moon?"  "Yes"
knife  "Does this sound like apple?"  "No"
train  "Does this sound like rain?"  "Yes"
truck  "Does this sound like table?"  "No"
cat    "Does this sound like hat?"  "Yes"
horse  "Does this sound like chair?"  "No"
<table>
<thead>
<tr>
<th>Item</th>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
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<td>&quot;Can this make a delicious pie?&quot;</td>
<td>&quot;No&quot;</td>
</tr>
<tr>
<td>fork</td>
<td>&quot;Can people eat cake with this?&quot;</td>
<td>&quot;Yes&quot;</td>
</tr>
<tr>
<td>car</td>
<td>&quot;Is this something you brush your teeth with?&quot;</td>
<td>&quot;No&quot;</td>
</tr>
<tr>
<td>bus</td>
<td>&quot;Can a lot of people ride in this?&quot;</td>
<td>&quot;Yes&quot;</td>
</tr>
<tr>
<td>dog</td>
<td>&quot;Is this something you wash your face with?&quot;</td>
<td>&quot;No&quot;</td>
</tr>
<tr>
<td>bear</td>
<td>&quot;Can we find this in the woods?&quot;</td>
<td>&quot;Yes&quot;</td>
</tr>
<tr>
<td>spoon</td>
<td>&quot;Does this sound like apple?&quot;</td>
<td>&quot;No&quot;</td>
</tr>
<tr>
<td>knife</td>
<td>&quot;Does this sound like wife?&quot;</td>
<td>&quot;Yes&quot;</td>
</tr>
<tr>
<td>train</td>
<td>&quot;Does this sound like table?&quot;</td>
<td>&quot;No&quot;</td>
</tr>
<tr>
<td>truck</td>
<td>&quot;Does this sound like duck?&quot;</td>
<td>&quot;Yes&quot;</td>
</tr>
<tr>
<td>cat</td>
<td>&quot;Does this sound like cookie?&quot;</td>
<td>&quot;No&quot;</td>
</tr>
<tr>
<td>horse</td>
<td>&quot;Does this sound like force?&quot;</td>
<td>&quot;Yes&quot;</td>
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### ORIENTING QUESTIONS (3-1 & 3-2)

<table>
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<tr>
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<th>Answer 1</th>
<th>Question 2</th>
<th>Answer 2</th>
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</thead>
<tbody>
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<td>glass</td>
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<td>&quot;Yes&quot;</td>
<td>&quot;Can we eat ice cream with this?&quot;</td>
<td>&quot;Yes&quot;</td>
</tr>
<tr>
<td>fork</td>
<td>&quot;Does this sound like apple?&quot;</td>
<td>&quot;No&quot;</td>
<td>&quot;Is this something you brush your teeth with?&quot;</td>
<td>&quot;No&quot;</td>
</tr>
<tr>
<td>car</td>
<td>&quot;Does this sound like jar?&quot;</td>
<td>&quot;Yes&quot;</td>
<td>&quot;Does this go 'choo-choo'?&quot;</td>
<td>&quot;Yes&quot;</td>
</tr>
<tr>
<td>bus</td>
<td>&quot;Does this sound like table?&quot;</td>
<td>&quot;No&quot;</td>
<td>&quot;Can this make a delicious pie?&quot;</td>
<td>&quot;No&quot;</td>
</tr>
<tr>
<td>dog</td>
<td>&quot;Does this sound like log?&quot;</td>
<td>&quot;Yes&quot;</td>
<td>&quot;Does this go 'meow'?&quot;</td>
<td>&quot;Yes&quot;</td>
</tr>
<tr>
<td>bear</td>
<td>&quot;Does this sound like cookie?&quot;</td>
<td>&quot;No&quot;</td>
<td>&quot;Is this something you wash your face with?&quot;</td>
<td>&quot;No&quot;</td>
</tr>
<tr>
<td>spoon</td>
<td>&quot;Can we eat ice cream with this?&quot;</td>
<td>&quot;Yes&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>knife</td>
<td>&quot;Is this something you brush your teeth with?&quot;</td>
<td>&quot;No&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>train</td>
<td>&quot;Does this go 'choo-choo'?&quot;</td>
<td>&quot;Yes&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>truck</td>
<td>&quot;Can this make a delicious pie?&quot;</td>
<td>&quot;No&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cat</td>
<td>&quot;Does this go 'meow'?&quot;</td>
<td>&quot;Yes&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>horse</td>
<td>&quot;Is this something you wash your face with?&quot;</td>
<td>&quot;No&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ORIENTING QUESTIONS (4-1 & 4-2)

glass  "Does this sound like apple?"  "No"
fork   "Does this sound like port?"  "Yes"
car    "Does this sound like table?"  "No"
bus    "Does this sound like plus?"  "Yes"
dog    "Does this sound like cookie?"  "No"
bear   "Does this sound like pear?"  "Yes"
spoon  "Is this something you brush your teeth with?"  "No"
knife  "Can we cut something with this?"  "Yes"
train  "Can this make a delicious pie?"  "No"
truck  "Can people load big boxes onto this?"  "Yes"
cat    "Is this something you wash your face with?"  "No"
horse  "Can people ride on this?"  "Yes"
APPENDIX B
THE RECORDING SHEETS

CONDITION: 1-1

<table>
<thead>
<tr>
<th>item</th>
<th>question</th>
<th>Y</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>train</td>
<td>&quot;Does this sound like rain?&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>spoon</td>
<td>&quot;Does this sound like moon?&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>dog</td>
<td>&quot;Does this go 'bow-wow'?&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bear</td>
<td>&quot;Is this something you wash your face with?&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>glass</td>
<td>&quot;Can people put milk in this?&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>horse</td>
<td>&quot;Does this sound like cookie?&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>truck</td>
<td>&quot;Does this sound like table?&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>fork</td>
<td>&quot;Is this something you brush your teeth with?&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>car</td>
<td>&quot;Do people drive this to work?&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bus</td>
<td>&quot;Can this make a delicious pie?&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cat</td>
<td>&quot;Does this sound like hat?&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>knife</td>
<td>&quot;Does this sound like apple?&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Experiment: ______________________
Date: ______________________

Subject Information:
School: ______________________
Name: ______________________
Age: ______________________
Sex: ______________________
circle one

53
Free Recall (Number the responses)
( ) glass ( ) car ( ) dog
( ) fork ( ) bus ( ) bear
( ) spoon ( ) train ( ) cat
( ) knife ( ) truck ( ) horse

Recognition (Record "Y" for "yes" responses, "N" for "no" responses)
( ) train ( ) pig ( ) dish ( ) horse ( ) spoon ( ) bike

Comments:
CONDITION: 1-2

Experimenter: ____________
Date: ________________

Subject Information:
School: _____________________________
Name: _______________________________
Age: ________________________________
Sex: _________________________________
circle one

knife  "Does this sound like apple?"  Y  N
cat  "Does this sound like hat?"  Y  N
bus  "Can this make a delicious pie?"  Y  N
car  "Do people drive this to work?"  Y  N
fork  "Is this something you brush your teeth with?"  Y  N
truck  "Does this sound like table?"  Y  N
horse  "Does this sound like table?"  Y  N
glass  "Can people put milk in this?"  Y  N
bear  "Is this something you wash your face with?"  Y  N
dog  "Does this go 'bow-wow'?"  Y  N
spoon  "Does this sound like moon?"  Y  N
train  "Does this sound like rain?"  Y  N

Free Recall (Number of responses)
(  ) glass  (  ) car  (  ) dog
(  ) fork  (  ) bus  (  ) bear
(  ) spoon  (  ) train  (  ) cat
(  ) knife  (  ) truck  (  ) horse

Recognition (Record "Y" for "yes" responses, "N" for "no" responses)
(  ) bike  (  ) spoon  (  ) horse  (  ) dish  (  ) pig  (  ) train

Comments:
CONDITION: 2-1

Experimenter ___________________
Date: ___________________________

Subject Information
School: _______________________
Name: __________________________
Age: ___________________________
Sex: ___________________________
circle one

fork "Can people eat cake with this?" Y N
train "Does this sound like table?" Y N
cat "Does this sound like cookie?" Y N
car "Is this something you brush your teeth with?" Y N
horse "Does this sound like force?" Y N
spoon "Does this sound like apple?" Y N
bear "Can we find this in the woods?" Y N
dog "Is this something you wash your face with?" Y N
knife "Does this sound like wife?" Y N
bus "Can a lot of people ride in this?" Y N
glass "Can this make a delicious pie?" Y N
truck "Does this sound like duck?" Y N

Free Recall (Number of responses)
( ) fork ( ) bus ( ) bear
( ) glass ( ) car ( ) dog
( ) knife ( ) truck ( ) horse
( ) spoon ( ) train ( ) cat

Recognition (Record "Y" for "yes" responses, "N" for "no" responses)
( ) truck ( ) pig ( ) dish ( ) bear ( ) fork ( ) bike

Comments:
CONDITION: 2-2

Experimenter ____________
Date: ________________

Subject Information

School: ____________________
Name: ______________________
Age: ________________________
Sex: _________________________

circle one

truck "Does this sound like duck?" Y N
glass "Can this make a delicious pie?" Y N
bus "Can a lot of people ride in this?" Y N
knife "Does this sound like wife?" Y N
dog "Is this something you wash your face with?" Y N
bear "Can we find this in the woods?" Y N
spoon "Does this sound like apple?" Y N
horse "Does this sound like force?" Y N
car "Is this something you brush your teeth with?" Y N
cat "Does this sound like cookie?" Y N
train "Does this sound like table?" Y N
fork "Can people eat cake with this?" Y N

Free Recall (Number of responses)

( ) fork ( ) bus ( ) bear
( ) glass ( ) car ( ) dog
( ) knife ( ) truck ( ) horse
( ) spoon ( ) train ( ) cat

Recognition (Record "Y" for "yes" responses, "N" for "no" responses)

( ) bike ( ) fork ( ) bear ( ) dish ( ) pig ( ) truck

Comments:
CONDITION: 3-1

Experimenter ________________
Date _______________________

Subject Information
School: ______________________
Name: _______________________
Age: _________________________
Sex: _________________________

truck    "Can this make a delicious pie?" Y N
train    "Does this go 'choo-choo'?" Y N
bus      "Does this sound like table?" Y N
glass    "Does this sound like grass?" Y N
knife    "Is this something you brush your teeth with?" Y N
fork     "Does this sound like people?" Y N
horse    "Is this something you wash your face with?" Y N
dog      "Does this sound like log?" Y N
bear     "Does this sound like cookie?" Y N
car      "Does this sound like jar?" Y N
spoon    "Can we eat ice cream with this?" Y N
cat      "Does this go 'meow'?" Y N

deck Recall (Number of responses)
( ) spoon ( ) train ( ) cat
( ) knife ( ) truck ( ) horse
( ) glass ( ) car ( ) dog
( ) fork ( ) bus ( ) bear

Recognition (Record "Y" for "yes" responses, "N" for "no" responses)
( ) car ( ) pig ( ) dish ( ) cat ( ) knife ( ) bike

Comments:
CONDITION: 3-2

Experimenter: ______________
Date: ______________________

Subject Information:
School: _____________________
Name: _______________________
Age: _________________________
Sex: _________________________
circle one

cat      "Does this go 'meow'?'"  Y N
spoon  "Can we eat ice cream with this?"  Y N
car   "Does this sound like jar?"  Y N
bear  "Does this sound like cookie?"  Y N
dog  "Does this sound like log?"  Y N
horse  "Is this something you wash your face with?"  Y N
fork  "Does this sound like apple?"  Y N
knife  "Is this something you brush your teeth with?"  Y N
glass  "Does this sound like grass?"  Y N
bus  "Does this sound like table?"  Y N
train  "Does this go 'choo-choo'?"  Y N
truck  "Can this make a delicious pie?"  Y N

Free Recall (Number the responses)
(  ) spoon  (  ) train  (  ) cat
(  ) knife  (  ) truck  (  ) horse
(  ) glass  (  ) car  (  ) dog
(  ) fork  (  ) bus  (  ) bear

Recognition (Record "Y" for "yes" responses, "N" for "no" responses)
(  ) bike  (  ) knife  (  ) cat  (  ) dish  (  ) pig  (  ) car

Comments:
CONDITION: 4-1

Experimenter: _____________
Date: _________________

Subject Information:
   School: _______________________
   Name: __________________________
   Age: ____________________________
   Sex: ____________________________

circle one

bear    "Does this sound like pear?"   Y  N
cat     "Is this something you wash your face with?"   Y  N
horse   "Can people ride on this?"   Y  N
truck   "Can people load big boxes onto this?"   Y  N
glass   "Does this sound like apple?"   Y  N
car     "Does this sound like table?"   Y  N
fork    "Does this sound like pork?"   Y  N
train   "Can this make a delicious pie?"   Y  N
bus     "Does this sound like plus?"   Y  N
spoon   "Is this something you brush your teeth with?"   Y  N
dog     "Does this sound like cookie?"   Y  N
knife   "Can we cut something with this?"   Y  N

Free Recall (Number the responses)
(  ) knife (  ) truck (  ) horse
(  ) spoon (  ) train (  ) cat
(  ) fork (  ) bus (  ) bear
(  ) glass (  ) car (  ) dog

Recognition (Record "Y" for "yes" responses, "N" for "no" responses)
(  ) bus (  ) pig (  ) dish (  ) dog (  ) glass (  ) bike

Comments:
CONDITION: 4-2

Experimenter: ____________________
Date: ____________________

Subject Information
School: _______________________
Name: _________________________
Age: _________________________
Sex: _________________________
circle one

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<th>N</th>
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<td>knife</td>
<td>&quot;Can we cut something with this?&quot;</td>
<td>Y</td>
<td>N</td>
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<tr>
<td>dog</td>
<td>&quot;Does this sound like cookie?&quot;</td>
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<td>N</td>
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<tr>
<td>spoon</td>
<td>&quot;Is this something you brush your teeth with?&quot;</td>
<td>Y</td>
<td>N</td>
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<tr>
<td>bus</td>
<td>&quot;Does this sound like plus?&quot;</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>train</td>
<td>&quot;Can this make a delicious pie?&quot;</td>
<td>Y</td>
<td>N</td>
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<td>fork</td>
<td>&quot;Does this sound like pork?&quot;</td>
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<td>N</td>
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<td>N</td>
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<td>glass</td>
<td>&quot;Does this sound like apple?&quot;</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>truck</td>
<td>&quot;Can people load big boxes into this?&quot;</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>horse</td>
<td>&quot;Can people ride on this?&quot;</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>cat</td>
<td>&quot;Is this something you wash your face with?&quot;</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>bear</td>
<td>&quot;Does this sound like pear?&quot;</td>
<td>Y</td>
<td>N</td>
</tr>
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</table>

Free Recall (Number the responses)
(  ) knife (  ) truck (  ) horse
(  ) spoon (  ) train (  ) cat
(  ) fork (  ) bus (  ) bear
(  ) glass (  ) car (  ) dog

Recognition (Record "Y" for "yes" responses, "N" for "no" responses)
(  ) bike (  ) glass (  ) dog (  ) dish (  ) pig (  ) bus

Comments:
BIBLIOGRAPHY


