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An analysis of normal adults' semantic judgments of picture associations

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AN ANALYSIS OF NORMAL ADULTS' SEMANTIC JUDGEMENTS OF PICTURE ASSOCIATIONS

BY

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ABSTRACT

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The purposes of this study were: 1) to identify 40 pairs of pictures in which ten pairs were capable of being judged as Interactive, ten as Categorical, ten as Both Interactive and Categorical, and ten as Not Being Related, and 2) to verify the selection of the forty pairs of pictures by determining the extent to which they elicited verbal responses in the above four categories. Twenty native English speaking college educated subjects participated in an identification task. They judged the relationship between pairs of pictures on an interactive scale and a categorical scale. A second group of twenty native adult speakers of English participated in a picture association task in order to verify the stimuli which were identified. Results indicated that subjects identified 40 pairs of pictures, 10 Interactive, 10 Categorical, 10 Both Interactive and Categorical, and 10 No Relation. The verification task results indicated that the stumuli chosen to represent the four categories did elicit responses from each of the categories. The Categorical and No Relation stimuli elicited their corresponding associations more consistently than did the Interactive and Both association stimuli. Possible factors affecting the results were presented and future research and clinical implications were discussed.

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CHAPTER I

INTRODUCTION

Semantic deficits often accompany language disorders in language-learning disabled children (Dinnan, Bickley, & Cowart, 1971; Harris, 1979; Israel, 1980; and Shilo, 1981). Specifically, researchers have determined that these children often have scattered semantic categorization abilities ranging from within normal limits to a significant delay. One clinical responsibility a speech language pathologist assumes is the assessment of semantic categorization performance difficulties in language-learning disabled (L. D.) children. The categorization performances of L.D. children on assessment tasks are often compared to normative developmental data. Much of the normal developmental data obtained have been adversely influenced by an interaction of methodologies and stimuli. The purpose of this study is to identify stimuli which would be capable of eliciting accurate developmental semantic categorization responses.

This chapter discusses semantic associations in relation to definition differences, developmental trends based upon these definitions, and the application of the developmental information to the learning disabled population. A discussion of the effects of the interaction between methodologies and stimuli on the normative data obtained to date will also be presented. Finally, an argument will be made for the need for adequate methodologies and stimuli which can accurately reflect the semantic categorization developmental continuum.

Definitional Statements

Semantics is generally defined as the study of meaning (Lyons, 1981) and encompasses a number of factors. Although these include word meanings, speech acts, sense/ reference, and semantic categorization, the focus of the discussion in this chapter is limited to categorization.

Semantic categorization research frequently involves investigating the relationships established between form classes and within form classes (Brown & Berko, 1960; Clark, 1973; Nelson, 1977). A form class is defined as a class of linguistic structures that can be used in an utterance and that has one or more morphological or syntactical features in common (Webster's Ninth New Collegiate Dictionary, 1983). A syntagmatic relationship has historically been defined as a relationship which is developed between form classes and specifically between syntactic elements. For instance, the words BOY and RAN are related syntagmatically because they are found adjacent to one another in a grammatical sentence such as THE BOY RAN FAST (Brown & Berko, 1960; Ervin-Tripp, 1973). Paradigmatic relationships have traditionally been defined as those relationships developed between elements within a single form class which have similiar semantic features. For example, the words MAN and BOY are related because they have similiar defining features such as + human, + male, and differ by age.

Researchers, using the definitions cited above, have investigated children's categorization abilities (Brown & Berko,

1960; Clark, 1973; Entwisle, 1966; Ervin-Tripp, 1973). Although most responses in these studies could be clearly categorized as paradigmatic and syntagmatic, numerous responses were not easily categorized as either syntagmatic or paradigmatic responses. For example, approximately 25-42% of responses given in word association tasks across three studies were noun responses to noun stimuli which were not related to similar semantic features (Deese, 1965; Ervin, 1961, Francis, 1972). The difficulty in using the paradigmatic definition was further illustrated in a study conducted by Lippman (1971).

After surveying the results of earlier investigations, Lippman (1971) noted that many of the subjects' responses were not based on similar semantic features even though they were noun responses to noun stimuli. They appeared, however, to share a functional or relational relationship. For example, BABY and CRIB could be classified as being related functionally since A BABY SLEEPS IN A CRIB. Also, a CHAIR and a TABLE could be classified as being related since A CHAIR CAN SLIDE UNDER THE TABLE. Thus, the need for a revision in the definition of the term "paradigmatic" was demonstrated.

Lippman (1971) utilized four categories to investigate word associations of noun stimuli and reasons for the associations which children made between words. These categories included NOMINAL (e.g., both words were toys, fruits, furniture, etc.), PERCEPTUAL (e.g., both have four legs, fur, short hair), RELATIONAL (e.g., married, cats chase dogs, opposites, enemies),

and FUNCTIONAL (e.g., boy-chair, The boy sits on a chair and boy-table, The boy writes on a table). The researchers were able to categorize all word association responses and reasons into one of these four categories.

Based on Lippman's (1971) results, Emerson and Gekoski (1976) expanded the definition of paradigmatic (see Figure 1). They included the traditional relationships of nouns sharing similar semantic features which they called CATEGORICAL, and developed a category which they called INTERACTIVE responses. The interactive category was similar to the combination of the categories Lippman (1971) described as functional and relational. An interactive association resulted when a child interpreted the stimulus noun in terms of an action sequence. Therefore a child's response which was the result of placing the stimulus into an action sequence was called interactive. An example of a categorical association is MAN and BOY. MAN and BOY share the feature of + animate, + human, and + male. An example of an interactive association is MAN and HAMMER. The two nouns can be placed in an action sequence (e.g., The man used the hammer). Using the defintions of syntagmatic and dividing the definition of paradigmatic into interactive and categorical, Emerson and Gekoski (1976) investigated children's responses to picture and word association tasks. Although the results did not contain the data necessary to determine that the number of unclassified responses decreased, the authors made no mention of difficulty scoring the responses

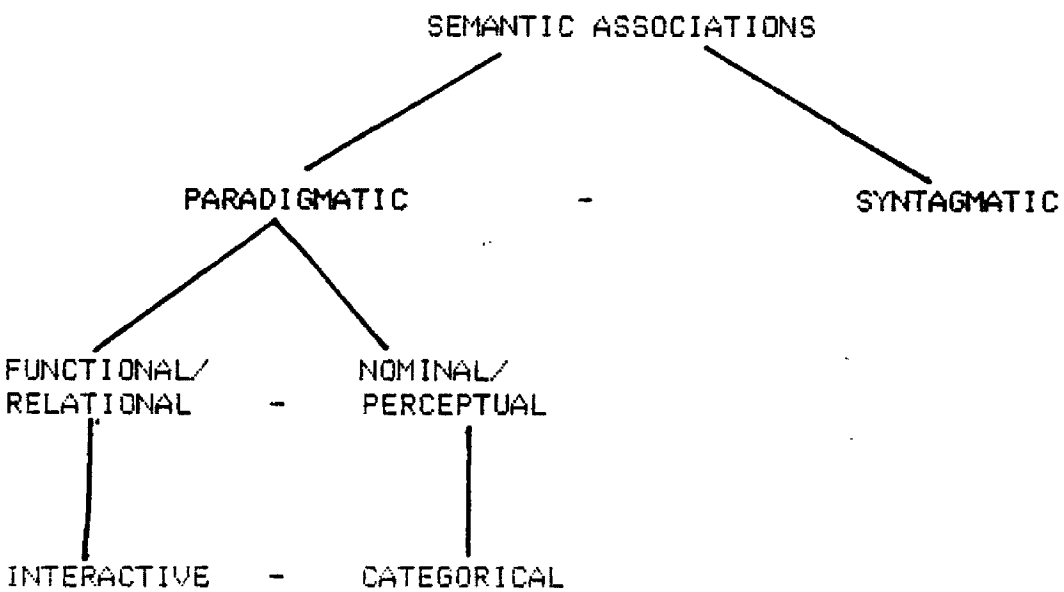

Figure 1. Expansion of paradigmatic definition.
(Based on Brown and Berko, 1960; Lippman, 1971; Emerson and Gekoski, 1976)

although this was an area of difficulty noted in the literature review of Lippman (1971) and data gathered by Francis (1972).

In summary, research to date indicates more than two categories need to be employed for classifying responses in order to accurately investigate categorization skills . Research has indicated that a strictly syntagmatic and paradigmatic division does not account for the development of categorization skills. The syntagmatic and extended versions of paradigmatic have been used to study the development of syntagmatic and paradigmatic relations and will be discussed next.

The Development of Syntagmatic and Paradigmatic Relations

A general developmental trend has been established for the acquisition of syntagmatic and paradigmatic relations. Initially, researchers reported that the ability to form syntagmatic relations was the first to emerge in children around the age of three (Brown & Berko, 1966; Clark, 1973; Entwisle, 1966). Thereafter, a shift from primarily syntagmatic responses to primarily paradigmatic responses occurred (Ervin, 1961; Brown & Berko, 1960; Enwistle, 1966). This shift was thought to occur between the ages of six to eight years. After the shift occurred, children began to respond primarily paradigmatically. Adults produced paradigmatic responses to classification tasks (Brown & Berko, 1960; Entwisle, 1966). These researchers categorized responses into either syntagmatic or paradigmatic divisions. Thus, even though they identified the time when the shift

occurred, they viewed the developmental sequence as an all or none process; a child was either syntagmatic or paradigmatic. The manner in which the development occurred could not be described due to the limitation of using only two category groups to classify subject responses.

More recently, Emerson and Gekoski (1976) expanded the definition of paradigmatic to determine if they could better describe how this developmental shift occurs. Using the extended definition of paradigmatic described previously, they indeed found that it is not clearly a case of children predominantly forming syntagmatic or paradigmatic associations. Furthermore, these researchers determined these relationships can coexist. Their results indicated that prior to age six and a half years syntagmatic and specific paradigmatic responses (interactive) were made. After this period, categorical responses were given in addition to interactive responses. The frequency of interactive responses decreased markedly at this time. The number of categorical responses peaked at age eight. Clearly, utilizing the expanded definition of paradigmatic allowed researchers to more clearly define the developmental sequence of syntagmatic to paradigmatic categorization.

Semantic categorization has been studied in children and adults (Brown & Berko, 1960; Clark, 1973; Emerson & Gekoski, 1976; Entwisle,1966; and Lippman, 1971). The developmental continuum of categorization shifted from syntagmatic to paradigmatic associations with an increase in age (Brown & Berko, 1960,

Entwisle, 1966). The transitional period from syntagmatic to paradigmatic also showed a developmental trend. This trend was a shift from interactive associations to categorical associations (Emerson & Gekoski, 1976).

The above referenced studies utilized different methodologies. Brown and Berko (1960) and Entwisle (1966) utilized word associations while Emerson and Gekoski (1976) utilized both a word association task and a picture association task. Results of Brown and Berko (1960), Emerson and Gekoski (1976), and Entwisle (1966) were reported in terms of group performance; however, analysis of individual performance of some adult subjects indicated that some subjects provided both interactive and categorical responses. Their results indicated that if adults are given the opportunity with appropriate stimuli, they may respond with categorical and interactive associations.

Developmental data are often used in assessing children with language problems. A child's performance on a given task may be compared to age appropriate normative data and a functioning age derived. Normative data is particularly important for assessing the language learning disabled population. Semantic categorization has been noted as an area of deficit with L.D. children (Wallach & Butler, 1984). Even though the shift occurs in normal children between the age of 6 and 8 years of age, L.D. children develop this shift at a later age, approximately age ten (Dinnan et al, 1971; Israel, 1980; Wallach & Butler, 1984). Having valid normative data is important in assessing a child's

development of semantic categorization abilities. The importance of accurate data reflecting the developmental spectrum is essential for determining whether a child's performance falls within normal limits or outside normal limits and thus indicates the need for intervention. Using a classsification scheme which allows responses to be clearly described on the developmental continuum would allow for assessing where children are functioning on the developmental continuum. Additionally, if a child is delayed, valid normative data allow for selection of appropriate treatment targets for a child demonstrating a problem.

In summary, research indicates that the developmental nature of categorization skills can be clearly described using the expanded definitions of paradigmatic. A need exists to develop and utilize stimuli and procedures which are capable of eliciting both types of paradigmatic associations and accurately reflecting a child's classification abilities along the developmental continuum. The reasons for this need are discussed next.

Methodology and Stimuli Interaction with Results

Researchers have investigated categorizational skills through the methods of word associations, picture grouping tasks, and reasons for sorting certain objects together. A brief review of the types of semantic categorization tasks in which children have participated, the stimuli used within those tasks, and a discussion of how the nature of the tasks and stimuli limited children's responses is presented next.

One method of investigating semantic relations has involved word associations (Brown & Berko, 1960; Entwisle, 1966). These tasks presented a child with a stimulus word and asked the child for the first word that came to mind. Brown and Berko (1960) investigated free word associations in elementary school aged children and adults. The stimuli consisted of 36 words representing each of six parts of speech which were selected on the basis of their high frequency of occurrence in the expressive language of American elementary-school children. The subjects were asked to say the first words that they thought of after hearing the stimulus word. The researchers scored the responses into one of six parts of speech (count nouns, mass nouns, adjectives, transitive verbs, intransitive verbs, and adverbs). Brown and Berko (1960) reported that there "were sometimes problems with scoring" (p.7). This problem related to children's responses which could not be easily scored as one part of speech versus another. When the authors had a doubt which part of speech to assign the response, they asked the subjects to put the word into a sentence. The researchers failed to report the exact number of responses which were not easily assigned to one class of words. Overall, their results indicated that a "tendency to associate words within parts of speech increases with age" (p.13). Nouns tended to elicit paradigmatic responses at all age levels, whereas verbs remained predominantly syntagmatic throughout development and adjectives shifted from syntagmatic to paradigmatic with an increase in age.

A disadvantage of using free word association tasks as a semantic categorization assessment procedure included limiting the information a researcher or clinican obtains. The researchers gathered one response to one stimulus word and failed to investigate any alternate relationships which children may have formed with the stimulus word. Therefore, the researchers obtained only the primary association a child made to a stimulus word without any knowledge of additional associations which also may have been present at that point in time. The results from the Brown and Berko (1960) study indicated that in some instances analyzing the data developmentally and using historical definitions of syntagmatic (between word classes) and paradigmatic (within word classes) were not adequate. Every response was either categorized as the same form class as the stimulus word or a different form class. Given the more current findings of Emerson and Gekoski (1976), viewing a child's reponse to a stimulus word strictly on the basis of form class is inadequate in determining where a child is functioning on a developmental continuum of semantic categorization skills. Using word associations to investigate semantic categorization does not add insight into other possible relationships a child may associate with a given stimulus word. Using word associations, the researcher or clinician is unable to determine the type of paradigmatic association a child is producing at the same time that they are producing syntagmatic responses. If a child is only given the opportunity to exhibit one association, his/her

response will be limited to one relationship. Emerson and Gekoski (1976) demonstrated that children are capable of forming more than one association as they develop categorizational skills. Thus, the need exists to have a tool capable of eliciting various associations which would accurately reflect the child's functioning on the categorization developmental continuum. Furthermore, if the responses from a free word association task are categorized into either paradigmatic or syntagmatic, an investigation of paradigmatic shift as it occurs in young children is not accomplished.

A modification of the free word association procedure was used by Ervin (1961). Ervin presented children with a stimulus word and then asked them to make a forced choice between two other words as to which word related best to the stimulus word. The results were comparable to the Brown and Berko's (1960) results. By utilizing a forced choice word association paradigm, the subjects were limited again in the possible choices and limited in expressing the semantic relationships which they might have identified between the stimulus words and other words. If the investigator had provided subjects with two words and asked them how they were related, the subjects would then have had the opportunity to produce more than one response if they identified more than one association. This modification may have produced different and more accurate performance of the paradigmatic shift.

Although researchers have consistently presented data which clearly reflected paradigmatic responses to noun stimuli at all

ages (Brown & Berko,1960; Ervin, 1961), many researchers have assumed that nouns undergo a similar syntagmatic- paradigmatic shift as do adjectives (Moran, 1974; Palermo & Jenkins, 1963; Emerson & Gekoski, 1976). In a review of research and theory related to the syntagmatic- paradigmatic shift, Nelson (1977) noted that the kinds of relationships which nouns "enter into appear to be primarily paradigmatic (i.e.,categories, coordinates, part-wholes)" (p.110). She also noted that situational relations (action, functions, locations) were likely to be syntagmatic in nature. This observation corresponded to Lippman (1971) results.

Lippman (1971) investigated children's semantic abilities using a free word association task and a word-pair task. Lippman used the expanded definition of paradigmatic in obtaining and analyzing his data. The subjects were kindergarteners, second and fourth graders, and college students. The free word association was conducted in the same manner as in the Brown and Berko (1960) study with the exception of using the expanded definitions of paradigmatic during data analysis. The word-pair task involved two words being presented simultaneously to a subject. The subject was then asked to give as many reasons as they could for why the two words went together. The stimuli consisted of a 12-word list (6 nouns and 6 adjectives). The results indicated that more qualitative information on a child's development of syntagmatic and paradigmatic relations could be obtained if the responses given in both tasks were analyzed according to nominal, perceptual, relational, and functional characteristics. This

information led Emerson and Gekoski (1976) to investigate the development of paradigmatic and syntagmatic relations in children using an expanded definition of paradigmatic.

Emerson and Gekoski (1976) concluded word association tasks were inadequate for eliciting information on the general developmental trend as well as being inadequate in determining specifically what type of relationships children of any age actually form. In an attempt to better define the developmental trend in children between the ages of 3 years and 9 years 11 months, they studied the syntagmatic and paradigmatic trends using a word association task. In addition, they added a picture grouping task in order to more accurately and precisely describe the paradigmatic trend.

Emerson and Gekoski (1976) redefined paradigmatic associations by encompassing perceptual and nominal characteristics under the term categorical and relational and functional characteristics under the term interactive. Their investigation used a picture grouping task and responses were analyzed into interactive and categorical associations. Their results were similar to Brown and Berko (1960) in that young children responded syntagmatically and older children responded paradigmatically to stimuli in free word association tasks. In contrast to previous research, they found, using the picture grouping task, that children were not forming strictly syntagmatic relationships between the age of 3 and 5, but rather interactive responses were occuring at the same time as syntagmatic responses.

Their results certainly supported the syntagmatic-paradigmatic shift and their picture grouping task provided a procedure for determining where a child might be functioning on the developmental continuum. Although this procedure was an improvement over word association tasks in that it allowed for further definition of the developmental trend, it was still limited. The children had to make a forced choice between four pictorial stimuli. Consequently the task limited the amount of information obtained from the children with regard to their categorizational skills. The children were forced to choose either a categorical matching picture, an interactive matching picture, or an unrelated alternative. The procedure did not allow the children the opportunity to demonstrate other relationships which they might have known. The nature of the task interfered with accurately determining where each child functioned on the developmental continuum. This could have been remedied by having a category which had stimuli which represented both a categorical and interactive association. Thus, a need exists to develop a procedure which uses pictorial stimuli to investigate interactive and categorical relations, and which allows a child multiple opportunities to identify the predominant relation and any other relations which might exist between stimuli.

In summary, in order to assess semantic categorizational skills in children along the entire developmental continuum, accurate normative data must be obtained. As demonstrated above, normative data obtained may not be accurate, in part due to

problems in methodologies and a lack of appropriate stimuli. Researchers agree that a shift from syntagmatic responses to paradigmatic responses in word association tasks occurs with an increase in age. Currently, interactive and categorical responses have been shown to coexist within syntagmatic responses. However, a paucity of data exist which defines this developmental trend. A need exists to simplify the interaction between methodology and stimuli. A first step is to develop a set of stimuli capable of eliciting the entire developmental continuum of semantic categorization abilities.

Statement of the Problem

Accurate semantic categorization normative data are an important assessment tool when evaluating semantic categorization skills in children with potential language problems. The data aid in establishing a child's level of functioning and determining whether that child is eligible for language remediation services. The data also aid in the selection of appropriate treatment targets. Language learning disabled populations have difficulty with categorization (Dinnan et al, 1971). The existing normative data has been shown to be contaminated by inadequate definitions, interaction between methodologies, which limit possible responses, and stimuli which limit responses (Emerson & Gekoski, 1976; Lippman, 1971). Thus a need exists to reexamine classification abilities and establish accurate developmental information. To do this the interaction between methodologies and stimuli must be

defined. This goal can be achieved by first identifying stimlui which would be capable of measuring responses along the developmental continuum. Therefore, the purposes of the present study were 1) to identify forty pairs of pictures in which ten pairs were capable of being judged as Interactive, ten as Categorical, ten as Both Interactive and Categorical, and ten as Not Being Related, and 2) to verify the selection of the forty pairs of pictures by determining the extent to which they elicited responses in one of the following categories: Interactive, Categorical, Both Interactive and Categorical, or No Relation.

CHAPTER II

METHODS

Subjects

Two groups of subjects participated in the present study. Group 1 subjects participated in a task in which they judged the degree to which pairs of pictures were Interactive, Categorical, Both Interactive and Categorical, or Not Related. This task is called the identification task.

Group 1 subjects were 20 adult undergraduate students, graduate students and faculty members who responded to a written request for subjects posted in the University of Montana Communication Sciences and Disorders Department. Group 1 subjects had passing grades in introductory college courses in linguistics and child language acquisition as determined by self-report. No subject had more than one college level course of which the primary content area was in semantics.

Group 2 subjects participated in a task which verified the selection of the forty pairs of pictures chosen from the identification task. Group 2 subjects were 20 adults from the Missoula area who volunteered in response to a verbal request by the examiner. They had not been enrolled in college courses in linguistics, semantics, or child language acquisition as determined by self report.

Subjects in both groups met the following criteria. All subjects were native speakers of English. They were adults who were at least 18 years of age. Their hearing acuity was within

normal limits by self-report (Appendix A). These adults had visual acuity within normal limits or vision was corrected with prescription lenses to bring their visual acuity within normal limits as determined by self-report (Appendix A).

The following section will describe the stimuli and procedures used for both the identification task and the verification task. Each task will be discussed seperately.

Identification Task

Stimuli Selection

From an original pool of 1200 pictures from the commercial source of Pictures Please! (Abbate & La Chappelle, 1979), 224 pictures representing nouns were selected by the examiner. These pictures were chosen from the following childhood semantic themes: household items, toys, vegetables, fruits, food, professionals (e.g., police, doctors, nurses, teachers), sports, animals, and transportation. The vocabulary level ranged from preschool to late elementary school age (Abbate & La Chappelle, 1979). Pictures were then paired together. The following operational definitions were used to combine the pairs of pictures by the investigator. If a pair of pictures had similar defining characteristics or belonged to the same superordinate category, they were paired as representing a Categorical association. Two pictures were paired as representing an Interactive association if a functional (e.g., man- hammer) or relational (e.g., married, opposites) association was evident. If a pair of pictures

demonstrated both types of associations, the pair was then assigned to the Both Interactive and Categorical category. A pair of pictures represented No Relationship if no interactive or categorical associations were evident.

Each pair of words was represented with two simple black and white line drawings on a black 8.5 x 11.0 inch card. Each pair of pictures will be referred to as a stimulus plate. Thus, 112 stimulus plates were formed (Appendix B) and divided by the investigator into one of four categories which were assumed to be capable of eliciting responses which could be classified as Interactive (28 plates), Categorical (28 plates), Both Interactive and Categorical (28 plates), or No Relation (28 plates).

These four sets of 112 plates were then presented to a consultant who was familiar with the study and the definitions of the associations. The consultant was trained using the above operational definitions (Appendix C contains the instructions). She was asked to identify whether each stimulus plate would elicit a Categorical, Interactive, Both Relations, or No Relation response. If the experimenter and the consultant disagreed as to the label of a stimulus plate, they then discussed it. Following the discussion, a stimulus plate was either moved to an agreed upon category or discarded from the study. The examiner and the consultant agreed on the classification of 106 of 112 stimulus plates. Of the six that were not agreed upon, 2 were reassigned to an agreed upon category and 4 were discarded. From the 108 plates, 100 became stimuli for the experiment and 8 became

training items for the present study. The pictures which were assigned as training items were rated at the extreme ends of the categorical and interactive scales during preliminary investigations.

The Scale

Two five-point Likert scales were constructed. The first scale was labelled Interactive Relations. Interactive Relations were operationally defined as those relationships which exist between two pictures based upon a functional association (e.g., man-hammer: the man hit the nail with a hammer) and/or a relational association (e.g., married, opposites, or cats chase dogs). The second scale was labelled Categorical Relations. A Categorical Relationship was operationally defined as one based upon nominal associations (both pictures are of fruits, dogs, etc.) and/or perceptual characteristics (e.g., both are fuzzy, have four legs, bark). An ordinal scale consisting of five points was used: 1) not related, 2) weakly related, 3) moderately related, 4) strongly related, and 5) extremely related. Both an interactive and a categorical scale were assigned to each stimulus plate. The scale on a rating form is located in Appendix D.

Two scales were utilized to allow subjects to respond with both an interactive and categorical association if the subjects saw both types of associations. If a continuous scale from interactive to categorical had been constructed, the scale would not have allowed for the identification of two associations if

observed by the subjects. A continuous scale would have forced the subjects to make a choice between the two relations. The subjects manually recorded their responses on each scale by circling the interval which they thought represented the level of association between the stimulus plates (Appendix E).

Procedures

The following operational definitions were used. A categorical association was one which was based on perceptual and nominal characteristics. An interactive association was one which represented functional or relational associations.

Subjects participated in three tasks: a training task, a practice task, and an identification task. Each subject was seen individually. In total, the training, practice, and identification tasks lasted approximately 30 minutes. Each of these tasks is described below.

The stimulus picture plates were randomly ordered using a random numbers table for each subject. This was done to offset presentation order bias.

The Introduction and Training Task.

The examiner introduced herself and informed the subject that she would like his/her judgements on pairs of pictures. The examiner then presented the person with a brief information sheet which operationally defined categorical and interactive relations between words (Appendix F). The examiner demonstrated the judgement task. She presented a stimulus plate and told the

subject that based on the definitions, the pair of pictures exhibited a relationship which would score a 5 on the categorical scale (exceptionally related) and a 1 on the interactive scale (not related). Three other stimulus cards were presented which demonstrated various associations.

The Practice Task.

Each subject was asked to judge 4 practice stimulus plates on the interactive and categorical scales (Appendix F). Two sets of four stimulus plates were used for practice.

If a subject rated the practice plates differently than that which was predetermined by the examiner, the subject was asked to explain his answer. This was done to determine whether the subject did not assess the stimulus plate as a clear example of each category or whether the subject did not understand the task. If the examiner determined the subject did not understand, she stated some of the possible relationships which could exist between the pictures. If the subject's ratings matched the examiner's ratings on three of the four practice plates, the subject proceded to the identification task. Subjects who failed to rate three stimulus plates correctly, underwent another training session of four plates following the same procedures previously described. Individuals whose ratings on 3 of 4 of the second set of practice stimulus plates did not match the examiner's ratings after the second training session were not included in the study. All subjects who participated in the

practice task advanced to participate in the study. No subjects were discarded.

Identification Task.

Group 1 subjects were asked to rate the degree to which pairs of pictures were related (Appendix F). In this task, Group 1 subjects were presented with 100 randomly ordered pairs of illustrations. The subjects were asked to rate each pair on the interactive and categorical scales. The examiner presented each stimulus plate individually. The subject's responses were scored manually by the subject on a score sheet.

Measurement

The examiner transferred the specific number circled from the interactive and categorical scales, for each subject on each stimulus plate. This data was then analyzed.

Analysis

Means and standard deviations for interactive and categorical responses for the subjects participating in the identification task were calculated for each stimulus plate. The stimulus plates were then rank ordered based on the means and standard deviations.

Verification Task

Stimuli

Stimuli for this task consisted of forty pairs of visually depictable words which had been identified from the identification task. The 10 stimulus plates which had the highest mean score on

the interactive scale and the lowest mean score on the categorical scale with the smallest standard deviations were chosen to represent an interactive association. The 10 stimulus plates which had the lowest mean score on the interactive scale and the highest mean score on the categorical scale with the smallest standard deviations were chosen to represent a categorical association. The 10 stimulus plates which had the highest means on both the interactive and categorical scales with the smallest standard deviations were chosen to represent the category of both interactive and categorical associations. The 10 stimulus plates which had the lowest means on both scales with the smallest standard deviations were chosen to represent no relation.

Procedures

Group 2 subjects were seen individually for the verification task. The 40 stimulus plates were presented individually. Each subject was instructed (Appendix G). Each subject was asked to provide up to five reasons as to how the pair of pictures were related. If no relation was apparent they were instructed to state that. The picture pairs were randomly ordered for each subject. The subject's responses were manually recorded by the examiner.

Measurement

A scorer, other than the examiner, assigned each subject's responses to the picture pairs to either interactive, categorical, both association or no association categories. The following

operational definitions were used to assign the responses. A stimulus plate was assigned to the Interactive category if up to 5 responses of a subject described the relationship between the pictures in terms of functional or relational characteristics. A stimulus plate was assigned to the Categorical category if up to 5 responses of a subject described the relationship between the pair in terms of superordinate categories or similiar defining characteristics. A pair of pictures was assigned to the Both category if the responses contained at least one response which could be assigned to the Interactive category and one which could be assigned to the Categorical category. A stimulus plate was assigned to the No Relation category if up to 5 responses of a subject did not represent either an interactive or a categorical relation. Responses that could not be assigned to one of the four categories were assigned to a miscellaneous category.

Analysis

A Cohen's kappa (Cohen, 1960) index of agreement was calculated. This analysis was used to determine the extent to which the subjects' responses to stimulus plates were related to the classification associations which were determined in the identification stage of the experiment.

RELIABILITY

Test-Retest

Identification Task.

Although subjects were randomly selected for test- retest reliability, many subjects were unavailable to participate in the reliability task. Thus, 7 of the 20 subjects who were available returned two weeks after they first participated in the identification task. They were again instructed and participated as outlined in Appendix F. Test- retest reliability was obtained to determined the consistency of the subject's ratings of the stimuli over time. Pearson product moment correlations (Quattro, 1987) were calculated to determine the consistency of subjects' responses across time.

Verification Task

Test- retest reliability was established by randomly selected 7 of the 20 subjects to return two weeks after they had participated in the verification task. They were again instructed as outlined in Appendix G. Test- retest reliability was obtained to determine the consistency of the subject's responses to the stimuli over time. A Cohen's kappa (Cohen, 1960) analysis was performed on the data.

Measurement Reliability

Identification task

Inter-observer reliability on the identification task was established by having a second observer score 25% of the stimulus plates. Means and standard deviations were calculated for the scoring of the plates. The measurements obtained were then compared to the examiner scores using a Pearson product moment correlation (Quattro, 1987).

Verification Task

Inter-observer reliability was established by having the examiner re-classify 25% of the subjects' responses. Inter-scorer reliability was calculated between the examiner's coded responses and original scorer's coded responses using a Cohen Kappa (Cohen, 1960) coefficient of agreement.

CHAPTER III

RESULTS

The purposes of the present study were 1) to identify forty pairs of pictures in which ten pairs were capable of being judged as Interactive, ten as Categorical, ten as Both Interactive and Categorical, and ten as Not Being Related, and 2) to verify the selection of the forty pairs of pictures by determining the extent to which they elicited responses in one of the following categories: Interactive, Categorical, Both Interactive and Categorical, or No Relation. The results obtained in the identification task and in the verification task will each be discussed.

Identification Task

Means and standard deviations for interactive and categorical responses were calculated for each stimulus plate (Appendix H). The mean score for each stimulus plate on both the interactive and categorical scales were then plotted and Figure 2 contains a graphic representation. Although the subjects rated the pairs of pictures on a five point Likert scale, the scale was extended for graphic clarity. Figure 2 represents the intersection of the mean scores for each stimulus plate on the interactive and categorical scales. Forty stimulus plates were chosen, as identified by the subjects, as the best exemplars of four categories (Interactive, Categorical, Both Interactive and Categorical, and No Relation). Table 1 lists the stimulus plates which were chosen to represent each of the 4 categories.

TABLE 1
Verification Task Stimuli

ASSOCIATIONS Plate# / Words	Interactive Mean	Interactive S.D.	Catgeorical Mean	Catgeorical S.D.
Interactive				
79. elephant-peanut	4.85	0.357071	1.45	0.739932
81. dog-stick	4.65	0.653835	1.1	0.3
82. rabbit-carrot	4.9	0.3	1.3	0.714143
84. monkey-banana	4.85	0.357071	1.45	1.023474
89. can opener-can	5.0	0.0	1.9	1.178983
91. tree-saw	4.55	0.589491	1.1	0.3
93. lady-iron	4.75	0.622495	1.2	0.87178
94. tree-beaver	4.75	0.53619	1.7	0.953939
95. deer-gun	4.65	0.7792149	1.3	0.781025
98. kitten-yarn	4.55	0.668954	1.2	0.509902
Categorical				
1. watch-clock	1.2	0.4	5.0	0.0
2. pear-grapes	1.2	0.6	4.9	0.3
7. potato-corn	1.3	0.781025	4.8	0.4
13. kangaroo-giraffe	1.2	0.509902	4.75	0.622495
18. couch chair	1.4	0.734847	4.9	0.3
19. grandmother-girl	1.35	0.792149	4.95	0.217945
20. cake-pie	1.05	0.217945	4.85	0.357071
21. egg beater-toaster	1.1	0.43589	4.8	0.4
22. skirt-dress	1.1	0.3	4.9	0.3
25. hamburger-hot dog	1.1	0.3	4.85	0.357071
Both				
3. mop-bucket	4.2	1.4	4.55	0.739932
24. toothbrush-toothpaste	5.0	0.0	4.5	0.921954
51. paddle-canoe	4.8	0.87178	4.3	1.1
57. pants-belt	4.35	1.061838	4.15	1.19478
62. lightbulb-lamp	4.55	0.973396	4.1	0.994987
66. shovel-wheelbarrel	4.1	1.135782	4.5	0.74162
67. chair-table	3.95*	1.32193	4.8	0.4
68. caterpillar-butterfly	4.4	1.240967	4.6	0.8
71. tree-leaf	4.1	1.3	4.4	0.860233
75. paintbrush-paint	4.95	0.217945	4.0	1.30384
Neither				
27. kite-bus	1.0	0.0	1.05	0.217945
33. tomato-bench	1.05	0.217945	1.0	0.0
36. vacuum-onion	1.0	0.0	1.0	0.0
37. squirrel-shirt	1.0	0.0	1.0	0.0
39. grasshopper-clock	1.05	0.217945	1.0	0.0
41. telephone-sock	1.0	0.0	1.0	0.0
42. scissors-snail	1.0	0.0	1.0	0.0
46. lamb-shoe	1.0	0.0	1.05	0.217945
47. goose-ball	1.0	0.0	1.0	0.0
48. turkey-boat	1.05	0.217945	1.0	0.0

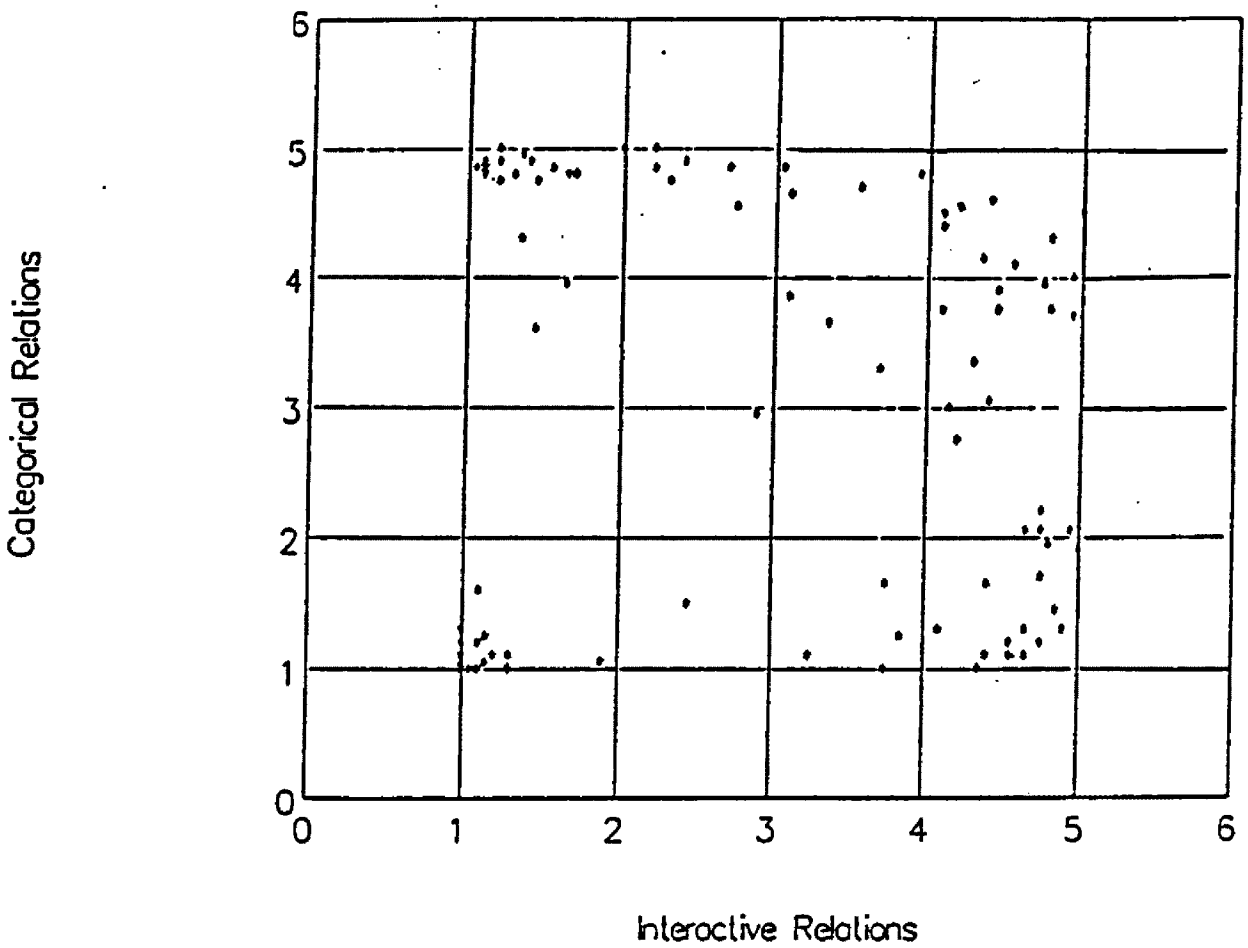

Figure. 2. Identification Task Means and Standard Deviations. The scale points of 1-5 indicate the Likert Scale used for rating. The scale was then expanded for graphic representation.

*Means

Inspection of the data in Figure 2 indicated that subjects were capable of rating each pair of pictures discriminantly. Best exemplars of the Categorical and No Relation stimulus plates were clearly identified and these have been identified in Figure 3. The Interactive category did not have the same extent of clustering at the extremities but ratings obtained did, however, allow for 10 pairs of pictures to be chosen as best examples of the category. Judges appeared to rate pictures in the Both category some what less than the extreme ends of the interactive and categorical scales.

The examiner chose those stimulus plates which had the highest means on the interactive scale with the lowest mean on the categorical scale to represent an Interactive association in the verification task (bottom left hand corner of Figure 3.) . Stimulus plates with the highest mean on the categorical scale and the lowest mean on the interactive scale were chosen to represent the Categorical association (top left hand corner of Figure 3). Those stimulus plates which had the highest means on both the interactive and categorical scales were chosen to represent the category of Both association (top right hand corner of Figure 3). Those pictures which had the lowest means on both scales were chosen to represent No Relation (bottom left hand corner of Figure 3). The data indicated that forty pairs of pictures from the 100 pairs could be identified as capable of being judged as Interactive, Categorical, Both Interactive and Categorical, and No Relation.

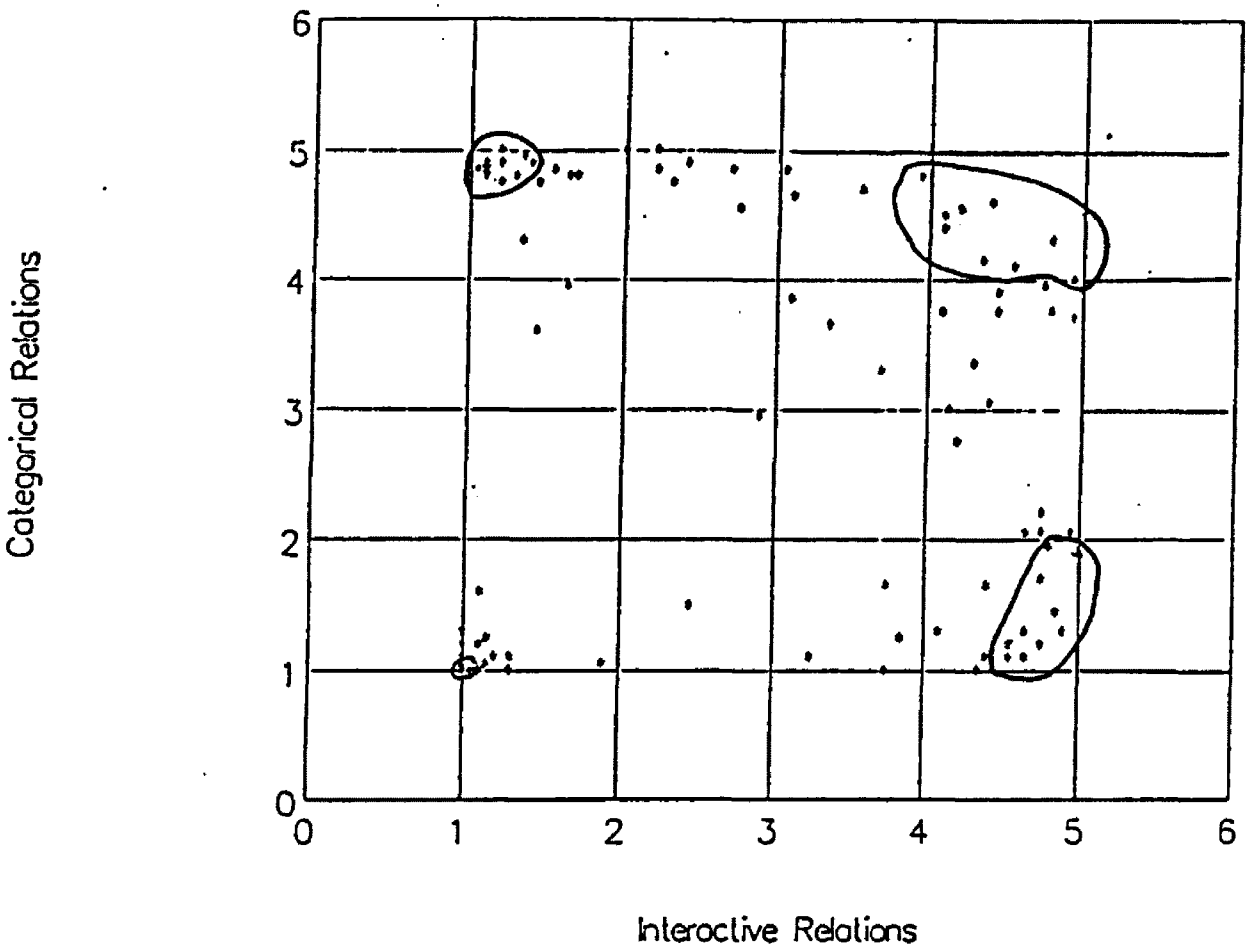

Figure 3. Means of identification task stimuli chosen for the verification task. The lower left corner represents No relation. The lower right corner represents Categorical relation. The upper left corner represents Interactive relation and the upper right corner Both relation. Pairs of words receiving the same value were superimposed on one another so that ten stars are not inclosed in each circle.

* Means

Some of the stimulus plates could have been difficult to classify. For example, should a stimulus plate with an interactive mean of 5.0 and a categorical mean of 1.5 be chosen or an interactive mean of 4.5 and a categorical mean of 1.0. The investigator arbitrarily decided to choose the stimulus plate with the highest mean on the scale of the category that the stimulus was intended to represent. Thus, if an interactive stimulus plate was being sought, the stimulus plate which had an interactive mean of 5.0 would be chosen over the stimulus plate of 4.5, even though the categorical mean was higher. One exception to this was if the 5.0 interactive stimulus plate had a categorical score of 2.0 or greater (i.e. stimulus plate # 54 - bone-dog). The stimulus plate that had a mean interactive score of 4.5 but a mean less than 2.0 would be chosen (i.e. stimulus plate # 95 - deer-gun). No stimulus plates were chosen either for the Interactive stimulus category or the Categorical stimulus category if they had a mean score of 2.0 or greater on the opposite scale because they were seen by the subjects as being weakly related and were not chosen to represent one of the best exemplars of the opposite categories. The examiner was forced to choose one picture which was rated less than 4.0 on the interactive scale to act as a stimulus for the verification task (plate# 67- chair-table).

Verification Task

In order to verify the extent to which the forty pairs of pictures selected from the identification task were likely to

elicit responses in one of the following categories: Interactive, Categorical, Both Interactive and Categorical, or No Relation, a Cohen's kappa (Cohen, 1960) coefficient of agreement was calculated between the predicted outcome and the actual responses by the subjects (Table 2). The Cohen's kappa coefficient of agreement for the verification data was .63. Table 3 contains which plates were agreed upon and which plates were not agreed upon. Table 2 demonstrates that 191 out of 200 responses to a pair of pictures identified as likely to elicit categorical responses were judged as such. The ten pictures which were identified as capable of eliciting interactive responses to the pairs of pictures did so 163 responses out of a possible 200. Therefore both the interactive association stimuli and categorical association stimuli elicited 82% of those associations in those possible contexts. However, only 51% of the responses given to stimuli identified as capable of elicting both associations actually elicted both associations. Subjects responded with no relation 135 times out of a possible 200 opportunities.

The Cohen's kappa level of agreement indicates a "substantial agreement". As noted in Shellen (1985) "if the agreement is below .70 the researcher should consider the possibilities that the categories are not clearly defined " (p. 23). This issue will be discussed in the next chapter.

Table 2

Frequency of Agreement and Disagreement
Between Predicted Responses and Verification Responses
Cohen's Kappa Coefficient

		Verification Task Responses				
	Category	Interactive	Categorical	Both	Neither	Total
Predicted Responses	Interactive	163	0	34	3	200
	Categorical	3	191	6	0	200
	Both	78	20	102	0	200
	Neither	22	35	8	135	200
	Totals	266	246	150	270	N= 800

Fo= 591 Fo (Frequency of Occurrence)

Fc= 233 Fc (Frequency of Chance)

Cohen's kappa = .63

Table 3

DATA FROM VERIFICATION TASK
NUMBER OF RESPONSES OCCURRING FOR CLASSIFICATION CATEGORIES

Identified Categories / Plate # - Word Pairs	Categories of Actual Verification Responses: INTERACTIVE	CATEGORICAL	BOTH	NO RELATION
BOTH				
3. mop-bucket	6	3	11	0
24. toothbrush-toothpaste	2	5	13	0
51. paddle-canoe	7	0	13	0
57. pants-belt	8	0	12	0
62. lightbulb-lamp	8	1	11	0
66. shovel-wheelbarrel	3	5	12	0
67. chair-table	8	2	10	0
68. caterpillar-butterfly	11	2	7	0
71. tree-leaf	12	1	7	0
75. paintbrush-paint	13	1	6	0
INTERACTIVE				
79. elephant-peanut	15	0	5	0
81. dog-stick	18	0	1	1
82. rabbit-carrot	15	0	5	0
84. monkey-banana	16	0	4	0
89. can opener-can	16	0	4	0
91. tree-saw	14	0	6	0
93. lady-iron	19	0	0	1
94. tree-beaver	16	0	3	1
95. deer-gun	18	0	2	0
98. kitten-yarn	16	0	4	0
CATEGORICAL				
1. watch-clock	0	20	0	0
2. pear-grapes	0	20	0	0
7. potato-corn	0	20	0	0
13. kangaroo-giraffe	0	20	0	0
18. couch-chair	0	20	0	0
19. grandmother-girl	3	13	4	0
20. cake-pie	0	20	0	0
21. egg beater-toaster	0	20	0	0
22. skirt-dress	0	18	2	0
25. hamburger-hot dog	0	20	0	0
NO RELATION				
27. kite-bus	0	7	0	13
33. tomato-bench	1	2	1	16
36. vacuum-onion	4	2	1	12
37. squirrel-shirt	3	3	2	12
39. grasshopper-clock	4	2	0	14
41. telephone-sock	1	2	1	16
42. scissors-snail	0	6	1	13
46. lamb-shoe	2	4	0	14
47. goose-ball	0	6	1	13
48. turkey-boat	7	1	1	11

RELIABILITY

Test-Retest Reliability

Identification Task

The Pearson correlation coefficients (Quattro, 1987) of test-retest reliability of 7 subjects' responses to stimulus plates on the interactive and categorical scales between the first and second rating sessions were computed. As seen in Table 4, individual coefficients of correlation across subjects and semantic relations ranged from 0.70 to 0.95. The mean coefficient of correlation was 0.85. These results were statistically significant at the 0.01 level. These results indicated that subjects' ratings of the stimuli over time were significantly consistent.

Verification Task

Seven of the twenty subjects, who participated in the verification task, returned to participate a second time in the same task to provide the investigator with reliability information. The Cohen's Kappa (Cohen, 1960) coefficient of agreement of the subjects' responses between the first and second testing sessions are listed in Table 5. The index of agreement was .73. These results indicated that the subjects' judgements on the stimuli were consistent over time.

Table 4

Identification Task - Test- Retest Reliability
Pearson Product Moment Coefficient

SUBJECT #	1	2	3	4	5	10	15
ASSOCIATIONS							
Interactive							
r=	0.70	0.71	0.95	0.80	0.87	0.88	0.72
Categorical							
r=	0.90	0.93	0.95	0.87	0.85	0.84	0.88

Mean Interactive Reliability coefficient = 0.80
Mean Categorical Reliability coefficient = 0.88
Mean Reliability Coefficient = 0.85

Measurement Reliability

Identification Task

Data from the identification task were initially entered into a computer by the investigator. A second individual re-entered randomly selected 25% of the subjects' responses to determine inter-scorer reliability. The reliability scorer was shown how to enter the data into the Quattro (Quattro, 1987) data spread sheet prior to conducting reliability measures. Means and standard deviations were calculated and compared to the examiners scores. The reliability was calculated according to Pearson correlation coefficient measurement (Quattro, 1987). The Pearson correlation coefficients (Quattro, 1987) of inter-scorer reliability are listed in Table 6. As indicated by the table, inter- scorer reliability ranged from 0.98 percentage agreement to 1.0 percentage agreement. The mean coefficient equalled 1.0 (0.997). These results were statistically significant at the 0.01 level. Thus, the results indicated that inter-scorer computer entry of the identification data was consistent between scorers.

Verification Task

Data from the verification task were initially scored by a person other than the investigator (as discussed in the methods). The investigator then scored a randomly selected 25% of the subjects' responses. Her scoring was then compared to the original scorer's results and a Cohen's Kappa (Cohen, 1960) coefficient of agreement was calculated. The index of agreement is reported in Table 7. As indicated by the table, inter- observer reliability

Table 5

Verification Task - Test-Retest Reliability
Cohen's Kappa Coefficient

		Responses- Session B				
	Category	Interactive	Categorical	Both	Neither	Total
Session A	Interactive	63	2	20	3	88
	Categorical	1	84	0	1	86
	Both	16	5	47	0	68
	Neither	1	6	0	31	38
	Totals	81	97	67	35	N= 280

Fo= 225 Fo (Frequency of Occurrence)
Fc= 76.2714 Fc (Frequency of Chance)
Cohen's Kappa = .73

Table 6

Identification Task - Measurement Reliability

Pearson Product Moment Coefficient

SUBJECT #	1	3	4	6	7
ASSOCIATIONS					
Interactive					
r=	1.0	0.998	1.0	1.0	1.0
Categorical					
r=	1.0	1.0	1.0	1.0	0.98

Mean Interactive Reliability coefficient = 1.0
Mean Categorical Reliability coefficient = 1.0
Mean Reliability Coefficient = 1.0

Table 7

Frequency of Agreement and Disagreement
Between Coder A and Coder B

Cohen's Kappa Coefficient

		Coder B				
	Category	Interactive	Categorical	Both	Neither	Total
	Interactive	51	2	2	0	55
	Categorical	0	62	1	0	63
Coder A	Both	4	3	45	0	52
	Neither	0	0	8	30	30
	Totals	59	67	48	30	N= 200

Fo= 188 Fo (Frequency of Occurrence)
Fc= 54.31 Fc (Frequency of Chance)
Cohen's kappa = 0.918

coefficient was .918 agreement. This coefficient suggested that scoring of the subjects' responses was consistent between the two scorers.

Summary

As indicated by the identification task data, subjects were capable of identifying forty pairs of pictures in which 10 pairs were capable of being judged as Interactive, 10 pairs as Categorical, 10 pairs as Both Interactive and Categorical and ten as Not Related. As discussed, Categorical and No Relation stimulus plates appeared to have less scattering of the means along the two scales than did the Interactive and Both stimulus plates. Some possible explanations for this phenomenon will be offered in chapter four.

The forty stimulus plates, which were identified from the identification task as best exemplars of each of the four categories, appeared to elicit predicted responses from the subjects participating in the verification task. The correlation between the predicted and actual responses obtained in the verification task was not as high as was hoped. Some possible reasons for the response pattern will be discussed in the following chapter. Both test-retest and measurement reliability for the identification task and the verification task were good, which indicated both consistency between scorers' and subjects' responses.

Possible factors affecting the results will be discussed next. Theoretical and clinical implications of this study's results will also be presented.

CHAPTER IV

DISCUSSION

The general purpose of this study was to identify stimuli which would be capable of eliciting accurate developmental semantic categorization responses. Specifically, the purposes of this study were to identify forty pairs of pictures in which 10 pairs were capable of being judged as Interactive, 10 pairs as Categorical, 10 pairs as Both Interactive and Categorical, and 10 as Not Related, and 2) to verify the selection of the forty pairs of pictures by determining the extent to which they elicit responses in one of the four categories: Interactive, Categorical, Both Interactive and categorical, or No Relation. This chapter will discuss the identification task and the verification task separately and then some general conclusions and implications will be presented.

Identification Task

The ratings of the subjects in this study identified forty pairs of pictures which were capable of eliciting Interactive, Categorical, Both associations, or No Relation responses. These results confirmed arguments put forth by Emerson and Gekoski (1976) that adults are capable of forming both interactive and categorical responses. Thus, further support is offered that categorical and interactive associations coexist.

The results indicated a compact clustering of ratings for both the Categorical stimulus plates and the No Relation stimulus plates. The Both association plates and the Interactive stimulus

plates did not have the same degree of clustering for the ratings. Some possible explanations are suggested.

Possible Factors Affecting Identification Results

Operational Definition Influence

The operational definitions for categorical and interactive associations may have been a confounding variable to the results of the present study. Many subjects questioned or asked for a repetition of the definition of an interactive association during the training task of the identification task. Perhaps this definition was not as clear to the subjects as the Categorical and None definitions. Subjects appeared to comprehend the definitions of categorical and no association satisfactorily. This was reflected in the paucity of requests for clarification of the two definitions and the subjects' ratings of the stimuli. Inspection of the data indicated less scatter on the categorical and no relation rating means. An alternate explanation may be that since interactive associations are a "secondary" association (Emerson & Gekoski, 1976) the definitions may have been more difficult for the subjects to remember. Both reasons are possibilities and future research is needed to address them.

Stimuli Effect

A second possible factor affecting the identification task results was stimuli effects. The original 100 stimuli pairs may have been biased when the pictures were paired for the study. The examiner had a specific number and set of pictures to choose from

out of the commercial source which she used. She then attempted to pair the pictures to develop stimuli for exemplars of each of the categories. This may have been limiting and not resulted in the best stimuli for the study. If the picture pool had been expanded, different pictures may have been selected to better meet the definitions. Also, if the examiner had developed a list of words which she believed to be the best exemplars, and then sought pictures to match the words, she may have obtained a better set of original stimuli.

Individual Variation

Individual variation among subjects may also influence the ratings. For example, many of the plates which were rated as No Relation by the identification subjects elicited either a categorical or an interactive response in the verification task. More specifically, "turkey" and "ship" were rated as No Relation by the identification subjects but were rated by many verification subjects to be related because turkey could be served on a ship. Also "lamb" and "shoe" were rated as No Relation by many identification subjects but were rated by many verification subjects to be related because both objects start with the same letters (sheep and shoe). Verbal reasoning of the identification subjects did not support actual scoring of some stimulus plates. Many subjects verbalized an association between pairs of words but then scored those pairs of pictures as not exhibiting a relationship. Thus, many of the identification subjects voiced

these associations but did not record the relationship on either of the scales. They scored the stimulus plates as No Relation.

Subject Age

Emerson and Gekoski (1976) stated that adults tend to respond primarily categorically in semantic association tasks. This tendency may account for the compact clustering occurring in the ratings of Categorical associations and No association stimuli and less compact clustering for the Interactive and Both associations. What remains unknown is the degree of scatter of ranking of responses as related to changes in subjects' ages. Whether the scatter of ranking responses would be less for the Interactive stimuli if the stimuli were presented to children under the age of six years remains unknown. Recall that prior to age six children tend to respond primarily interactively (Emerson & Gekoski, 1976). Perhaps children who are in a period of shift between primary semantic associations, would rank the Both category more consistently than did the adults in the present study. The issue needs further investigation.

Verification Task

Emerson and Gekoski (1976) stated that adults tend to use primarily categorical associations when presented with picture pairs. These authors reported, however, that adults are capable of making interactive associations, but that these are secondary to categorical associations. This observation was supported by the results in the verification task of the present study. Responses given to the Interactive and Categorical stimuli

differed in consistency of responses. The stimulus pictures which were identified as capable of eliciting Categorical responses were judged by the verification subjects as representing a Categorical association more often than Interactive and Both associations were judged as representing their respective associations.

Stimuli selected to elicit a Both relation response did not do so consistently. Analyses of the responses obtained indicated that some subjects had one response which was interactive and three or four responses which were categorical. Categorical associations appeared to be made more often than were interactive responses to the Both stimuli. For example, one individual (subject #6) responded with both associations for every stimuli with the exception of all the categorical stimulus plates and four of the no relation stimulus plates. Although she formed interactive associations, the categorical association appeared to be the stronger relation of the two. The results from the verification task supported the results of Emerson and Gekoski (1976) which demonstrated adults are capable of forming both types of responses but do tend to respond primarily categorically even when presented with stimuli which have been rated as interactive stimuli.

The results of the verification task argue in support of the premise that people do have a primary response pattern but one which may not be strictly a categorical or interactive pattern. Therefore, when investigating semantic associations, useful information can be obtained from a task which would allow people

to express more than one association if observed. The results of the present study have identified stimuli and a methodology which allow for the investigation of all four response patterns, not just the primary one.

Clinical Implications/ Future Research

The rationale for the present study evolved from a need for an assessment tool which would be capable of eliciting accurate developmental semantic categorization responses. Subjects identified stimuli which formed Interactive, Categorical, Both Interactive and Categorical or No associations. Thus, stimuli plates have been identified which have the potential to determine where a person's performance might be in a developmental continuum for semantic categorization. As discussed previously, some stimuli represented better exemplars of certain categories but stimuli were capable of eliciting all four association responses.

Are these stimuli ready for clinical use? The answer is no. The results of the present study are only the first step in a lengthy process to develop a valid and reliable assessment tool. Future research needs to investigate whether or not improved definitions of Interactive would result in a more compact rating of interactive stimuli. Additional research includes a need to identify and then verify different stimuli selection for the Interactive and Both associations to obtain better exemplars than were obtained in the present study.

The verification task needs to be administered to normal functioning children. If the ultimate goal of this research is to develop a standardized assessment tool for assessing the developmental continuum of semantic categorization skills in children, the responses to the pictorial stimuli must be obtained from normal children. Normative data from children age 3 to 10 need to be obtained. After these data have been collected and norms developed, the procedure could then be used to assess language- impaired children.

Summary

This study identifed forty pairs of pictures in which 10 pairs were capable of being judged as Interactive, 10 as Categorical, 10 as Both Interactive and Categorical and No Relation. Secondly, these picture pairs were verified as capable of eliciting responses in one of the four categories: Interactive, Categorical, Both Interactive and Categorical,, or No Relation.

The results obtained are in accord with the studies by Emerson and Gekoski (1976) and Lippman (1971). The results from this study indicated adults were capable of forming more than one type of paradigmatic association when given a task which allowed them to express all types of semantic associations. However, a need exists for a more specific definition of the interactive category and replication of the ratings by children between the ages of 3 and 10 years and the establishment of norms.

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Appendix A

JUDGES QUESTIONNAIRE

Do you have vision within normal limits or within normal limits with the aid of prescriptive lenses?

Yes No

Have you had a college introductory course in linguistics?

Yes No

If yes: Where?
Title and number of course?
When?
# of Credits?

Have you had a college course in child language acquisition?

Yes No

If yes: Where?
Title and number of course?
When?
# of credits?

Are you a native speaker of English?

Yes No

Have you had additional courses in linguistics?

Yes No

If yes: Please List

_____
_____
_____

* Asked verbally: Did you have passing grades in your course work?

_____ _____
name date

APPENDIX B

Categorical Word List			Interactive Word List	
T1.	man	boy	T2. man	hammer
P1.	basketball	football	P2. mailman	letter
P5.	big dog	little dog	P6. dog	bone
1.	watch	clock	76. bird	cage
2.	pear	grapes	77. gas	truck
3.	mop	bucket	78. box	shoe
4.	motorcycle	bike	79. elephant	peanut
5.	doctor	nurse	80. butterfly	flower
6.	bottle	jar	81. dog	stick
7.	potato	corn	82. rabbit	carrot
8.	dustpan	broom	83. fishing pole	fish
9.	swing	slide	84. monkey	banana
10.	swimming pool	swim suit	85. vacuum	man
11.	fork	spoon	86. sewing machine	pants
12.	train	plane	87. steering wheel	car
13.	kangaroo	giraffe	88. purse	money
14.	cow	pig	89. can opener	can
15.	piano	guitar	90. owl	tree
16.	comb	brush	91. tree	saw
17.	scarf	hat	92. puppy	slipper
18.	couch	chair	93. lady	iron
19.	grandmother	girl	94. tree	beaver
20.	cake	pie	95. deer	gun
21.	egg beater	toaster	96. brush	horse
22.	skirt	dress	97. school	teacher
23.	cup	saucer	98. kitten	yarn
24.	toothbrush	toothpaste	99. lawn mower	boy
25.	hamburger	hotdog	100. dog house	dog

Interactive/ Categorical		No Relation	
T3. bat	ball	T4. snake	lamp
P3. hammer	nail	P4. tractor	sock
P7. woman	girl	P8. ladder	candy
51. paddle	canoe	26. sweater	church
52. chicken	egg	27. kite	bus
53. fireman	baby	28. poodle	plant
54. bone	dog	29. cookie	skate
55. clown	balloon	30. frog	rope
56. television	couch	31. wheel	house
57. pants	belt	32. crayon	stool
58. tow truck	car	33. tomato	bench
59. apple	tree	34. turtle	shoe
60. pencil	book	35. bear	shoe
61. ice cream	milk	36. vacuum	onion
62. light bulb	lamp	37. squirrel	shirt
63. dollar	coin	38. tractor	doll
64. goat	barn	39. grass hopper	clock
65. hamburger	ketchup	40. police woman	tent
66. wheel barrel	shovel	41. telephone	sock
67. chair	table	42. scissor	snail
68. caterpillar	butterfly	43. truck	knife
69. lace	shoe	44. market	ball
70. soup	pot	45. window	mouse
71. tree	leaf	46. lamb	shoe
72. sharpener	pencil	47. goose	ball
73. camper	bike	48. turkey	boat
74. coffee pot	mug	49. pajama	wagon
75. paint brush	paint	50. basket	coat

APPENDIX C

CONSULTANT INSTRUCTIONS

You have been asked to participate in this study as a judge. You will be presented with pairs of pictures and asked to judge these on how they are related semantically. Your judgements will be made in regard to how the two pictures are related INTERACTIVELY and CATEGORICALLY.

Words that have similar defining characteristics (such as woman and girl which only differ by age; and lamp and flashlight which have similar functions) are related categorically. An interactive relation is the result of interactive knowledge wherein the stimulus words are placed in an action sequence based on functional or relational characteristics (e.g., woman-needle: woman sews with a needle and as in man- hammer: man hits with a hammer. These relationships may not be mutually exclusive. With some pairs of words there exists the potential for both types of relationships to be formed and with other pairs of words no relationship may be seen.

Please place each stimulus plate in one of four groups: interactive, categorical, both interactive and categorical, no relation. Thank you for your assistance.

APPENDIX D

Plate # _____
Subject # _____

Order # _____

The Scale	1	2	3	4	5	Interactive
	not related	weakly related	moderately related	strongly related	extremely related	
	1	2	3	4	5	Categorical

APPENDIX E

SAMPLE SCORING

Plate # _____
Subject # _____

Order # _____

The Scale	1	2	3	4	5	Interactive
	not related	weakly related	moderately related	strongly related	extremely related	
	1	2	3	4	5	Categorical

Appendix F

INSTRUCTIONS FOR IDENTIFICATION TASK

1. Introduction

You have been asked to participate in this study as a judge. You will be presented with pairs of pictures and asked to judge these on how they relate semantically. Your judgements will be made in regards to how the two pictures are related INTERACTIVELY and CATEGORICALLY.

Words that have similar defining characteristics (such as woman and girl which only differ by age; and lamp and flashlight which have similar functions) are related categorically. An interactive relation is the result of interactive knowledge where the stimulus words are placed in an action sequence based on functional or relational characteristics (e.g., woman-needle: woman sews with a needle and as in man- hammer: man hits with a hammer.. These relationships may not be mutually exclusive. With some pairs of words there exists the potential for both types of relationships to be formed and with other pairs of words no relationship may be seen.

I'm going to show you some pictures one pair at a time. I will ask you to judge each picture on a categorical scale and an interactive scale. If you think there is no relation circle 1; if weakly related, circle 2; if moderately related, circle 3; if strongly related, circle 4 ; and if you think it is extremely strongly related, circle 5 on your score sheet. Each scale ranges from not related to extremely related. Let me show you an example.

2. Training Task

Here is a picture of a man and a boy. These two pictures have many similar defining characteristics and generally differ only by age. These pictures would be extremely related categorically, so you would circle 5 on the categorical scale. However, they would not be related interactively; therefore, you would circle 1 on your score sheet.

Look at this pair of the man and hammer. They wouldn't have any similar defining characteristics but do have a relationship based on function. Therefore, you would circle the 5 on the interactive scale and a 1 on the categorical scale.

Here is another pair: a baseball bat and a baseball. You can form a functional relationship between the two pictures , for example the bat hits the ball. Both objects also belong to the same category of baseball equipment. Therefore you would score a 5 on both the interactive and categorical scale.

Look at this pair of a snake and a lamp. They don't have similar defining features and they don't have a functional or relational association. Thus you would circle a 1 on both the interactive and the categorical scale. Do you have any questions about these exmples? Now I'd like you to try some.

3. Practice Task

"Here is a pair of pictures: a woman and a girl. Circle the number on your score sheet for how, if at all, the two pictures are

related. Circle one number for how you think they are related interactively and one for how you think they are related categorically.

Great! Here's another pair: a mailman and a letter. Do the same as you just did. One for the interactive scale and one for the categorical scale. O.K.

Try this one now: a hammer and nail. And then try this one: tractor and a sock. All right let's see how you scored them."

If the potential subject fails to score the examples like the examiner and consultant did, the following procedure will follow.

For example, if the potential subject does not score woman-girl as a 5 on the categorical scale and a 1 on the interactive scale, the examiner would ask what relationship he/she saw (i.e., both female). If the examiner determined the subject did not understand the task by his/her response, she would do the following. The examiner would tell the potential subject that the two only differ by age and therefore would be rated as 5 on the categorical scale and a 1 on the interactive scale. This process would be completed for any other pairs that were scored differently from the examiner. A second set of four practice plates would be provided.

If the person failed to have agreement on three out of the four plates during a second set of training items, the individual would be excluded from participating in the study.

4. Identification Task

"I will now present 100 pairs of pictures to you one at a time. Here is the first one."

APPENDIX G

INSTRUCTIONS FOR VERIFICATION TASK

"You will be presented with pairs of pictures and asked to say how they are related. Your responses will be manually recorded. Some may be related by similar characteristics (e.g., both pictures are square, both are male, both are used to brush something etc.). Others may be related based on functional or relational characteristics (e.g., **woman-needle:** a woman sews with a needle, or as in **man-hammer:** the man hits with a hammer). These relationships may not be independent. You may see more than one relationship between pairs of pictures. You may also not see any relationships between the pair of pictures.

You will be presented forty pairs of pictures. Please tell me up to 5 reasons for how the two pictures might be related. Some pictures may be related and others may not. If you do not see any relationship between the two pictures, just say 'no relationship'."

After a subject gives her/his responses, the experimenter asks, "Can you think of any other reasons why___ and ____ might go together?" When the subject responds "no" the next stimulus plate is presented.

APPENDIX H
Identification Task Means and Standard Deviations

PLATE	WORDS	CATEGORICAL RELATION MEAN	CATEGORICAL RELATION STANDARD DEVIATION	INTERACTIVE RELATION MEAN	INTERACTIVE RELATION STANDARD DEVIATION
1	watch - clock	5.0	0.0	1.2	0.4
63	dollar - coin	5.0	0.0	2.0	1.414214
16	comb - brush	5.0	0.0	2.2	1.32665
19	grandmother - girl	4.95	0.217945	1.35	0.792149
22	skirt - dress	4.9	0.3	1.1	0.3
2	pear - grapes	4.9	0.3	1.2	0.6
18	couch - chair	4.9	0.3	1.4	0.734847
9	swing - slide	4.9	0.3	2.4	1.8
20	cake - pie	4.85	0.357071	1.05	0.217945
25	hamburger - hotdog	4.85	0.357071	1.1	0.3
4	motorcycle - bike	4.85	0.357071	1.55	1.203121
6	bottle - jar	4.85	0.357071	2.2	1.568439
5	doctor - nurse	4.85	0.357071	3.05	1.802082
58	tow truck - car	4.85	0.47697	2.7	1.268858
21	egg beater - toaster	4.8	0.4	1.1	0.43589
7	potato - corn	4.8	0.4	1.3	0.781025
15	piano - guitar	4.8	0.4	1.7	1.144552
67	chair - table	4.8	0.4	3.95	1.32193
12	train - plane	4.8	0.509902	1.65	1.152172
14	cow - pig	4.75	0.433013	1.45	0.589491
23	cup - saucer	4.75	0.53619	2.3	1.382027
13	kangaroo - giraffe	4.75	0.622495	1.2	0.509902
8	dustpan - broom	4.7	0.458258	3.55	1.802082
61	ice cream - milk	4.65	0.726292	3.1	1.479865
68	caterpillar - butterfly	4.6	0.8	4.4	1.240967
3	mop - bucket	4.55	0.739932	4.2	1.4
11	fork - spoon	4.55	1.116915	2.75	1.409787
66	wheel barrel - shovel	4.5	0.74162	4.1	1.135782
24	toothbrush - toothpaste	4.5	0.921954	5.0	0.0
71	tree - leaf	4.4	0.860233	4.1	1.3

PLATE	WORDS	CATEGORICAL RELATION MEAN	CATEGORICAL RELATION STANDARD DEVIATION	INTERACTIVE RELATION MEAN	INTERACTIVE RELATION STANDARD DEVIATION
73	camper - bike	4.3	0.781025	1.35	0.053835
51	paddle - canoe	4.3	1.1	4.8	0.87178
57	pants - belts	4.15	1.19478	4.35	1.061838
62	lamp - light bulb	4.1	0.994987	4.55	0.973396
75	paint - paintbrush	4.0	1.30384	4.95	0.217945
53	fireman - baby	3.95	0.973396	1.65	0.852936
74	coffeepot - mug	3.95	1.160819	4.75	0.53619
65	ketchup - hamburger	3.9	1.090871	4.45	0.920598
56	television - couch	3.85	1.19478	3.1	1.3
69	lace - shoe	3.75	1.299038	4.45	0.920598
87	car - steering wheel	3.75	1.299038	4.8	0.678233
97	school - teacher	3.75	1.512448	4.1	1.479865
72	sharpener - pencil	3.7	1.268858	4.95	0.217945
10	pool - swimsuit	3.65	1.525615	3.35	1.710994
17	scarf - hat	3.6	1.827567	1.45	0.864581
52	chicken - egg	3.35	1.492481	4.3	1.268858
55	clown - balloon	3.3	1.053565	3.7	1.268858
59	apple - tree	3.05	1.28355	4.4	1.067708
70	soup - pot	3.0	1.449138	4.15	1.061838
60	pencil - book	2.95	1.32193	2.9	1.374773
64	goat - barn	2.75	1.47902	4.2	1.122497
83	fishing pole - fish	2.2	1.6	4.75	0.53619
77	gas - truck	2.05	1.243986	4.75	0.698212
54	bone - dog	2.05	1.359228	4.95	0.217945
76	bird - cage	2.05	1.56449	4.65	0.90967
100	dog - doghouse	1.95	1.243986	4.8	0.509902
89	can - canopener	1.9	1.178983	5.0	0.0
94	tree - beaver	1.7	0.953939	4.75	0.53619
90	owl - tree	1.65	1.061838	4.4	0.969536
80	butterfly - flower	1.65	1.107926	3.75	1.444818

PLATE	WORDS	CATEGORICAL RELATION MEAN	CATEGORICAL RELATION STANDARD DEVIATION	INTERACTIVE RELATION MEAN	INTERACTIVE RELATION STANDARD DEVIATION
49	pajama - wagon	1.6	1.019804	1.1	0.3
78	box - shoe	1.5	0.921954	2.45	1.32193
79	elephant - peanut	1.45	0.739932	4.85	0.357071
84	monkey - banana	1.45	1.023474	4.85	0.357071
30	frog - rope	1.3	0.640312	1.0	0.0
88	purse - money	1.3	0.640312	4.1	1.178983
82	rabbit - carrot	1.3	0.714143	4.9	0.3
95	deer - gun	1.3	0.781025	4.65	0.792149
28	poodle - plant	1.25	0.433013	1.15	0.357071
96	brush - horse	1.25	0.766485	3.85	1.19478
29	cookie - skate	1.2	0.4	1.1	0.3
98	kitten - yarn	1.2	0.509902	4.55	0.668954
38	tractor - doll	1.2	0.87178	1.0	0.0
93	lady - iron	1.2	0.87178	4.75	0.622495
31	wheel - house	1.1	0.3	1.0	0.0
34	turtle - shoe	1.1	0.3	1.0	0.0
43	truck - knife	1.1	0.3	1.0	0.0
92	puppy - slipper	1.1	0.3	3.25	1.336974
86	sewing machine - pants	1.1	0.3	4.4	0.8
91	tree - saw	1.1	0.3	4.55	0.589491
81	dog - stick	1.1	0.3	4.65	0.653835
44	market - ball	1.1	0.43589	1.2	0.4
40	policewoman - tent	1.1	0.43589	1.3	0.640312
27	kite - bus	1.05	0.217945	1.0	0.0
35	bear - shoe	1.05	0.217945	1.0	0.0
46	lamb - shoe	1.05	0.217945	1.0	0.0
32	crayon - stool	1.05	0.217945	1.15	0.357071
50	basket - coat	1.05	0.217945	1.9	1.337909
36	vacuum - onion	1.0	0.0	1.0	0.0
37	squirrel - shirt	1.0	0.0	1.0	0.0

PLATE	WORDS	CATEGORICAL RELATION MEAN	CATEGORICAL RELATION STANDARD DEVIATION	INTERACTIVE RELATION MEAN	INTERACTIVE RELATION STANDARD DEVIATION
41	telephone - sock	1.0	0.0	1.0	0.0
42	scissor - snail	1.0	0.0	1.0	0.0
47	goose - ball	1.0	0.0	1.0	0.0
33	tomato - bench	1.0	0.0	1.05	0.217945
39	grasshopper - clock	1.0	0.0	1.05	0.217945
48	turkey - boat	1.0	0.0	1.05	0.217945
26	sweater - church	1.0	0.0	1.1	0.3
21	eggbeater - toaster	1.0	0.0	1.1	0.43589
45	window - mouse	1.0	0.0	1.3	0.640312
7	potato - corn	1.0	0.0	1.3	0.781025
15	piano - guitar	1.0	0.0	1.7	1.144552
85	vacuum - man	1.0	0.0	3.75	1.373863
67	chair - table	1.0	0.0	3.95	1.32193
71	tree - leaf	1.0	0.0	4.1	1.3
99	boy - lawn mower	1.0	0.0	4.35	0.726292
87	steering wheel - car	1.0	0.0	4.8	0.678233